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I, Bradley Lynn Deline,

hereby submit this original work as part of the requirements for the degree of:

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in Geology

It is entitled:

The Effects of Scale, Community Structure, and Environment on Ordovician through Early Silurian Laurentian Crinoid Disparity.

Student Signature: Bradley Lynn Deline

This work and its defense approved by:

Committee Chair: Carlton Brett

Michael Foote

David Meyer

Arnold Miller

Colin Sumrall

Approval of the electronic document:

I have reviewed the Thesis/Dissertation in its final electronic format and certify that it is an accurate copy of the document reviewed and approved by the committee.

Committee Chair signature: Carlton Brett

The Effects of Scale, Community Structure, and Environment on Ordovician through Early Silurian Laurentian Crinoid Disparity.

A dissertation submitted to the

Graduate School

of the University of Cincinnati

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requirements for the degree of

Doctor of Philosophy

in the Department of Geology

of the College of Art and Sciences

by

Bradley Deline

M.S. University of Cincinnati

Cincinnati, OH. 2006

B.S. University of Michigan

Ann Arbor, MI. 2003

Committee Chair: C. E. Brett, Ph.D.

ABSTRACT

The quantification of morphological disparity is an important tool in the study of macroevolution. Estimating disparity is difficult and is therefore relatively understudied in relation to taxonomic diversity. The current study aims to reexamine and explore the disparity of Early Paleozoic crinoids across geographic and taxonomic scales. Disparity is calculated based on the coding of discrete morphological characters. Regional crinoid disparity was examined using greater stratigraphic resolution and taxonomic coverage in order to test the patterns and interpretation of previous studies. At the local level (i.e. biofacies) the effects of different communities on measures of disparity as well as the meaning of rarity in regard to morphological uniqueness was examined.

In agreement with previous studies, Ordovician through Early Silurian crinoid disparity rapidly expanded than stabilized during the Ordovician. However, the current study shows a major rise in disparity during the Silurian recovery following the Ordovician Mass Extinction. This rise is mostly because of the proliferation of the myelodactylids that were well suited to the soft substrate environments that expanded late in the Ordovician. Examination of both the Late Ordovician and Permian extinctions indicate that there is no evidence of an increased rigidness of morphology during recoveries and if genetic canalization played a large role in crinoid morphologic history, it likely occurred during the Early Ordovician.

Biofacies level disparity shows a very different pattern from the regional patterns. On average biofacies have equitable disparity through time and individual biofacies do not show strong differences in disparity with regard to environment, time, or geography.

Contrary to previous studies the choice of taxonomic level can affect the results in two ways. First, the number of species per genera can change through time such that the disparity of time bins with a higher ratio will be underestimated. Secondly, combining aberrant species into a single genus can drastically reduce disparity values as is seen in myelodactylids in the Early Silurian.

Local disparity was also examined in regard to community structure. Even though many disparity metrics are not sample-size dependant biases can result from rare taxa being outliers or merely segregated in morphospace from common taxa. In Early Paleozoic crinoids rare species do not contribute more to local disparity than common species, however, in some biofacies rare crinoids occupy separate areas of morphospace. Weighting local disparity by abundance is a less biased metric that includes elements of morphology, evenness, and subgroup occupation. Localities that have a low weighted to unweighted disparity ratio often are strongly structured following aerosol filtration theory. Localities that have equitable values for the two metrics often are at intermediate depths, occur early in crinoid history, or are environmentally or ecologically disturbed. Examining the ratio of these metrics for crinoid biofacies through time it appears that structured community based on aerosol filtration theory appeared no later than the Late Middle Ordovician.

ACKNOWLEDGEMENTS

I would like to foremost thank my advisor Carlton Brett as well as the other members of my committee Michael Foote (University of Chicago), David Meyer (University of Cincinnati), Arnold Miller (University of Cincinnati), and Colin Sumrall (University of Tennessee). William Ausich (Ohio State University) provided unpublished data on Early Paleozoic crinoid occurrences and provided authorship level contributions to chapters two and three. Michael Foote provided unpublished morphological data that was helpful in the characterization of crinoid features. I would also like to thank Thomas Guensburg (Rock Valley State College), Forest Gahn (Brigham Young University - Idaho), and William Ausich provided access to undecided crinoid specimens. The clarity of chapter one was improved by the comments of Matthew Wills (University of Bath) and Loic Villier (Universite´ de Provence). Rick Schrantz and Daniel Phelps of Kentucky Paleontological Society provided access to their personal collections. I would also like to thank Daniel Blake (University of Illinois- Urbana-Champaign), Brenda Hanke (Cincinnati Museum Center), Tiffany Adrian (University of Iowa), Michael Henderson (Burpee Museum of Natural History), and Jann Thompson (Smithsonian National Museum of Natural History). The programming and methodology used in this project was greatly improved with the suggestions of Devin Buick (University of Cincinnati) and Peter Wagner (Smithsonian). The clarity of the figures was improved with the suggestions of Katherine Bulinski (Bellarmine University) and Trisha Smrecak (Paleontological Research Institution). This project was funded by the University of Cincinnati Graduate School, University of Cincinnati Geology Department, the Cincinnati Dry Dredgers, and the Paleontology Society. This project would not be possible without the love and support of wife (Stacy Deline) and family (Steve, Terry, and Mark Scott, and Nate and Janice Deline.)

BIOGRAPHY and INTRODUCTION

Written by Carlton Brett

Let me begin by introducing Brad's dissertation committee: in addition to Arnie Miller, Dave Meyer, and myself it is a pleasure to welcome two outside members both of whom took time to attend this defense: Michael Foote of the University of Chicago and Colin Sumrall, U. Tennessee, Knoxville. Also, I offer a welcome to the main member of Brad's support team, his wife, Stacy.

Brad Deline grew up in the small town of Adrian in southern Michigan and developed interests in fossils and ancient life as a youngster, but his professional excitement in paleontological research stemmed from working as a high school student with Dr. Tom Baumiller at University of Michigan. As an undergraduate at the University of Michigan, Brad developed a keen sense for scientific research; working on projects with Tom on ancient drilling predation and with Dan Fisher, using the isotope geochemistry of mastodon ivory to gain insights into the modes of life of these ancient proboscideans. He also benefited from the tutelage and infectious enthusiasm of Forest Gahn, recently departed from the University of Cincinnati and then a PhD candidate at the University of Michigan. Forest fostered Brad's interests in fossil echinoderms. When he graduated in 2003, Brad decided to pursue master's studies at the University of Cincinnati with David Meyer. He chose an interesting and innovative study relating sizes of crinoid columnals to environmental gradients in the local Cincinnatian rocks. He received a Masters degree in 2006 for this interesting research.

We were delighted that Brad stayed on here for his PhD. He rapidly formulated his own unique dissertation research directions, building on the seminal work of Michael

Foote. He bolstered his analytical abilities with a summer course in quantitative methods associated with the Paleobiology Database. Brad quickly established expertise in working with the morphology of crinoids and examined and coded vast numbers of specimens and tallied data on abundance from museum and amateur collections

Today, Brad will discuss the results of this work that relate to morphological diversity of crinoids during a critical time of expansion, diversification, mass extinction and recovery from the Ordovician to Early Silurian.

Brad worked independently and diligently on his dissertation, but he also continued to research a number of side projects, including work on taphonomy of echinoids in conjunction with the large SSETI project (Shelf and Slope Taphonomy Initiative), even discovering possible soft part preservation in real time. He will be an author on several SSETI papers. Other research included further studies of crinoid and blastozoan systematics and paleoecology, drilling predation and even description of a new Mississippian soft bodied polychaete. All of these projects have led to interesting papers that are published or in press. All in all Brad has some seven major published papers and more in the works, all of which bodes well for his success as a professional.

At the same time, Brad also was establishing a reputation as an excellent and dedicated TA and twice received awards for his teaching abilities. He also established himself as an excellent citizen in this department and an important and active member of the geology club and participated in many activities; in 2008 he was recipient of the Department’s Good Spirit Award. Most recently, Brad helped as facilitator for field trips for the North American Paleontology Conference; as usual, he did an outstanding job with this.

Brad’s excellence in teaching and research have led him to receive one of the few jobs in paleontology this year as a temporary assistant professor at West Georgia College; this position has potential to become permanent and we wish Brad all the best of success in this next endeavor.

It is a pleasure working with Brad not only because he is exceptionally self-motivated, innovative and industrious, witty and cynical in a good way, but because we share a common bond of interest in the ecology and evolution of Paleozoic echinoderms. With this in mind let me introduce Brad’s interesting dissertation on the disparity or morphological diversity of early Paleozoic crinoids. I believe that this approach is opening up a series of new avenues to explore the morphospace occupation of ancient environments and its underlying structure.

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INTRODUCTION

Biodiversity has been a primary focus of paleontology in the last thirty years. The study of biological richness has led to a greater understanding of the diversification of life on earth (Seilacher 1974, 1977; Raup 1975, 1976a, 1976b; Bambach 1977; Sepkoski et al. 1981; Sepkoski 1984, 1988), subsequent mass extinctions (Raup and Sepkoski 1982, 1984; Sepkoski 1984), and the controls on the geographic distribution of organisms (Schopf 1979; Raup and Jablonski 1993; Roy et al. 1998; Jablonski et al. 2006). Taxonomic diversity, however, does not tell the entire macroevolutionary story, for example; there are hundreds of thousands of species of beetles that all follow similar body plans with relatively minuscule morphologic differences. Echinoderms, in contrast, are represented by approximately 5,000 extant species yet differ greatly in body plan, skeletal incorporation, ecology, and methods of feeding and locomotion. When the breadth of morphology (morphologic disparity) is examined a different view of macroevolutionary history is possible and, in conjunction with taxonomic biodiversity, can be a powerful tool in reconstructing the evolutionary history of organisms (Foote 1993b; Fortey et al. 1996; Moyne and Neige 2007). In this study, using Early Paleozoic crinoids, I will explore the dynamics of disparity across scales both geographic and taxonomic, examine the biases in estimates of local disparity, and test the patterns previously reported (Foote 1994, 1999) that have led to hypotheses regarding the causes of morphologic constraints through time.

Crinoids are sessile, suspension filter-feeding echinoderms that were extremely abundant in Paleozoic shallow marine environments. Even though crinoids all fall within a similar guild they show a large degree of morphological variation (Figs. 1 and 2).

These organisms have been well studied in regard to their morphological (Foote 1995, 1999) and taxonomic diversities (Ausich and Peters 2008; Peters and Ausich 2008) and have been well sampled throughout North America (Webster 2003).

Fossil crinoids accurately depict the morphology of the living organism in that the majority of the large features of the animal are skeletonized and thus not lost with the decay of soft tissues (Ausich 2001). As with other fossil taxa, the mode of preservation of crinoids has advantages, e.g. low levels of time-averaging giving a better depiction of community assemblages and disadvantages, e.g. require special circumstance to be preserved intact (Brett et al. 1997; Ausich 2001). In the current study, crinoid disparity is examined from the Ordovician through the Early Silurian. This interval includes the initial crinoid taxonomic and morphologic diversifications, Late Ordovician Mass Extinction, and subsequent recovery in crinoids.

The current project adds to the body of knowledge of disparity in several aspects. First, the nature of disparity at a local level is examined. The relationship of disparity to ecology, community structure, and geographic scale has not previously been closely examined. Secondly, the biases associated with local disparity will be examined. Many disparity metrics are inherently sample size independent (Ciampaglio et al. 2001), and thus collection biases are not directly related to differences in sampling intensity, but relate more to the community structure in regard to morphology. This study also allows examination of the morphological meaning of rarity and tests whether if rare species are morphologic outliers or segregated from common species in shape space. Lastly, Early Paleozoic crinoid disparity is reexamined. Previous crinoid disparity studies (Foote 1995, 1999) have shown a plateau in morphology throughout the Paleozoic followed by a lesser Post-Paleozoic plateau. The constraints that cause this limitation to the expansion of morphology have been attributed to the filling of available ecospace as well as a constriction of genetic plasticity (Valentine 1995, 2004). If clades are becoming more genetically rigid through time then the effects of mass extinctions over time would be more devastating, not in magnitude, but in the ability of the survivors to diversify morphologically during the subsequent recovery. Therefore, the response of crinoid disparity to expansions of ecological opportunities and mass extinctions over time and the evidence of class level genetic canalization are reexamined.

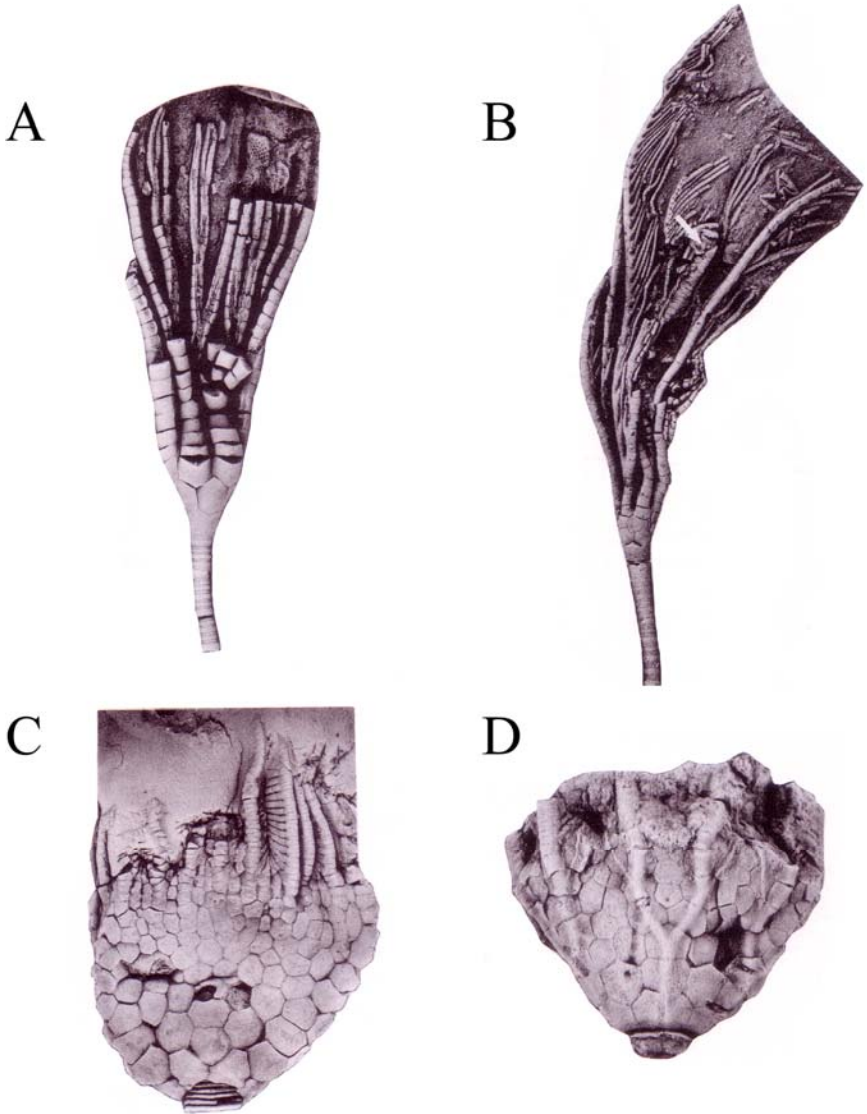


FIGURE 1. Representative crinoids of the four major subgroups of crinoids from the Lebanon Limestone of Tennessee. Photographs are reproduced from Guensburg (1984). A. *Cupulocrinus* species cf. *C. gracilis* (Hall); Cupulocrinidae;Cladida B. *Tryssocrinus endotomitus* (Guensburg); Tryssocrininae; Disparida C. *Gustabilicrinus plektanikaulos* (Guensburg); Anthracocrinidae; Diplobathrida D. *Abludoglyptocrinus gregatus* (Guensburg); Glyptocrinidae; Monobathrida.

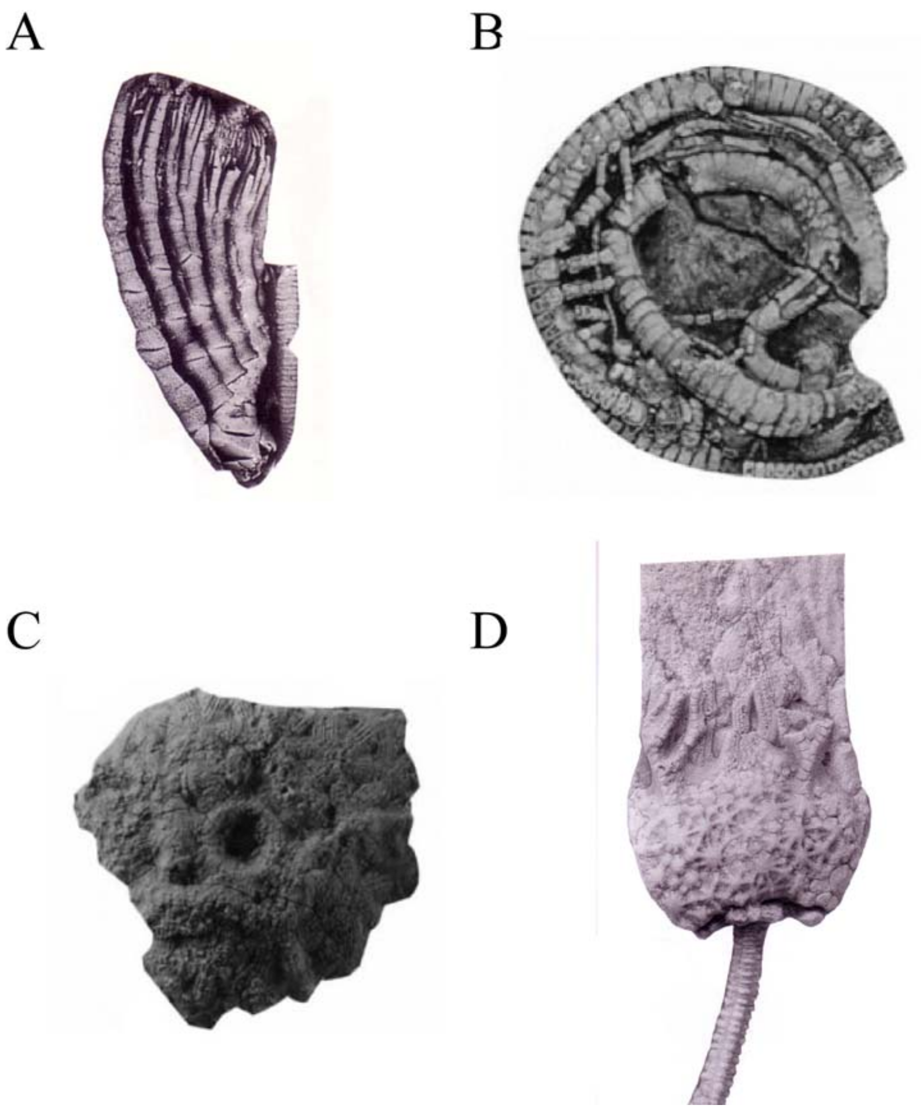


FIGURE 2. Crinoids discussed in depth in the dissertation which show unique morphological features. A. *Diaphorocrinus pleniramulus* (Eckert); Calceocrinidae; Disparida, Cabot Head Formation, Stoney Creek, Ontario. Eckert (1984). B. *Eomyelodactylus murrayi* (Bolton); Myelodactylidae; Disparida, Thornloe Formation, Armstrong township, Ontario. Eckert (1990). C. *Xysmacrinus greenensis* (Ausich); Rhodocrinitidae; Diplobathrida; Brassfield Formation, Dayton Ohio. Ausich (1986). D. *Glenocrinus globularis* (Guensburg and Sprinkle); Titanocrinidae; Protocrinoida; photograph from Guensburg and Sprinkle (2003).

CHAPTER 1

The Effects of Rarity and Abundance Distributions on Measurements of Local Morphological Disparity.

Abstract.—Understanding the relationships between morphological disparity and environment, geography, and scale require examination at the local level. Even with disparity metrics that are inherently sample size independent, the nature of rare species and the segregation of common and rare species within morphospace can create substantial sampling issues. Eight, well-sampled, Late Ordovician crinoid assemblages were examined for potential biases in the study of local disparity. Disparity is based on the ordination of discrete characters. The rare and common species within these assemblages contributed equally to disparity. In spite of this pattern, rare species in some localities occupy a different area of morphospace causing disparity to vary greatly with sampling intensity. Morphological rarefaction based on the number of specimens shows disparity weighted by abundance is constant past a sample size of approximately 30 individuals. This metric is dependent on the evenness within an assemblage as well as the abundance within subgroups in morphospace. Disparity weighted according to abundance gives a view of the functional disparity of an assemblage that is more applicable in studies of local disparity, though unweighted disparity is still preferred in regional scale studies and in investigations of morphospace filling through a clade's history.

Introduction

Morphologic and taxonomic diversification are fundamental aspects in the macroevolution of any clade. While these two metrics are inherently related, morphologic diversity is not always directly correlated with taxonomic diversity (Foote, 1993b; Lupia, 1999; Eble, 2000; Villier and Eble, 2004). Indeed, increasing taxonomic diversity can lead to decreased disparity by filling in morphospace between disparate taxa. Furthermore, assessment of morphologic diversity may yield insight into aspects of development (Erwin, 1993; Valentine and Jablonski, 2003.), ecology (Van Valkenburgh, 1994; Jernvall et al., 1996; Ciampaglio, 2002), and morphological breakthroughs that promote diversification within a clade (Sundberg, 1996). However, disparity has rarely been dissected with respect to geography or environment. Thus, many patterns observed in analyses of taxonomic diversity such as differing extinction patterns at a local and regional scales (Adrain et al., 2000), and variation in diversity patterns among environments (Sanders, 1968), and geographic areas (Jablonski et al., 2006) remain untested or even unexamined for disparity.

An important prerequisite in investigating these patterns with respect to morphology is to understand the potential biases involved in studying disparity at the local scale. It is important to recognize whether differences in disparity between assemblages result from biological patchiness or an artificial collection bias. Sampling biases have been largely disregarded in disparity studies because the metrics used to quantify morphological disparity are not inherently sample size dependent (i.e. average distance between taxa in morphospace, Ciampaglio et al., 2001). This sample size independence only holds true, however, if taxa are randomly sampled with respect to their position in morphospace. This assumption could be violated in two ways when considering local assemblages; rare taxa could be outliers or rare and common taxa could occupy different areas in morphospace. Rare taxa are often assumed to exhibit unusual morphologies because of unusual or specialized life habits and could thus contribute disproportionately to the disparity of an assemblage. It could also be possible for rare taxa to be segregated in morphospace from common taxa while still displaying a relatively generalized morphology.

Foote (1992) and Neige (2003) used rarefaction to assess the amount of morphospace that would be occupied by a sample containing fewer species. This method was used to assess the change in morphology after correcting for differential sampling and changes in taxonomic diversity. This rarefaction method would not be able to correct for large sample size differences between two assemblages with similar disparities and morphologic segregation between rare and common taxa, such that a rarefaction curve of only the common taxa in the first assemblage would likely be much lower than the curve including the entire second assemblage. The aim of this study is to closely examine well-sampled assemblages to assess the affects of variable sampling intensity on the assessment of local disparity as well as to propose a method to correct for this bias.

Crinoid disparity

Crinoids are ideal organisms for the study of disparity. They display a wide array of morphological forms that are commonly tied to their environments (Kammer et al. 1987; Meyer et al., 2002) as well as their evolutionary trajectories (Baumiller, 1993). The overall morphology is well represented by the skeleton and crinoids are major constituents of most Paleozoic assemblages. Even though crinoids are not always well preserved, they can sometimes be identified or reconstructed based upon disarticulated elements (Meyer et al., 2002; Brower and Veinus, 1974). Crinoids are also well studied with respect to their occurrences and evolutionary history during the early Paleozoic (Ausich and Peters, 2005), as well as with respect to their history of morphological diversification. In a series of papers on crinoid disparity, Foote (1994, 1999) found a pattern of rapid morphological diversification early in the clade's history leading to a period of static morphospace occupation throughout the rest of the Paleozoic. While this pattern is robust on a global scale, it is not known whether the pattern also holds at the local scale, in all environments (e.g. siliciclastic versus carbonate) or at varying depths.

Materials

To test the affects of abundance distribution and rarity on morphological disparity, eight different Late Ordovician echinoderm assemblages were chosen for comparison (Table 1). The Late Ordovician was chosen because of high and rather even abundances of species within the three subclasses of crinoids (Foote, 1999). Localities were chosen based on several criteria, including a high taxonomic richness, a history of careful taxonomic description, availability of quantitative data, and occupation of a wide breadth of environments. Assemblages range in size from 95 to 4469 specimens and all have been subject to high sampling intensity, such that many of the rare species within each assemblage have been recovered. This assumption is based on the high taxonomic richness in these assemblages compared to other less well-sampled assemblages of similar age and environment. Six of these localities have been the subject of substantial monographs, whereas two were documented from museum and field collections. Data

TABLE 1. The eight localities included in the study. Samples from the Fairview and Waynesville Formations combine field collections with specimens from the Cincinnati Museum Center. Samples from the Benbolt Limestone, Decorah Shale, Girardeau Limestone, Lebanon Limestone, and the Bromide Formation are based on monographs by Brower and Veinus (1974), Brower and Veinus (1978), Brower (1973), Guensburg (1984), and Sprinkle(1982) respectively. Letters in parentheses after formations are abbreviations used in figures.

Formation	Age	Location	Species	Specimens
Benbolt Limestone (B)	Caradoc	TN, VA	25	422
Decorah Shale (D)	Caradoc	IL, MN, WI	13	95
Fairview Formation (F)	Ashgill	IN, KY, OH	10	676
Girardeau Limestone (G)	Ashgill	IL, MO	15	196
Lebanon Limestone (L)	Caradoc	TN	26	187
Mountain Lake Member, Bromide Formation (M)	Caradoc	OK	19	4469
Pooleville Member, Bromide Formation (P)	Caradoc	OK	18	469
Waynesville Formation (W)	Ashgill	IN, KY, OH	15	108

derived from the literature have been shown to underestimate the abundance of common taxa (Davis and Pyenson, 2007). The monographs included in this study, however, incorporated museum specimens with field collections such that this bias is assumed to be minimal. Field collections of the Fairview and Waynesville formations made by the author reflect abundance patterns similar to those from the museum collections.

Quantifying Morphology

Several methods have been used to quantify the morphology of anatomical structures or of an entire animal species or genus, including landmark analysis, outline analysis, and the use of discrete morphological characters. Landmark analysis involves the selection of biologically homologous points that can be recognized easily on all of the individuals in the study (Dryden and Mardia, 1998). The spatial distribution of these points gives a simplified summary of morphology that is more informative than simple measurements of features. Often landmarks cannot be reliably identified and comparisons of the entire outline of the animal are used instead of single points (Zelditch et al., 2004). Both of these methods require significant morphologic overlap among the species compared in the study and thus cannot generally be used in comparisons among higher taxa (e.g. orders or classes) or among groups that have variable morphology or questionable homology (Guensburg and Sprinkle, 2007). The calyces of the crinoids in this study, for example, can differ greatly in construction ranging from simple cups composed of ten plates (disparids) to complex calyces of several hundred (camerates), such that the identification of the few definitive homologous landmarks would not give a full picture of the differences among species.

The only viable alternative for adequately comparing the wide array of forms seen in crinoids is to use discrete morphological characters. Data can include the presence or absence of a feature (binary characters) or the identification of a character with several different possible morphologies (multistate characters). These characters should address all areas of morphology including features that are present in a single species. Unique characters were included to accurately describe the unusual morphologies which are important to the goals of the study. Overall 84 characters, based roughly on those used by Foote (1999), were chosen to encompass the entire morphology of the study animals (i.e. crown, column, and holdfast). Crinoid species were coded based on published descriptions, inspection of plates, and direct examination of museum specimens. Multiple specimens of each of the 137 total species were examined when possible to gain a better idea of the overall morphology as well as the variability within a species. Specimens of species that occurred at multiple localities were examined at each locality to prevent the possible lumping of morphologically different populations. All species included in the study differed by at least one character.

One difference between the coding scheme in the current study and that used by Foote (1999) is the treatment of unpreserved and inapplicable characters. Foote (1999) distinguished these two fundamentally different character states. However, methodologically they were both coded as “not applicable” (NA), which greatly increased the proportion of missing data in the analysis. To circumvent this problem, unpreserved data were treated as NA, inapplicable data were coded as 0 and morphologic states were coded as multi-state characters (i.e. the absence of a character was coded as 1 instead of zero to differentiate from inapplicable characters). Absent characters convey morphologic information (e.g. the absence of pinnules or an anal sac) regardless of being derived or primitive and should be treated the same as other character states in the analysis.

Gower's (1971) similarity coefficient was then calculated for the morphology dataset. This Gower similarity coefficeient (s_{ij}) for two species, i and j, is defined as:

$$s_{ij} = \frac{\sum_k w_{ijk} s_{ijk}}{\sum_k w_{ijk}} \tag{1}$$

where s_{ijk} is the contribution provided by the *k*th variable; if the two variables are non-zero and match, the contribution is given a value of 1. w_{ijk} is the weight given to the *k*th variable, if either of variables is not zero the weight is given a value of 1.

This similarity measure was chosen because it does not have metric properties; in particular, distance in morphospace is not affected by shared 0's in the dataset. Thus, Gower's method does not include shared inapplicable characters in computation of the similarity coefficients and with an additive coding scheme it can add extra importance to anatomical features that have several subsidiary characters associated with them. When two species have differing character states with regards to a trait with subsidiary characters it forces all of the associated characters to also be mismatched, which decreases the similarity coefficient. To illustrate this property consider the following example comparing four hypothetical species of crinoids shown in Table 2. Species C and D both lack a stem but are mismatched for character three giving a similarity value of 1/2. The denominator in this case is two instead of three because character 2 (stem type), being inapplicable in a stemless crinoid, does not give weight to the similarity coefficient. Therefore shared NA characters do not increase the similarity value between species. Species A and D differ in all three characters so that the similarity between these two species is 0/3 even though character 2 for species D is coded as not applicable (0).

Therefore the mismatch in character one is counts twice as much as the mismatch of character three, because character two still contributes to the denominator. If NA

Species	Character 1 Stem	Character 2 Stem type	Character 3 Arms	Gower's Similarity				
					A	B	C	D
A	2	1	2	A	-	2/3	1/3	0/3
B	2	2	2	B		-	1/3	0/3
C	1	0	2	C			-	1/2
D	1	0	1					

TABLE 2. A hypothetical example showing the coding scheme used to assess similarity. Four crinoids are coded for two primary charcters (1 and 3) and one subsidiary character (2). Gower's similarity (Gower, 1971) is calculated using equation 1. Character 1: Stem absent (1), Stem present (2); Character 2: Not applicable (0) Homeomorphic stem (1), Heteromorphic stem (2); Character 3: Stellate ridges absent (1), Stellate ridges present (2).

characters were treated as missing data, the denominator in both cases would be 2, thus rendering the lack of a stem and the lack of stellate ridges mathematically equivalent.

However, it is a desirable property for the differences in large scale morphologic features, such as the presence of arms (17 associated traits), stem (12 associated traits), or anal sac (4 associated traits) to have a greater effect in the analysis than less pervasive traits, such as having stellate ridges on the plate surface(no associated traits). These larger scale features should have more influence in the analysis because they play a larger role in the ecology, evolutionary history, or basic developmental construction of the species and differences in the fundamental construction of the organisms should have larger ramifications in morphospace than more superficial characters. It should be noted that a match in a primary character has the same weight as any other character. Therefore, this coding scheme differs from the use of character weighting in systematics. The degree to which this coding scheme has affected the analysis can be explored by examining which traits are important in creating groupings in morphospace, i.e. which characters are highly correlated with the axes.

The similarity matrix was analyzed using Principal Coordinate Analysis (PCO) because of its flexibility in the choice of similarity coefficient and because it handles missing data better than Principal Component Analysis (Lofgren et al., 2003). Disparity for this study is then defined as the average squared distances between species in the morphospace defined by the first two or the first ten PCO axes for each assemblage following the methods of Foote (1994, 1999).

Because of missing or inapplicable characters, triangle inequalities can exist among taxa when using PCO with non-metric similarity coefficients. That is, Taxa A, B & C might indicate that Taxa D and E are identical; however, characters missing from A, B and C can show that D and E are different, and thus have a distance between them that cannot fit into Euclidean space. This will result in negative eigenvalues for PCO analyses. Theoretically, triangle inequalities might distort the multivariate structure among even the main axes (Kirkpatrick and Lofsvold 1992). To test for this, I used the “squeezing” routine of Kirkpatrick and Lofsvold (1992) to assess whether accommodating inequalities altered the multivariate structure of the analyzed axes (i.e., axes 1-10).

Examining the effects of rarity and abundance structure on disparity

There are several ways to test the relative contribution to morphospace of rare and common species. The preferred method to address this issue is to determine if the rare species contribute significantly more to the measure of disparity than the common species. The relative contribution of an individual species can be assessed by calculating the partial disparity, defined by Foote (1993a) as the difference between the disparity of an entire assemblage and the disparity of the assemblage excluding the species in question. This value is computed for each successive species with respect to abundance in an assemblage and the morphological contribution of rare species, defined here as a species contributing less than 1% of specimens to a sample, can than be compared with that of more abundant species.

Two different methods were used to determine the effects of different abundance structures on disparity. The first method, referred to as cumulative morphospace occupation, involves calculation of the disparity of the four most common species and then plotting the trajectory of change in disparity as remaining species are added sequentially to the calculation, in order of decreasing abundance, following the methods of Foote (1997). A starting point of four species was chosen to reduce the initial noise in the pattern owing to the small number of distances included in the calculation. This method allows inspection of disparity at different levels of sampling intensity, assuming that the order in which species would be recovered can be based on their abundance. These patterns can then be compared to randomizations of the species in the assemblages using rarefaction. Rarefaction is a technique used to estimate some property of a sample given a sample size smaller than the original (Sanders, 1968). The methods of rarefaction in this case mirror those of Foote (1992) and are displayed as the area that envelopes a proportion of the 200 replicates. It should be noted that with 200 replicates at a small sample size, the maximum and minimum possible values of disparity are likely to be randomly achieved, such that the envelopes should be used as a guide and not a test of significance.

The second method involves the use of rarefaction that in this case differs from that of Foote (1992), in that morphological disparity is rarified to the number of specimens rather than the number of species. All specimens for a given species are given the coordinates in morphospace of the reference specimens, i.e. those coded for the analysis, which effectively disregards any intraspecific variation. When possible multiple individuals within a species were examined and no polymorphic characters were observed. A dataset is then built for each locality with the number of specimens reported from a monograph or counted from a museum collection. From this dataset, a random sample is taken without replacement and sample disparity is then calculated. This process is repeated 100 times to yield a mean value for a given intensity and this exercise is repeated for sample sizes varying from four specimens to that of the actual assemblage. Error bars are calculated at each sample size as the standard error associated with the mean of the fifty replicates.

There is an important difference in these two methods that should be noted at the outset. For the cumulative morphospace occupation analysis, each species has equal weight in the disparity calculation regardless of its abundance, as was the case in previous studies (Foote, 1994, 1999). However, in the rarefaction analysis, the disparity value is inevitably weighted by the random sampling procedure such that the distances between the common species in the disparity calculation are emphasized over the distances associated with the rare species. In essence, the former (unweighted disparity) is the distance between species in morphospace while the latter (weighted disparity) is the distance between individuals in morphospace.

All analyses were conducted using R 2.3.1 (R Development Core Team, 2006) and all statistical tests were computed using PAST (Hammer et al., 2001).

Results

Figure 3 shows the morphospace generated by the PCO analysis of 137 crinoid species examined for this analysis. The analysis did result in negative eigenvalues; however, the 'squeezing' routine indicated the first 50 axes were unaffected. All disparity estimates were calculated based on the first two and the first ten PCO axes, which explain 44.6 and 78.8 percent, respectively, of the sum of eigenvalues in the data. The first two and the first ten axes showed similar patterns in analyses of disparity, therefore, only the more inclusive analyses, those for ten axes, are presented.

Four distinct groups can be distinguished easily by examining the first two axes, each of which is composed of members from several different localities. Several taxa fall between these groups, which is most likely due to higher levels of missing data. Each locality has species occurring in at least three of the four groups showing that the species are not grouping based on environment, age, or geographic position. Instead, the groups segregate primarily into the recognized crinoid subclasses. The characters separating these groups can be distinguished based on the correlation of the characters states with the PCO axes. The four groups differentiate monocyclic from dicyclic crinoids, which are distinguished by the characters associated with the infrabasal circlet, and camerates from non-camerates; the former based on their fixed brachials and interareas in the calyx as well as pinnulate arms. The groupings are based on characters with subsidiaries (infrabasals) as well as independent characters (arm separation), showing that the coding method was not overwhelmed by the additive character coding and the large scale differences between groups of crinoids can be recognized.

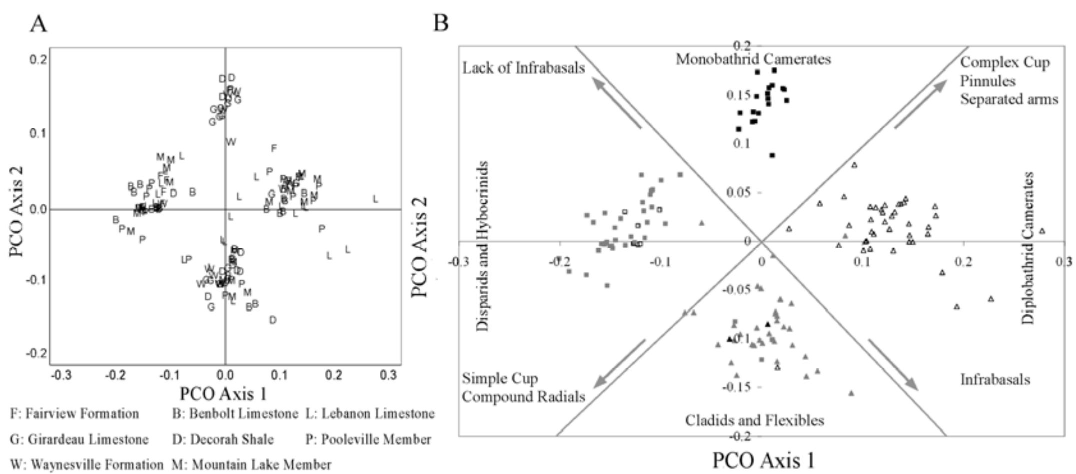


FIGURE 3. A. Distribution of species on the first two Principal coordinate axes for all eight localities. B. Same principal coordinate analysis as shown in figure 1a with species identified based on subclass. Characters that separate groups are determined by correlation between characters and the first two PCO axes. Monobathrid Camerates:

Black Square; Hybocrinids: White Squares; Flexibles: Black Triangle; Diplobathrid Camerates: White Triangle; Disparids: Gray Square; Cladids: Gray Triangle.

Rarity and abundance structure

The relationship between the partial disparity of species and the percent abundance at the different localites is shown in Figure 4. There is no statistical difference in the average contribution of rare versus common species for any of the eight localities (Table 3). The exclusion of rare species can nevertheless have a large affect on the local disparity of an assemblage. Plots showing the way in which disparity changes as progressively rarer species are included show variable patterns in the different assemblages (Figure 5). If the species were randomly distributed in morphospace in

TABLE 3. Average partial disparity for common and rare taxa for the eight localities. P-values calculated using Mann-Whitney statistical tests for differences between the means. None are statistically significant at p=0.05.

Formation	No. of Common Species	Average Partial Disparity Common Species	No. of rare species	Average Partial Disparity Rare Species	*p*-value
Benbolt Limestone	8	0.0024	17	0.0025	0.884
Fairview Formation	5	0.005	5	0.036	0.403
Girardeau Limestone	11	0.0036	4	0.0042	0.17
Lebanon Limestone	17	0.0026	9	0.0031	0.332
Mountain Lake Member, Bromide	5	0.0034	14	0.0035	0.817
Pooleville Member,	11	0.0045	7	0.0048	0.717

Bromide					
Waynesville Formation	11	-1.92568E-05	4	5.29562E-05	0..948

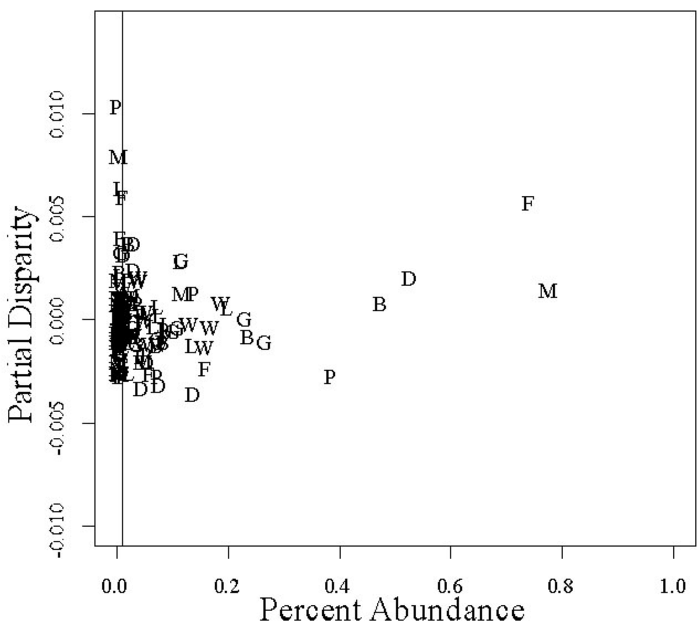
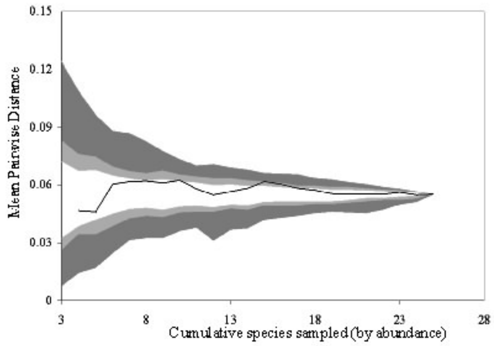


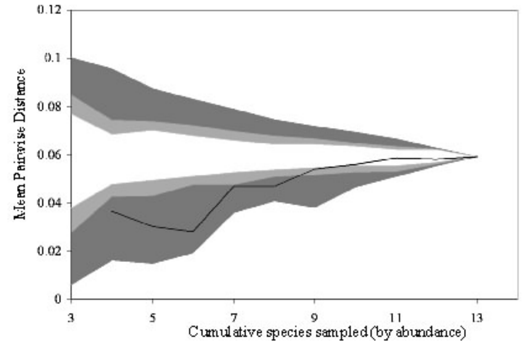
FIGURE 4. Partial disparity (defined as the contribution of an individual species to the local disparity of a given assemblage (Foote, 1993a)) compared with the percent

abundance of the species. Vertical line indicates the boundary between rare and common species at one percent abundance. Refer to Table 1 for Abbreviations.

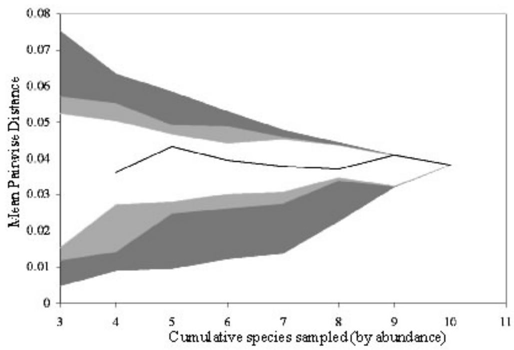
Benbolt Limestone



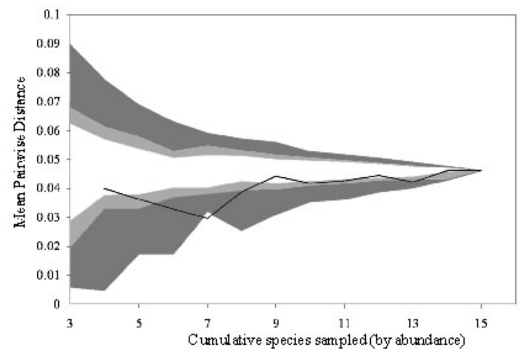
Decorah Shale



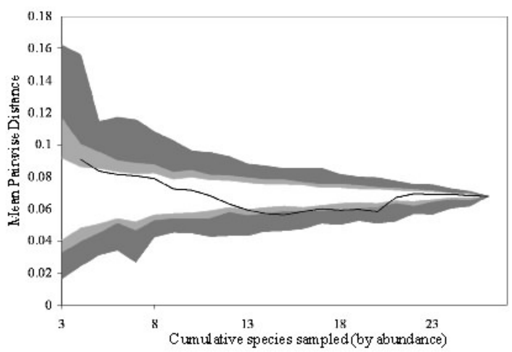
Fairview Formation



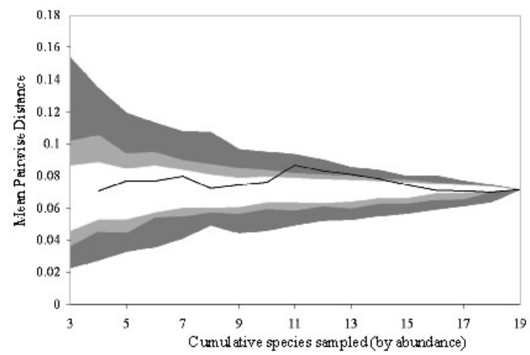
Girardeau Limestone



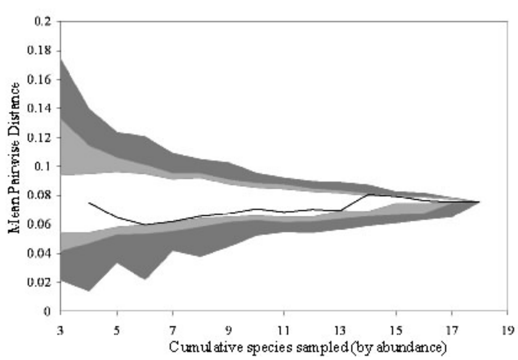
Lebanon Limestone



Mountain Lake Member



Pooleville Member



Waynesville Formation

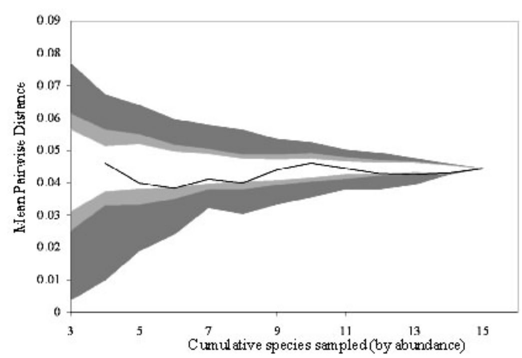
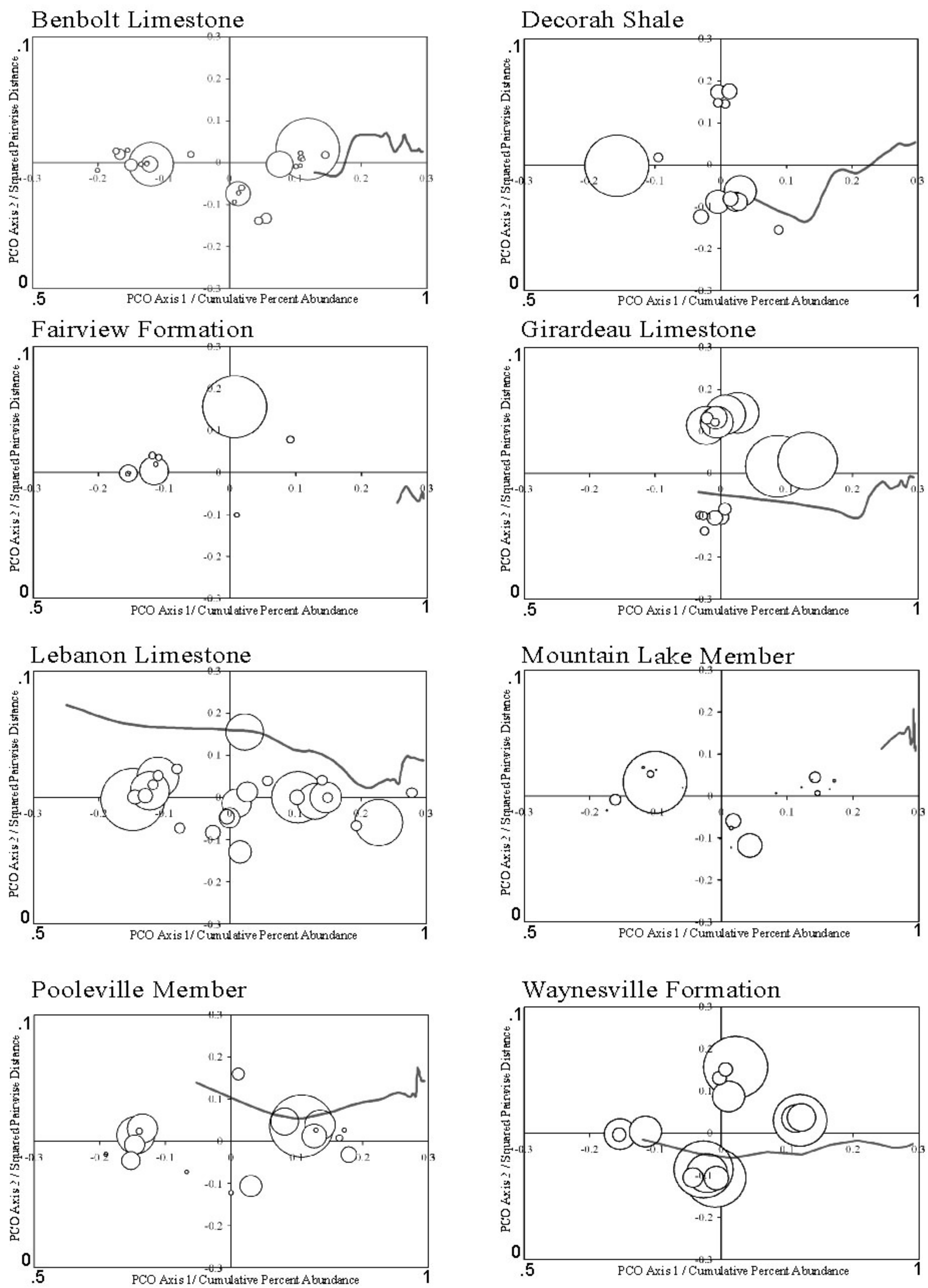


FIGURE 5. Cumulative morphospace occupation of the eight study localities. Species are arranged by the sequential addition of species in abundance, from most to least common. Disparity of the four most abundant species within each locality is calculated and graphed against the number of species included in the calculation. Progressively rarer species are then added to the disparity calculation until the disparity for the entire locality is reached with 100 percent abundance. The dark and light gray areas encompass 100% to 80% and 80% to 60% of the random ordering of species, respectively.

FIGURE 6. The morphospace occupation for each locality. Size of each point in morphospace is scaled based on the percent abundance of the species at the locality. Gray lines indicate the cumulative morphospace occupation compared with the percent abundance included in the calculation.



Benbolt Limestone
Decorah Shale
Fairview Formation
Girardeau Limestone
Lebanon Limestone
Mountain Lake Member
Pooleville Member
Waynesville Formation
PCO Axis 2 / Squared Pairwise Distance
PCO Axis 1 / Cumulative Percent Abundance

relation to their abundance, the resulting pattern would exhibit initial noise because of small sample size followed by stabilization of disparity value (Ciampaglio et al. 2001) as shown by the rarefaction envelopes; none of the curves would be expected to exhibit a ‘trend’. Several localities follow this pattern (e.g. Mountain Lake Member, Bromide Formation and the Waynesville Formation); however, this is not the case for all eight localities. The Lebanon Limestone, Decorah Shale, and the Girardeau Limestone show a large difference between the random expectation and the pattern observed based on abundance. Examination of the cumulative morphospace occupation as well as the morphospaces of the assemblages (Figure 6) shows three basic patterns.

The Girardeau Limestone sample, which exemplifies one pattern, shows increasing disparity as rare species are progressively included in the disparity calculation. The most common crinoids in the Girardeau limestone are all monobathrid and diplobathrid camerates. Both groups are close together in morphospace such that initially the disparity is low. Cladids are rare in the Girardeau and disparids do not occur so that overall disparity is low, but the disparity is nevertheless twice as high when the rare species are added.

The Lebanon Limestone crinoids show an opposite pattern of decreasing disparity as increasingly rare species are included in the calculation. The most common six species in the Lebanon limestone are all at the edges of the morphospace composed of three different subclasses of crinoids. The rare species fill in morphospace among the common species, and also occupy the centroid area of the morphospace, which lowers the average distance between species. Some of the rarest species (species known from single specimens) appear as outliers in morphospace creating a slight rise in disparity at the right tail.

The Waynesville Formation sample shows a pattern that appears relatively unaffected by sampling intensity, with a nearly constant disparity regardless of the abundance of the species included in the calculation. In this case rare and common species both have representatives from the four groups in morphospace (Figures 3). Moreover, the species all fall roughly at the centroid for the subclasses, such that the average distance among the rare species is approximately the same as the distance among the common species.

Morphological rarefaction curves were constructed as an alternative method for assessing how abundance structure affects disparity (Figure 7). Initially, the morphological rarefaction curves show noise resulting from small sample size. However, the weighted disparity stabilizes at approximately 30 individuals. The initial noise and the number of specimens required to stabilize weighted disparity varies among localities based on the abundance structure and the sample distribution of species in morphospace. Species in the Girardeau Limestone are relatively tightly grouped in morphospace such that the initial noise is low and stabilization occurs at a small sample size. Conversely, species in the Lebanon Limestone are more highly dispersed across morphospace, such that initial noise is larger and weighted disparity takes longer to stabilize. The variability in the random subsamples also decreases as sample size increases as would be expected and as seen in the decreasing size of the error bars.

Rarefaction yields disparity estimates that are different from those illustrated in Figure 5. A comparison between the two different disparity metrics is shown in Figure 8

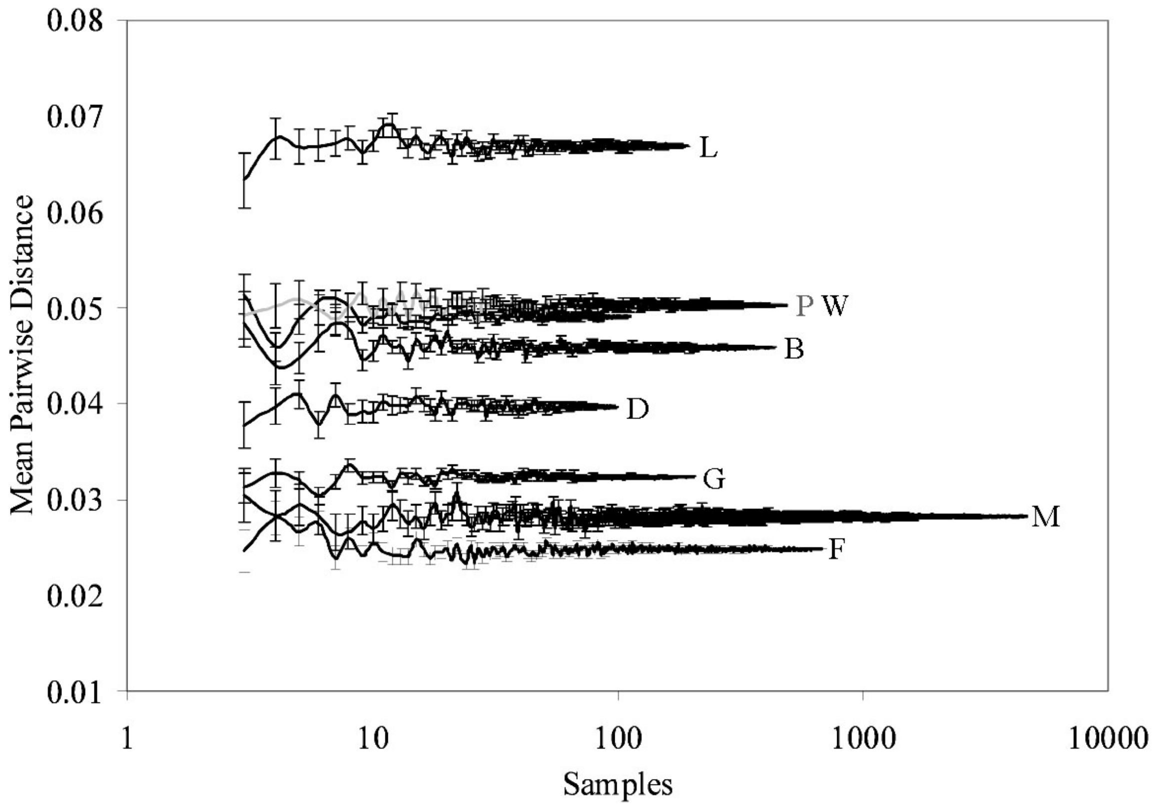


FIGURE 7. Morphological rarefaction of crinoids for the eight localities comparing the number of specimens sampled with the mean pairwise distance of those points in morphospace. Within species morphological variation is ignored such that each individual within a species is placed in the same location within morphospace. The average disparity at a given number of specimens is based on 100 replicates and error bars are defined as the standard error of the resampled data. As the sample size increases the variance in the curve decreases, therefore, sample size is plotted logarithmically to emphasize the variation at smaller sample sizes. Above a sample size of 1700, the Mountain Lake Member of the Bromide Formation incrementally increases in sample size by twenty instead of one. Refer to Table 1 for Abbreviations.

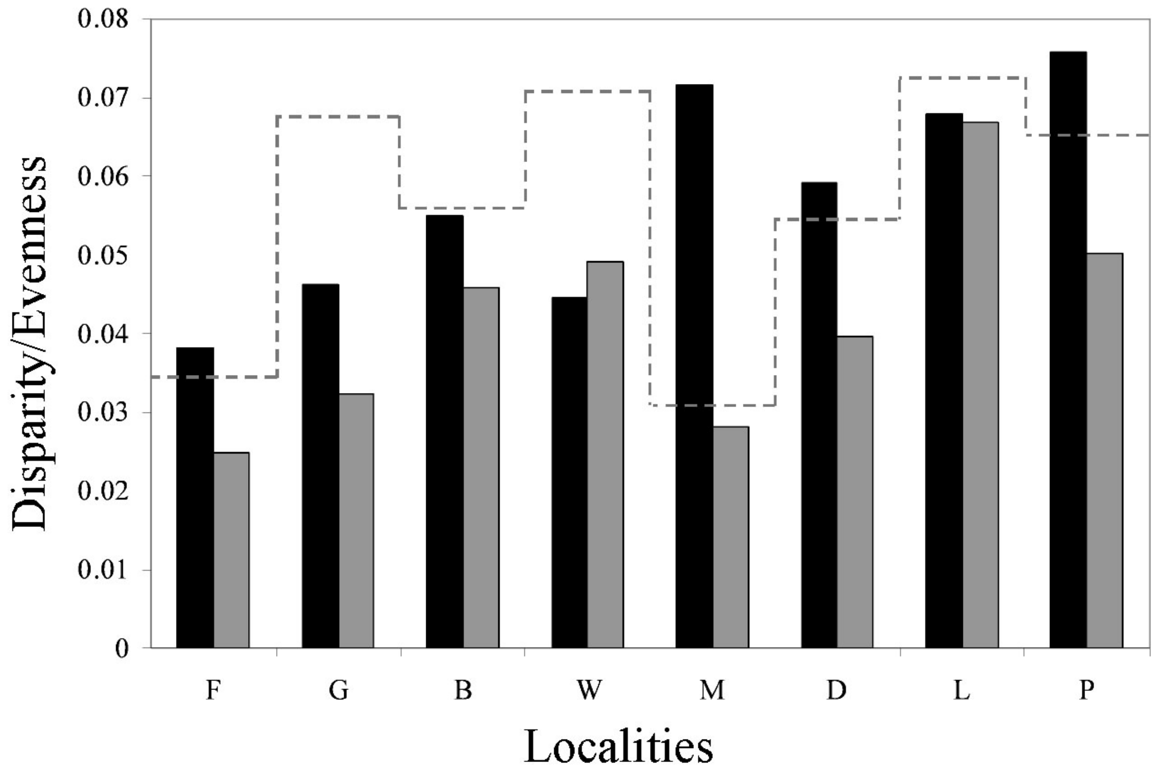


FIGURE 8. The disparity (black) and weighted disparity (gray) for each of the locations. The PIE evenness is plotted for each locality with the dotted line; note that evenness is scaled to 0.05 instead of 1. Refer to Table 1 for Abbreviations.

with unweighted disparity (based on the analysis illustrated in Figure 5), ordered from lowest to highest. The weighted disparity shows a distinctly different pattern for the eight localities, which may be explained in part, by the evenness (Probability of Interspecific Encounter [PIE], Hurlbert, 1971) shown by the dashed line. This evenness metric was chosen because it is stable at small sample sizes (Bulinski, 2007). Several samples, such as the Mountain Lake Member of the Bromide Formation and the Fairview Formation, show a large difference between the two ways of calculating disparity, which is directly influenced by the evenness. The dominant species in both of these localities has an abundance of over 75 percent. Since species variability is ignored all of the specimens within a species sit in the same location in morphospace. With a large proportion of the specimens in this case occupying the same position of morphospace the average distance between individuals (weighted disparity) is much lower. Alternatively, samples with a high evenness, such as the Benbolt Formation and the Lebanon Limestone, do not differ greatly for the two metrics. These localities still have individuals within a species that sit at the same location in morphospace. However, on average the distance between individuals in morphospace is the same as the distance between species. In an extreme case, the Waynesville Formation, the common species are far apart from each other in morphospace such that the distance between individuals is greater than that for species. The relationship between disparity metrics and evenness does not hold true for the Girardeau Limestone. The Girardeau has high evenness with the six most common crinoids having abundances that range between 7% and 26%. These six species are all camerates, while the rare species are cladids giving a much lower weighted disparity than unweighted disparity despite the high evenness.

Discussion

Rare species have been interpreted in several different ways (e.g. Gaston, 1994) which would be expected to have very different morphological implications. It is important to note that rare species in paleontological samples are more abundant that those in modern studies. Rare species are often explained as inhabiting specialized niches or as evolutionary experiments, both of which might be expected to yield novel or specialized morphology placing the species as outliers in morphospace relative to closely related species that are more common. If this were the case, the exclusion of rare species would be expected to reduce the morphologic disparity of a sample. Another possibility is that rare species are merely slight variations of common species differing by a single character. In this case, rare species would fill the morphospace among the common species and would likely lower morphologic disparity. The third possibility is that species in a given sample are rare because they are at the periphery of their environmental preferences and are more common elsewhere. Environmental conditions, morphology, and abundance patterns are often tightly correlated (Meyer et al., 2002), such that a certain morphology will be advantageous in one environment leading to a high abundance of those species, while that morphology will be detrimental in another causing those species to be rare. Since morphology, abundance and environment are linked, one might then expect to see segregation in morphospace between the common and rare species.

Within the type Cincinnatian crinoid fauna, rare species have been interpreted to fit each of the above expectations. *Anomalocrinus incurvus* displays several unusual morphological features and has been interpreted as inhabiting a novel ecological niche (Brett et al., in press). *Tenuicrinus longibasalis* is a slight variation from *Cincinnaticrinus pentagonus* and likely occupied a similar ecological niche (Kallmeyer and Donovan, 1998). *Glyptocrinus decadactylus* is rare in the Kope Formation, while being the most abundant member in the shallower Fairview Formation (Meyer et al., 2002). Thus, all three modes of “rarity” are present and, paired with the results above, indicate that rare species can possibly be outliers; however, on average they exhibit morphologies similar to common species.

On average, rare species do not appear to contribute less or more to assemblage disparity than do common species (Table 3). However, there appears to be a sampling bias. Rare species are segregated in morphospace relative to common species in some samples (e.g. the Girardeau Limestone and Decorah Shale) indicating that the two groups are either using different resources or acquiring the resources differently in these cases. This break is usually between camerates and non-camerates, a result that is far from surprising for students of crinoid paleoecology. Camerate crinoids have denser filtration fans than most cladids and disparids which allow more efficient feeding in shallower, faster moving water (Kammer et al., 1987). This produces patterns like those seen in the Girardeau Limestone and the Fairview Formation. In deeper water crinoids with open fans (disparids and cladids) prosper in relation to those with denser fans producing the pattern observed in the Decorah Shale and possibly the Mountain Lake Member of the Bromide Formation.

During certain times in crinoid history or under certain environmental conditions this segregation breaks down. In intermediate depths there is a mixture between open to closed meshed filtration fans, producing an assemblage that is evenly distributed in terms of abundance between the clusters in morphospace. This pattern would also be present in highly tiered communities, for instance those of the Mississippian Edwardsville Formation (Ausich, 1980). Early in the evolution of crinoids cladids and camerates had similar filter morphology such that disparity might not be as affected by environment (Guensburg and Sprinkle, 1992.). Finally, in shallow water a faunal invasion may break down assemblages that were previously established at a given water depth (Waynesville Formation, Richmondian invasion, Holland and Patzkowsky, 2007). Therefore, the abundance structure as well as the positions of species in morphospace is important in explaining the ecological and environmental patterns between localities.

The combination of abundance and morphospace occupation of communities is an important consideration in the ecology of local assemblages, as well as a method to decrease the effects of biased sampling. For instance, the Waynesville Formation and the Girardeau Limestone have the same richness (Table 1) and approximately equal unweighted disparity (figure 8). With much lower sampling the disparity would just measure the difference among the common species within each of the assemblages resulting in the Waynesville Formation containing one and a half times the disparity of the Girardeau Limestone. Using weighted disparity, the differences in the disparity and abundance structures of these two assemblages would be apparent regardless of the sampling intensity. This metric shows a much higher disparity in the Waynesville indicating many different forms of crinoids within the assemblage as opposed to the Girardeau which is overwhelmingly dominated by a few forms, thus giving a better picture of the functional assemblage of crinoids.

It is important to note that biases may still affect some assemblages, such as differences in preservation potential between species. For example, in the Waldron Shale, *Eucalyptocrinites crassus* is overwhelmingly the most abundant species in most assemblages. However, it has been shown that the calyces of *E. crassus* remain on the seafloor after death and even become microhabitats for encrusters (Liddell and Brett, 1982). The robust construction of the calyx greatly increases its abundance and skews abundance distributions. Brett et al. (1997) placed most crinoids into the same taphonomic category with the exception of robust camerates (e.g. *Eucalyptyocrinites*) such that these crinoids may exhibit inflated abundances in relation to other species. However, examination of morphology, such as tightly sutured calyx plates, as well as study of the taphonomy of an assemblage should give ample indications of the skewing of abundance, which could then be corrected.

The two disparity metrics (weighted and unweighted) are measures of morphological disparity at different scales (individual versus species) with differing results and thus may not be appropriate or interchangeable in all analyses. In analyses of morphospace filling within a class through time, weighted disparity would be inappropriate because the amount of space occupied depends on the existence of a species rather than its abundance. The high abundance of *Glyptocrinus decadactylus* compared to *Cincinnaticrinus varibrachialus* in the Fairview Formation of Ohio and Kentucky is not relevant in understanding the ecological and genomic underpinnings of the Ordovician radiation. Also, as the scale is increased it is more difficult to assess the abundance of *G. decadactylus* compared with *C. varibrachialus* during the Ashgill in North America.

In studying local disparity, weighting all of the species equally is also inappropriate because of sampling issues, as well as the importance of abundance structure to the functioning of the community. It would be inappropriate to compare the unweighted disparity of the Hull Limestone which has been studied and collected extensively since Springer (1911) with a formation that has only been briefly examined, e.g. the Kimmswick Limestone (Kesling, 1972). A large proportion of the fauna from the Hull would be compared with just the most common species of the other locality and the result could be significantly different than if they were both sampled evenly. The

Fairview Formation has more disparid than camerate species, but *Glyptocrinus decadactylus*, a camerate crinoid, accounts for over 80% of the abundance. In this case the abundance is needed to interpret the ecology as camerate-dominated and high-energy as opposed to a disparid-dominated and low-energy and the local disparity should reflect the actual ecology of the assemblage. Therefore, each of these metrics may be informative depending on the scale and aim of the study.

Conclusions

Assessment of local disparity patterns requires examination of the biases associated with these measures, especially the affects of differential sampling. Because most measures of disparity are not inherently sample-size dependent, differences in the morphologic character of rare and common species were evaluated here. Examination of eight assemblages of Late Ordovician crinoids shows that rare species are not morphological outliers, and that they contribute the same amount of disparity as common species. Despite this, there is a potential sample size bias in most of the localities examined in cases where common and rare species occupy different areas of morphospace. One way to circumvent this bias is to weight disparity based on the abundances of the species within the assemblage. This metric may not be appropriate in broader studies of morphospace occupation such as those of Foote (1994, 1999). However, weighting disparity based on abundance gives a metric that is functionally more representative of a community and thus may be preferred in studies of the relationship between morphology and geography, ecology, or environmental conditions.

CHAPTER 2

Testing the Plateau; a Reexamination of Disparity and Morphologic Constraints in Early Paleozoic Crinoids.

Abstract. — Studies of crinoid morphology have been pivotal in understanding the constraints on the range of morphology within a clade as well as the patterns of disparity throughout the Phanerozoic. Newly discovered and described faunas and recent study of Early Paleozoic crinoid diversity provide an ideal opportunity to reanalyze Ordovician through Early Silurian crinoid disparity with more complete taxonomic coverage and finer stratigraphic resolution. Using the coarse stratigraphic binning of Foote (1999), the updated morphologic data set has a similar disparity pattern to that presented by Foote (1999) during the Early Paleozoic. However, with the more resolved stratigraphic binning used by Peters and Ausich (2008), a significant difference exists between the original and current data sets. Both data sets have a pronounced disparity high during the late Middle Ordovician. However, the updated disparity curve has a much higher initial disparity during the Early Ordovician and a pronounced rise in disparity during the Silurian recovery. Examination of differential sampling, proportions of the crinoid orders through time, and methods of coding characters indicate little effect on the pattern of crinoid disparity. The Silurian morphospace expansion occurs primarily within disparids and coincides with the origination of the myelodactylids. These findings corroborate the rapid expansion of morphospace during the Ordovician. However, crinoid disparity did not remain static and, although less frequent than during the initial radiation, new body plans

evolved following the Ordovician Extinction (e.g. the myelodactylids). These results are consistent with the hypothesis of ecology constraining the limits on morphologic disparity.

Introduction

Understanding the patterns and mechanisms of macroevolution is central to the study of paleontology. Large-scale studies of morphologic evolution and diversity can lead to insights into the mechanisms and patterns displayed during the initial diversification within a clade (Gould 1989; Briggs et al. 1992a, 1992b; Lee 1992; Fortey et al. 1996; Wagner 1997; Wills 1998). Many early innovations occur during phases of low diversity, such that taxonomic radiations may have lagged behind important stages in the formative evolution within a clade, such that taxonomic diversity follows a different trajectory than morphologic diversity (disparity) (Foote 1993b). Morphologic disparity analyses can also provide insights into the limitations and constraints on morphological evolution (Foote 1999; Eble 2000; Ciampaglio 2002, 2004), and the selectivity of mass extinctions and radiations (Erwin et al. 1987).

It has long been recognized that few new body plans have originated since the Early Paleozoic and many clades exhibit their peak disparity early in their history (Gould 1989; Valentine 1995, 2004). Two hypotheses have been proposed to explain this pattern. First, open ecosystems early in the Paleozoic or following mass extinctions presumably had lower levels of competition, thus enabling the survival and proliferation of new forms (Jernvall et al. 1996; Foote 1999): newly evolved taxa could occupy novel or recently vacated areas of ecospace and, thus, take advantage of unutilized resources. The second hypothesis is that early in any clade's history there were fewer controls on developmental processes and, therefore, a greater opportunity for morphologic variation and innovation (Eble 2003; Valentine and Jablonski 2003; Ciampaglio 2004). Over time as developmental processes became more canalized, only slight modifications were possible without significant effects on the fitness of the organism. Choosing between these, or perhaps other, scenarios is difficult without knowledge of complete ecosystems, ontogenetic sequences, or genetic systems. However, several tests have been conducted to try to tease apart the controlling constraints on disparity (Wagner 1996; Foote 1999; Ciampaglio 2002).

Foote (1999) investigated crinoid disparity using character-based methods through the Phanerozoic and diagnosed intervals of rapid diversification during the Early Ordovician radiation of the clade, and again during the Early Triassic following the Late Permian mass extinction. Each of these episodes was followed by prolonged periods of static morphological disparity. This pattern was consistent with the first of the aforementioned hypotheses (i.e. a pattern of rapid utilization of ecosystem resources followed by a deceleration of morphological expansion with concomitant slowing of taxonomic origination rates until structural and functional limitations are reached). However, post-Paleozoic crinoids never attained Paleozoic levels of disparity, despite the probable availability of ecospace, which suggests a role for the second hypothesis (i.e. an increased rigidness in the developmental and genetic systems). Ciampaglio (2002) followed this early study by defining crinoid morphologic characters as ecological or developmental and examining the relative role of the different character sets after extinction events. Defining characters as ecological or developmental is difficult, such that the results should be taken tentatively. Results indicated that developmental traits did not play large roles in the rapid expansion in disparity following extinction. Instead, Ciampaglio (2002) concluded that increased structuring of guilds imposed a limit in the expansion of morphologic features.

Foote (1999) and Ciampaglio (2002) both base their conclusions on the pattern of an immediate rise in disparity, followed by a morphologic plateau. However, these features could both be artifacts of coarse stratigraphic binning schemes, as well as low taxonomic sampling during the critical intervals. Poor sampling during the Early Ordovician and surrounding extinction events could give the impression of a plateau when variation exists, just as a coarse binning scheme averages out variation and creates a flatter pattern

The strong discordance between Early Paleozoic disparity and diversity remains a major topic of discussion and interpretation (Gould 1989; Foote 1993b; Roy and Foote 1997; Lupia 1999; Eble 2000; McGowan 2004; O'Meara et al. 2006), and questions remain about the timing of the original morphologic diversification. Against this backdrop, it seems appropriate to reexamine the patterns of the previous studies of crinoid disparity (Foote 1994, 1999) and to explore the nature of morphology during the Ordovician Radiation, through the subsequent Late Ordovician Mass Extinction, and test the apparent Paleozoic disparity plateau. Peters and Ausich (2008) produced a sample-standardized taxonomic diversity curve for Early Paleozoic crinoids that provides a highly resolved view of crinoid diversity throughout this interval. This curve is broken into nineteen stratigraphic intervals as opposed to the four that were used in previous crinoid disparity studies (Foote 1994, 1999) and is used in the current study as a baseline for comparisons between diversity and disparity.

The previous analysis of Foote (1999) did not generally include multiple species per genus per time interval. This can be problematic when many crinoids have not been examined with modern phylogenetic techniques and there is little uniformity in the breadth of morphology present within different genera. The previous study was limited taxonomically to include a correction for taxonomic oversplitting (which would artificially reduce disparity) and reducing biases in favor of well sampled localities. Foote (1999) chose the best preserved species within each genus, which drastically reduced the amount of unpreserved and therefore unknown morphology that is often present in rarer species. Limiting the temporal scale of the present project allows for more specimens to be examined, greatly increasing the number of species within a genus. Species that occur in multiple localities were also examined to recognize differences between populations.

Newly discovered and described faunas have filled in several Early Paleozoic gaps that hindered previous analyses. A plethora of Early Ordovician crinoids have recently been discovered in the western United States (Guensburg and Sprinkle 2003; Gahn et al. 2006) that help to fill in the history and timing of the Early Paleozoic morphologic radiation, and recently described crinoids from Anticosti Island (Ausich, in press) have aided our understanding of the Ordovician extinction and Early Silurian recovery. This interval was marked by a shift in the dominance of orders within crinoids, which could be reflected in patterns of morphologic disparity. Here, we demonstrate that crinoid disparity is not static through the Early Paleozoic and that a large expansion in morphologic disparity occurred during the Early Silurian because of the diversification of myelodactylids.

Materials

As with many other Early Paleozoic taxa (Gould, 1989; Briggs et al. 1992a, 1992b; Wills, 1998), crinoids displayed a rapid morphological diversification (Foote, 1994, 1999), and went through several extinction and recovery events (Eckert 1988; Simms and Sevastopulo 1993; Ausich et al. 1994; Peters and Ausich 2008). This history provides opportunities to address many of the issues at the forefront of disparity studies (Foote 1997). During the Paleozoic, crinoids were widespread both environmentally and geographically and were abundant in most shallow-marine settings. Morphologically, crinoid features are well represented in the skeleton, so little information is lost with the decay of soft tissues (Ausich 2001). Although the crinoid skeleton requires special circumstances to be preserved intact (Donovan 1991; Brett et al. 1997; Ausich 2001), many species, especially during the Early Paleozoic, can be identified based on disarticulated elements alone (Brower and Veinus 1974; Meyer et al. 2002) and thus taxa from environments that have lower preservation potential can be included in morphological investigations. Even within a cohesive guild of sessile passive suspension feeders, crinoids exhibit many different features for obtaining resources (Kammer and Ausich 1987).

Two different morphologic data sets were compared in this study. The first is the Early Ordovician through Llandovery subset of Foote’s (1999) original global database of Phanerozoic crinoid morphology. This data set is comprised of 142 crinoids, with 86% consisting of a single species per genus and an average of 1.15 species per genus. The second morphological database compiled for the present study consists of 479 Laurentian crinoid species from the same time interval with an average of 2.26 species per genus

TABLE 4. Stratigraphic intervals used in Foote (1999) with a comparison of the number of species used in Foote (1999) and this study.

Interval		Age of base	Duration (Myr)	Species used by Foote (1999)	Species in New Compilation
Lower Silurian	Llandoverian	443.7	15.5	29	132
Upper Ordovician	Upper Caradocian through Ashgill	455.8	12.1	63	177
Middle Ordovician	Llanvirnian through lower Caradocian	466.2	10.4	42	203
Lower Ordovician	Tremadocian and Arenigian	488.3	22.1	8	32

among the 212 genera represented. This study was limited to Laurentia owing to difficulties in high-resolution correlation between different paleogeographic provinces.

Species definitions can be problematic in macroevolutionary studies (Ausich and Peters 2005), but in this case, our methodology corrects for the problem. “Species” within a genus were compared, and if they do not differ in any character states, they were treated as members of the same species. All congeneric species included in the study therefore differed from one another by at least one character. When possible, multiple specimens within a species were examined from single populations, as well as from multiple distinct localities, to assess whether populations should be divided into multiple species. This eliminates biases stemming from oversplitting or lumping within crinoid groups or

TABLE 5. Stratigraphic intervals used in Peters and Ausich (2008) with q comparison of the number of species used in Foote (1999) and this study.

Time interval	Abbreviation	Age of base	Duration	Foote Species	Number of Species
Telychian	T	436	7.8	3	64
Aeronian	A	439	3	18	54
Rhuddanian	R	443.7	4.7	9	18
Hirnantian	H	445.6	1.9	5	28
Rawtheyan	R	447.4	1.8	15	40
Cautleyan	C	449	1.6	10	34
Pusgillian	P	451	2	10	19
Onnian-Actonian	O	453.6	2.6	11	31
Marshbrookian	M	455.8	2.2	28	101
Soudleyan	S	456.9	1.1	37	102
Harnagian-Costian	H	459	2.1	42	116
gracilis Zone	g	460.9	1.9	2	0
teretiusculus Zone	t	463.7	2.8	1	0
murchisoni Zone	m	464.8	1.1	0	0
bifidus Zone	b	466.2	1.4	1	3
hirundo Zone	h	470.8	4.6	6	3
extensus Zone	e	478.6	7.8	4	14
Late Tremadoc	Tu	485.5	6.9	1	16
Early Tremadoc	T1	488.3	2.8	0	4

stratigraphic intervals and creates a more uniform species concept based off of the characters used in the disparity analysis. Crinoid species were coded morphologically based on published descriptions, inspection of photographic plates, and direct examination of museum specimens.

The two morphological databases were examined using two different scales of stratigraphic resolution: a) the relatively coarse scale of Foote (1994, 1999) (Table 4), and b) the finer scale of Peters and Ausich (2008) (Table 5).

Methods

The most viable method for adequately comparing the wide array of forms among crinoids is to use discrete morphological characters. A total of 92 characters, based roughly on those used by Foote (1999), were chosen to encompass the entire morphology of the study animals (i.e. crown, column, and holdfast). These characters include both presence/absence features (binary characters) and characters with several different possible morphologies (multistate characters). These characters address different aspects of morphology, including features that are present only in a single species; these unique features were included to describe sufficiently the unusual morphologies of many Early Paleozoic crinoids.

Foote (1999) differentiated between *unpreserved* and *inapplicable* characters. However, methodologically they were both coded as “not applicable” (NA), which greatly increased the proportion of missing data in the analysis. Foote (1999) examined the effects of both unpreserved and inapplicable characters by omitting characters or taxa with a high proportion of missing data and reanalyzing the data set, which produced similar results. One potential problem with this methodology is that in omitting taxa with inapplicable characters, disparity will commonly decrease because of the exclusion of well-preserved but morphologically aberrant taxa (e.g. *Acolocrinus,* which does not possess arms). To include these taxa and still not include shared inapplicable characters in the analysis, a different coding was implemented here: unpreserved data were treated as NA, inapplicable characters were coded as 0 and morphologic states were coded as multistate characters (i.e. the absence of a character was coded as 1 instead of zero to differentiate from inapplicable characters). For example, for the presence or absence of pinnules: without arms, the presence of pinnules is inapplicable and coded as 0 (e.g. *Acolocrinus*), crinoids without pinnules on their arms are coded as 1 (e.g. *Cincinnaticrinus*), crinoids with pinnules are then coded as 2 (e.g. *Glyptocrinus*).

Gower's (1971) similarity coefficient was calculated for the morphology data set. This measure was chosen because it does not have metric properties; in particular, distance in morphospace is not affected by shared 0's in the data set. Gower's method, therefore, does not include shared inapplicable characters in computation of the similarity coefficients, and with an additive coding scheme, extra importance is given to anatomical features that have several subsidiary characters associated with them. Where two species have mismatching characteristics with regard to a trait with subsidiary characters, it forces all of the associated characters to also be mismatched, which decreases the similarity coefficient between those two taxa. It is desirable for major features (e.g. the presence of a stem or arms) to have more influence in the construction of the morphospace because complex features play a larger role in the ecology or basic developmental construction of the species. Differences in the fundamental construction of the organisms should have larger ramifications in morphospace than more superficial characters (e.g. stellate ridges on the plates or cuneiform brachials).

For a detailed example of this coding scheme see Deline (2009). It should be noted that a match in a primary character has the same weight as any other character, distinguishing this coding scheme from character weighting in systematics. The degree to which this coding scheme itself has affected the analysis can be explored by examining which traits are important in creating groupings in morphospace (i.e. which characters are highly correlated with the axes), and by comparing the results to those produced by using the methods of Foote (1999) on the updated dataset.

The similarity matrix was analyzed using Principal Coordinates Analysis (PCO) because of its flexibility in the choice of similarity coefficient and because it handles missing data better than Principal Components Analysis (Lofgren et al. 2003). Disparity in both datasets is defined as the average squared distances between species in the morphospace defined by the first two through ten PCO axes for each assemblage following the methods of Foote (1994, 1999). In subsequent analyses in the study, the first ten PCO axes were used because they are more inclusive and describe a larger amount of variation within the dataset. To examine the morphological effects of changes in the proportions of the crinoid orders, disparity was also measured as the average distance of crinoid species from the centroid of their respective orders for each stratigraphic interval. This eliminates the distances between the crinoid orders and, thus, gives a lower estimate of disparity. Error bars for all disparity measurements were calculated as the standard error of 1000 bootstrap resamples (Efron 1982).

Because of missing or inapplicable characters, triangle inequalities can exist among taxa when using PCO with non-metric similarity coefficients, such as Gower's. That is, some taxa may appear to be identical in reference to other taxa, but yet may still differ in characters that are missing in the other taxa, thus requiring a distance between them that is non-euclidean. This issue will result in negative eigenvalues in PCO analyses. These triangle inequalities usually do not have a large effect on the primary structure of the analysis, but they could theoretically distort the multivariate structure (Kirkpatrick and Lofsvold 1992). We used the “squeezing” routine of Kirkpatrick and Lofsvold (1992) to test whether triangle inequalities affected the multivariate structure of the analyzed axes (i.e. 1-10).

All analyses were conducted using R 2.3.1 (R Development Core Team 2006) and all statistical tests were computed using PAST (Hammer et al. 2001).

Results

Figure 9 shows the species scores on by the first two axes of the PCO analysis of 479 Ordovician through Early Silurian crinoid species in our new dataset. The analysis resulted in negative eigenvalues; however, the ‘squeezing’ routine of Kirkpatrick and Lofsvold (1992) indicated the first 50 axes were unaffected. The first two and ten axes represent 33.3% and 65.7% of the sum of the eigenvectors, respectively. The variation explained in the first two axes is low, low, indicating large degree of morphologic variation. Character states were correlated with the loadings for the first ten PCO axes and those with high correlation values are given in table 6.   The first two axes show differentiation between the four major orders of crinoids (disparids, cladids, monobathrid camerates, and diplobathrid camerates), driven by characters associated with the infrabasal circlet and the complexity of the cup (opening of the circlets and the presence of fixed brachials and interradials). The minor orders, the flexibles and hybocrinids, are nested within the cladids and disparids, respectively, which is expected given similarities in morphology and the

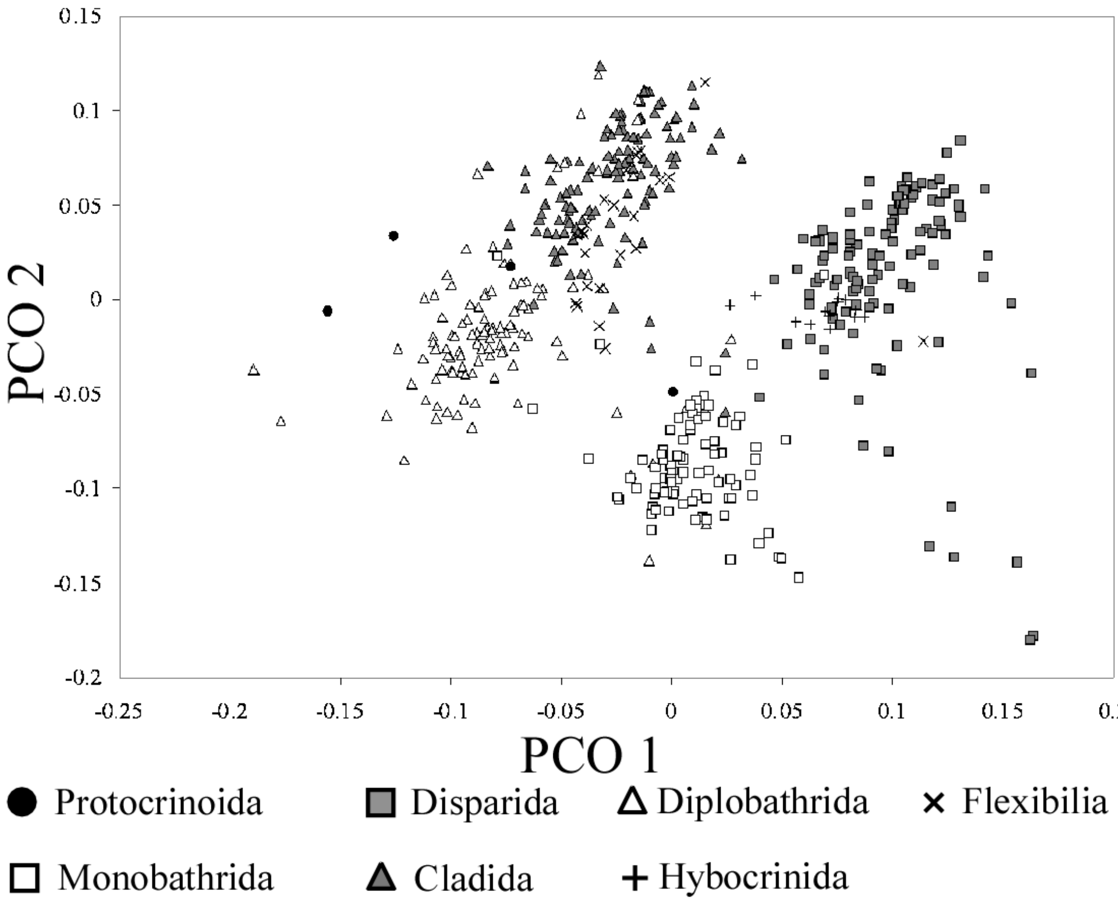


FIGURE 9. Distribution of Ordovician through Early Silurian crinoid species on the first two principal coordinate axes.

TABLE 6. The proportion of the sum of the eigenvalues for the first ten principal coordinate axes and the characters that correlated ($r^2 > 0.5$) with the PCO axes.

PCO Axes	Proportion of the sum of the Eigenvalues	Correlated Characters
1	0.180	Type and presence of Basal Circlet, Opening of Circlets, Presence and number of compound radials
2	0.153	Presence and the type of fixed brachials and interbrachials
3	0.081	Presence and type of Anal tube or sac and number of anal plate incorporated into the cup
4	0.054	Stem coiling and the presence of cirri
5	0.040	Presence and type of Arm Branching and Cup shape
6	0.036	Presence and type of Arm Branching and Cup shape
7	0.033	Cup Ornamentation
8	0.031	Type of arm branching and Cup Ornamentation
9	0.027	Opening of the basal circlet and merging the basal and radial circlets
10	0.022	Opening of the radial circlet and Cup Ornamentation
total	0.657	

their collective or individual phylogenetic positions are not clearly understood, and they may represent a sister clade or a paraphyletic assemblage of the primary crinoid lineage. Regardless of their exact status, protocrinids contain several features that would be expected in ancestral crinoids (disorganized calyx structure, irregular plate shapes, and small gap plates) and they are thus treated in this study as a proxy of the ancestral lineage.

Subsequent PCO axes (Table 6) correlated with characters that either distinguish groups with a distinctive feature of morphology (e.g. myelodactyids or cleiocrinids) or crinoids that share a homoplasic character (e.g. anal tubes).

When the morphospace is differentiated with respect to stratigraphic interval several patterns are evident (Figs. 2, 3). During the Tremadoc (Early Ordovician), the fairly limited set of crinoid species occupied almost the entire range of morphologies present during the Early Paleozoic for the first two axes. However, there is a lack of a gap between the orders of crinoids as is seen later in the Ordovician. The four major crinoid clades gradually separated and appear to constrict around the centroids of the clades from the late Middle Ordovician to the Late Ordovician. The morphospace remains relatively static until the Early Silurian when several species broke out of the area of morphospace occupied during the Ordovician. The myelodactyids broke off of from disparid zone while *Xysmacrinus* deviates from the diplobathrid zone displaying morphology reminiscent of cleiocrinids.

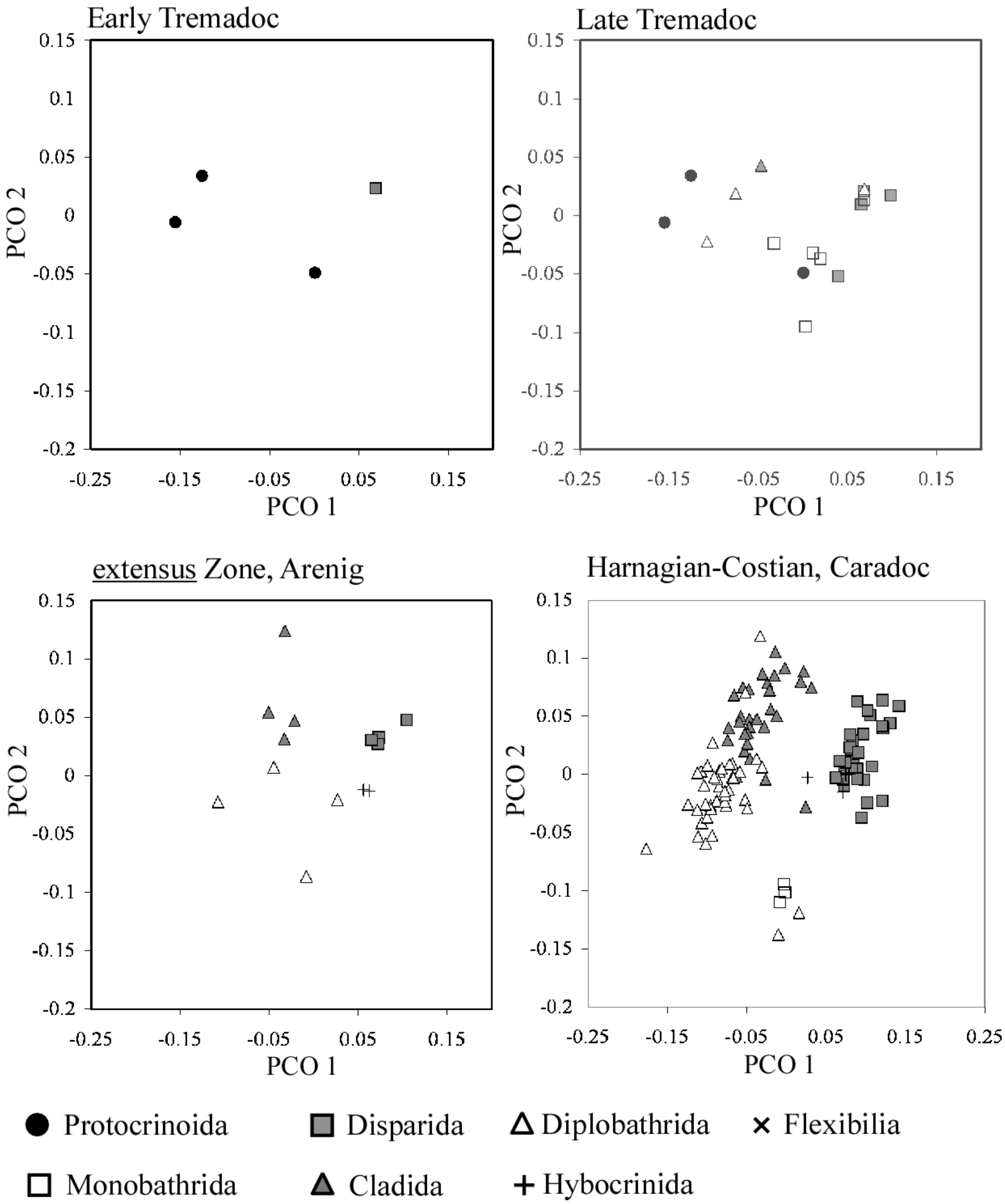


FIGURE 10. Distribution of crinoid species on the first two principal coordinate axes during four intervals from the Early to Late Ordovician .

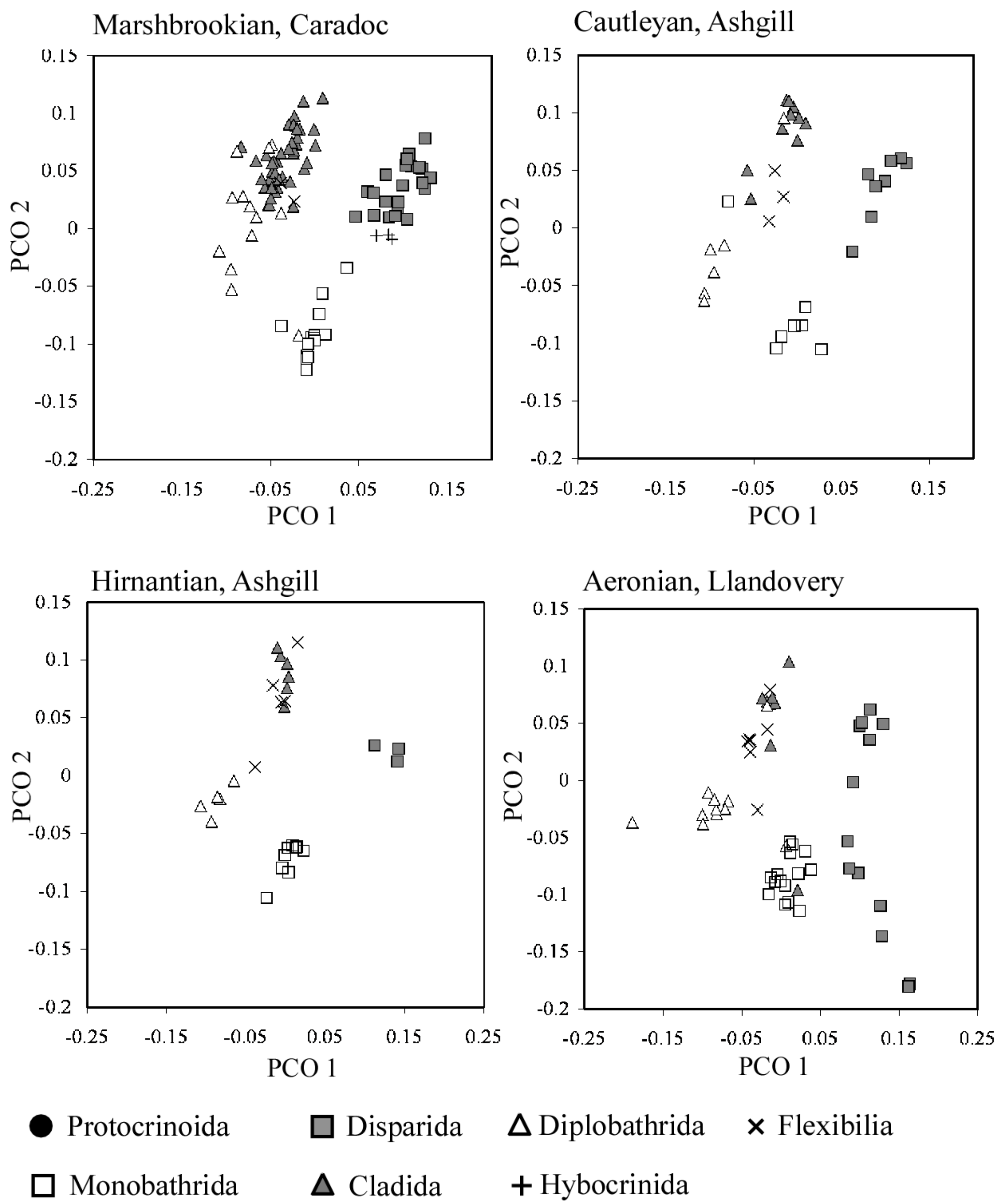


FIGURE 11. Distribution of crinoid species on the first two principal coordinate axes during four intervals from the Late Ordovician through Early Silurian.

Disparity Patterns

If both the new dataset and Foote's (1999) are binned using the Foote's stratigraphic intervals, comparable patterns emerge (Fig. 4). The absolute values differ because of differences in the method used with the two datasets, however the differences in patterns are still comparable. The new data set better constrains Early Ordovician crinoid disparity confirming that morphologic diversification (i.e. reaching the plateau) in crinoids predated the fivefold generic Ordovician diversification in crinoids. Similar to the results of Foote (1994, 1999), the new analysis shows a plateau of consistent disparity throughout the Ordovician. However, the two analyses differ during the Early Silurian with the current data set showing a rise in disparity. To more effectively assess the timing of the initial morphologic diversification, the validity of the plateau, and the nature of the Silurian disparity rise; both data sets were re-examined using the finer stratigraphic intervals of Peters and Ausich (2008) (Fig. 5). The rebinning of Foote's (1999) morphologic data exhibits a pattern that differs from the original in several

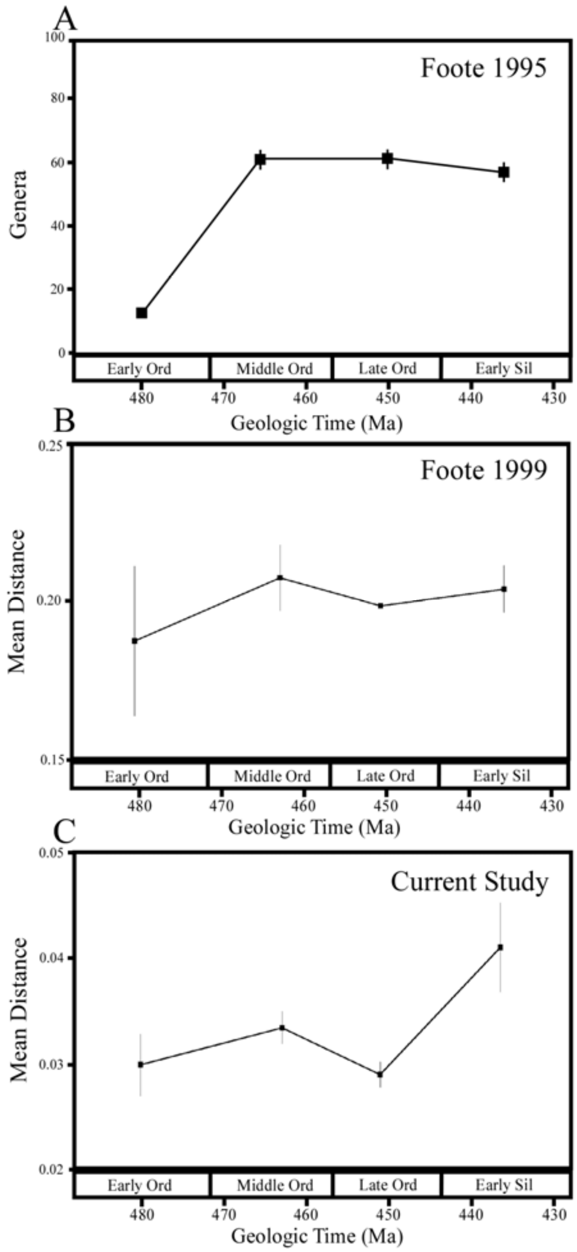


FIGURE 12. A Generic diversity of crinoids from the Ordovician through Early Silurian from Foote (1995). B. Disparity based on the morphologic characterization of 139 crinoids presented by Foote (1999). C. Crinoid disparity based on 479 crinoids species examined for this study binned using the stratigraphic intervals of Foote (1999).

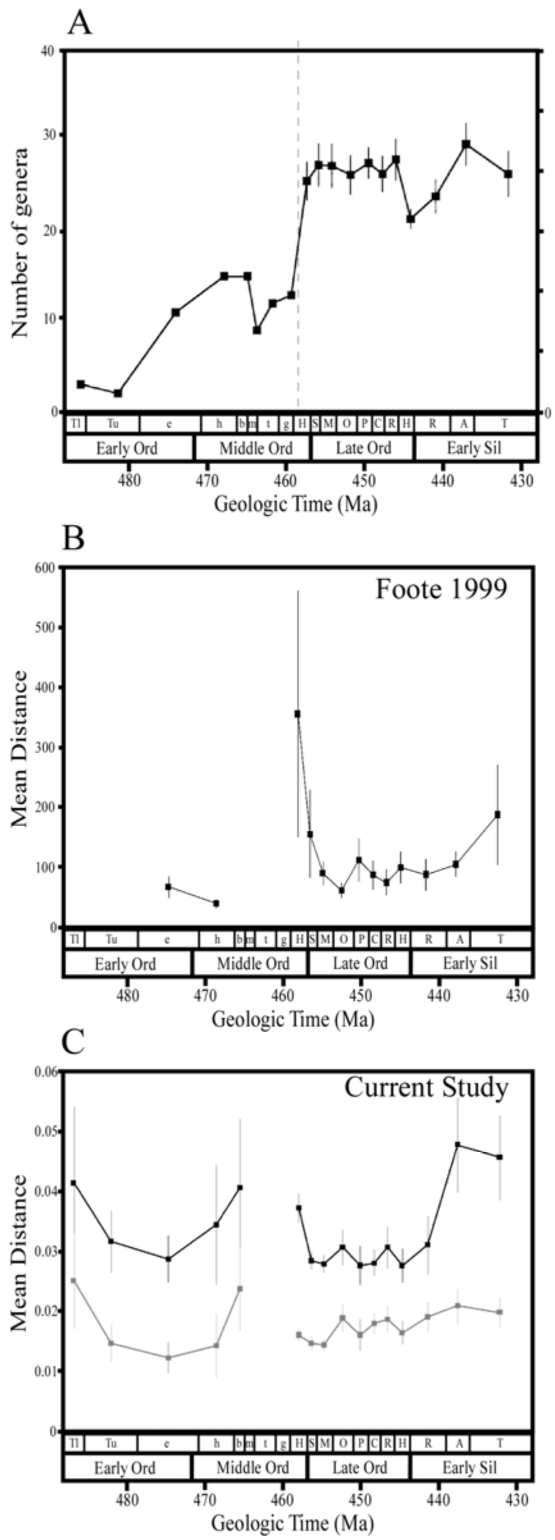


FIGURE 13. A. Sample standardized generic richness of Ordovician through Early Silurian crinoids (Peters and Ausich 2008). The dashed line indicates when the minimum sampling quota was achieved in order to accurately assess sampling error. B. Crinoid disparity based on the Foote's (1999) morphologic data rebinned using the stratigraphic intervals of Peters and Ausich (2008). C. Updated crinoid disparity showing the squared pairwise distance between the first two (gray) and first ten PCO axes of crinoid species in morphospace. Gaps in the time series are due to low sampling intensity and diversity of crinoids during the Middle Ordovician.

aspects. First, there is a poorly constrained late Middle Ordovician peak that corresponds to the five-fold increase in taxonomic diversity. Second, there is a rise in disparity at the end of the Early Silurian, which occurs after the Silurian taxonomic diversity rebound and coincides with a drop in taxonomic diversity. However, several other features remain, such as the Late Ordovician through Early Silurian plateau and a slight elevation in disparity between the Early Ordovician and the Middle Ordovician.

The new data set (Fig 5c) contrasts with that of the rebinned Foote (1999) curve in several aspects. Even with smaller sample sizes, as is expected with lower diversities, it appears that crinoid disparity in the Early Ordovician was as high as that of the Late Ordovician. The curve also shows a pronounced rise in Silurian disparity, especially when the first ten PCO axes are included in the study (Fig. 6). This rise in disparity corresponds to the taxonomic rebound in the Silurian and occurs in an earlier stratigraphic bin than the more muted rise in the rebinning of the Foote (1999) database. Both data sets retain a drop in disparity after the Late Middle Ordovician followed by relatively stable disparity plateau during the Late Ordovician.

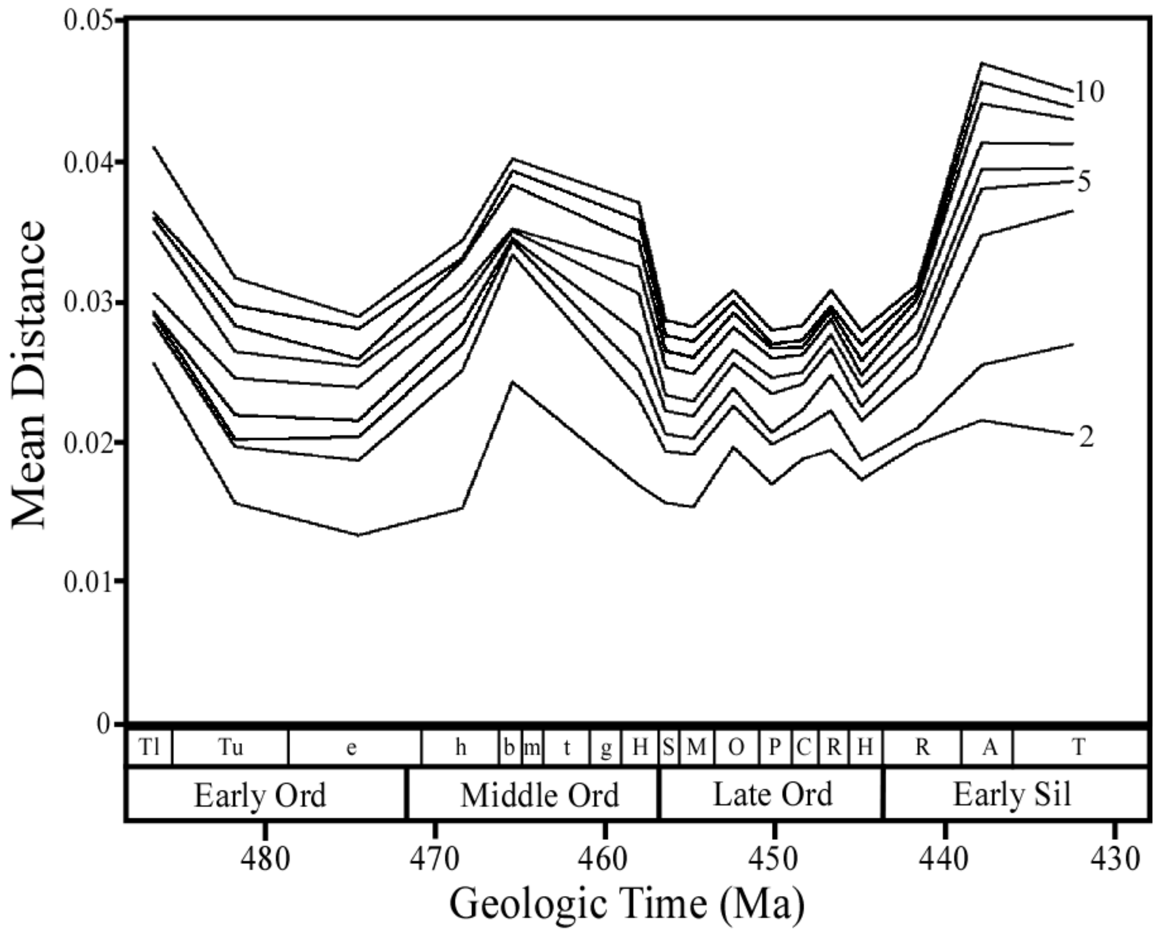


FIGURE 14. Ordovician through Early Silurian crinoid disparity based on the first two PCO axes through the first 10 PCO axes. Error bars have been omitted for clarity; however, error bars are on all axes are comparable to those in Figure 5C.

Testing the robustness of the pattern

Several different analyses were conducted to further examine the nature of the disparity curve and to test its robustness. First, we altered the data coding methods to observe their effects on the results. As noted earlier, our initial coding scheme differed from Foote (1994, 1999), which might explain differences observed between the two datasets illustrated in the previous section. The updated dataset was recoded and analyzed using the methods of Foote (1999); i.e. treating non-applicable and missing data the same and using a Euclidean distance metric. The resulting curve is similar to the original (Fig. 7, Spearman's rho; p=0.058), but there are several differences. The Early Ordovician trajectory is flatter and the Early Silurian recovery occurs earlier and is more pronounced. Nevertheless, the pattern still shows the major features that differentiate it from the results of Foote (1994, 1999) and are, thus, not an artifact of the methodology.

Measuring disparity as the average pair-wise distance between taxa in morphospace has been shown to be minimally affected by sample size (Ciampaglio et al. 2001); however, other studies have used rarefaction to correct for any biases owing to differential sampling (Foote 1992; Neige 2003). Even with rarefaction, sampling biases may still exist because of the segregation of rare and common species within morphospace (Deline 2009). To determine whether sample size might affect disparity values in the current study, disparity was compared to the number of species sampled within each stratigraphic interval (Fig. 8). There is no trend or relationship between sampling and disparity (Spearman's rho, p=0.64), so any such biases are assumed to be minimal.

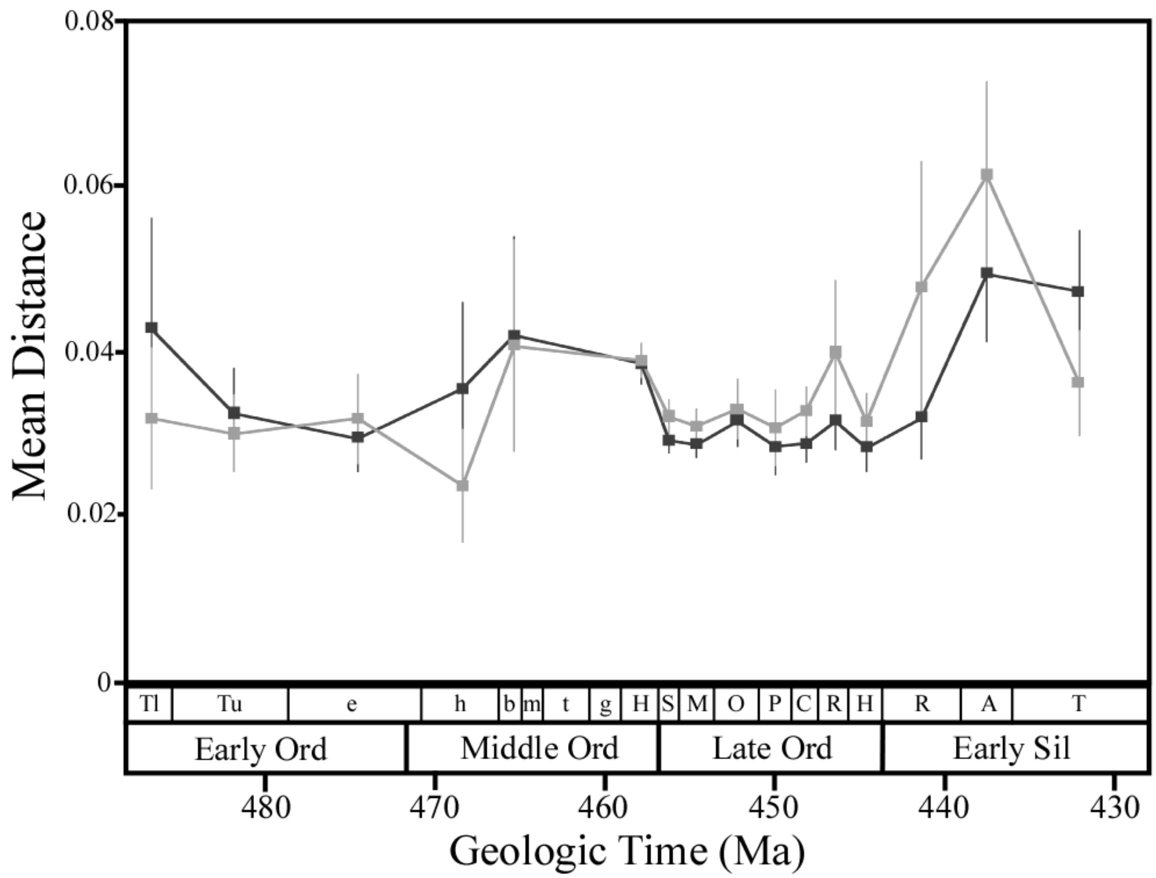


FIGURE 15. Ordovician through Early Silurian crinoid disparity based on an additive character scheme (black) as detailed in Deline (2009). In this scheme non-applicable and missing data are treated differently and analyzed using Gower's similarity coefficient. This is compared with the same data coded and analyzed using Foote's (1999) methods (gray). In this case, non-applicable and missing data are coded as NA and similarity is based on Euclidean distance. In both cases the similarity matrices are analyzed using PCO.

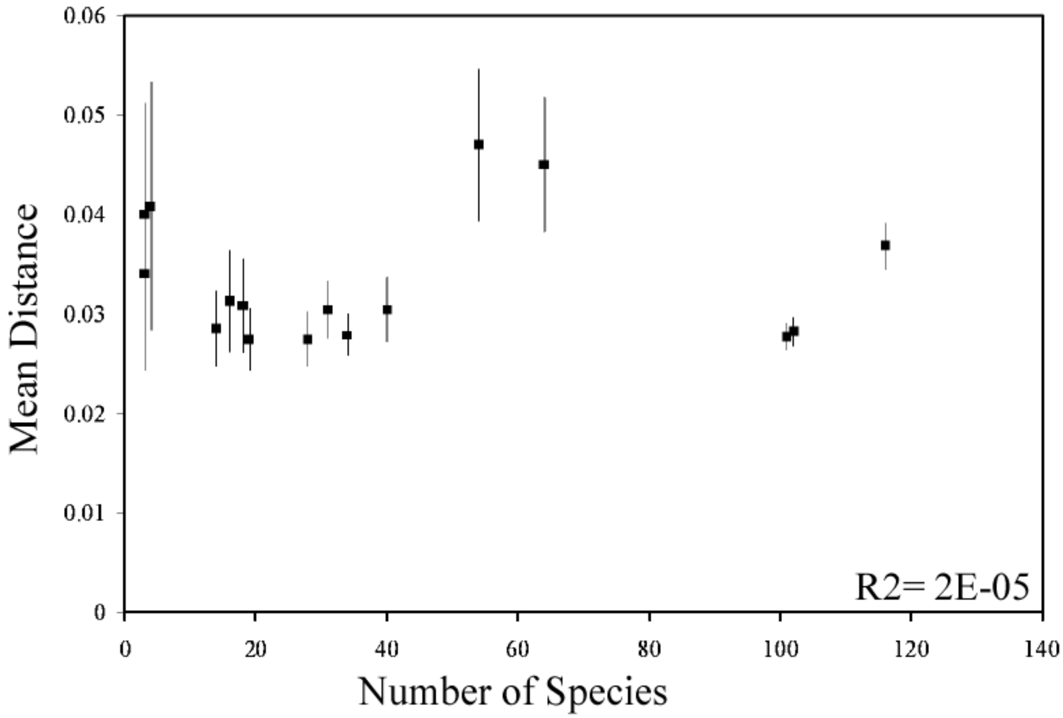


FIGURE 16. A comparison of the disparity and the number of crinoid species with in a stratigraphic interval.

Because of the observed influence of differing proportions of crinoid orders on disparity values in previous studies (Foote 1999; Deline 2009), order-level differences were removed from the study (Fig 9a). This is a measure of the average distance between individual species and the average position of the order (i.e. the centroid of the order) in morphospace within a given stratigraphic bin. Because of low sample sizes during the Early and Middle Ordovician this analysis was limited to the Late Ordovician through Early Silurian. By its nature, this method returns a lower disparity value and a more muted pattern. Nevertheless, the pattern of a higher disparity in the late Middle

Ordovician followed by static disparity until a Silurian expansion still remains prominent and the curve is significantly correlated with the original analysis (Spearman's rho; $p<0.001$). During the Late Ordovician the curve is flat-lying, and the distance between the two curves is static showing that within order disparity and the distance in morphospace between the orders is fairly constant. The Silurian diversification, as well as the late Middle Ordovician high, exhibits a higher within order disparity as well as an increase in the distance between the two curves, indicating that the rise in disparity results from an increase in both the spread of taxa within the individual orders and the average distance between orders in morphospace.

Disparity within the different orders has a strikingly different pattern (Fig 9b). Monobathrid camerates and cladids have a low initial disparity but show a gradual rise throughout the Ordovician and into the Silurian. Diplobathrid camerates have a high disparity value during the late Middle Ordovician, which gradually declined throughout the study interval. Disparids show a highly variable disparity with a high initial disparity that decreased through the Ordovician but grew rapidly during the Silurian recovery, thus controlling the overall rise in crinoid disparity during the Early Silurian. With the exception of the disparids, disparity among orders parallels the crinoid evolutionary faunas (CEF) (Baumiller 1993; Ausich et al. 1994). The lower Paleozoic CEF was dominated by diplobathrid camerates and disparids, whereas the middle Paleozoic CEF was dominated by monobathrid camerates, flexibles, and disparids.

To better understand the variability in disparid disparity as well as the Silurian morphologic expansion, the disparid morphospace was parsed out at a family level. Most

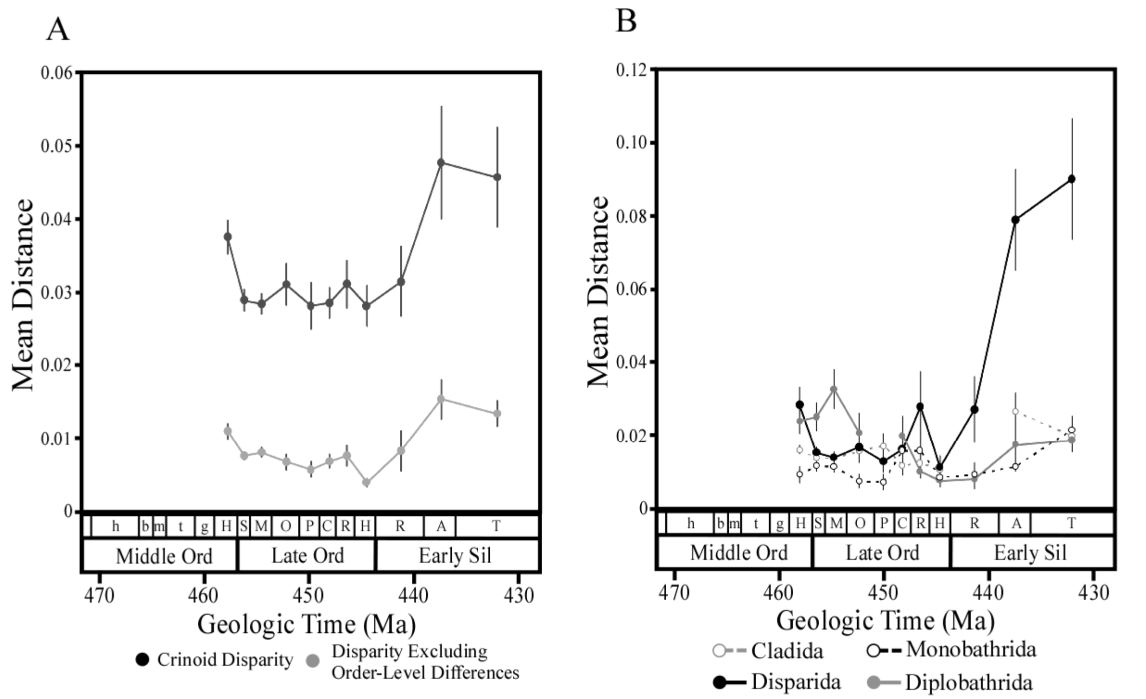
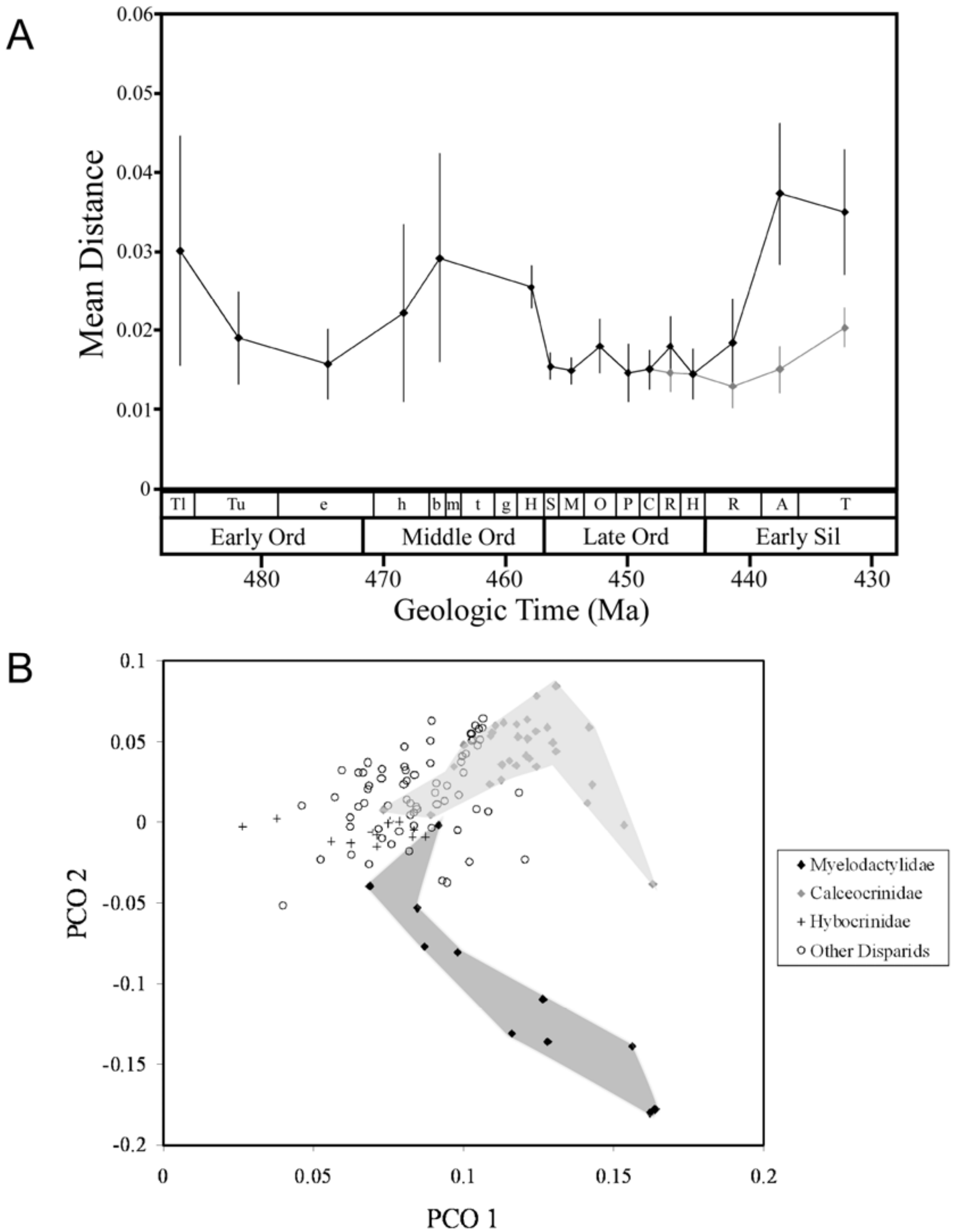


FIGURE 17. A. Middle Ordovician through Early Silurian crinoid disparity calculated as the average pairwise distance in morphospace (black) and as the average distance of individual species from the centroid of their ordinal centroid for the four primary orders of crinoids (grey). B Disparity of four orders of crinoids through the Middle Ordovician through Early Silurian.

disparid families overlap in morphospace with the exceptions of Calceocrinidae and Myelodactylidae (Fig. 10b). The Calceocrinidae play a large role in expanding morphospace during the late Middle Ordovician leading to the high disparity value. This separation can be observed in the two primary PCO axes, but it is also pronounced in axis

8 (Fig. 6), which correlates to cup and arm patterns that differentiate calceocrinids from other crinoids (Table 6). Myelodactylids occupy a wide area in morphospace in the first two PCO axes. However, the rise in Silurian disparity is primarily in the 4th axis (Fig. 6), which separates myelodactylids from other crinoids based on stem characteristics. When disparity is recalculated excluding myelodactylids, a Silurian rise is still present though greatly muted (Fig. 10a), indicating the Silurian rise is mostly due to the evolution of the distinct stem morphologies within the myelodactylids.

FIGURE 18. A. Ordovician through Early Silurain crinoid disparity with (black) and without (gray) the family Myelodactylidae. B Morphospace showing the distribution of the different disparid families. The other disparid families include Anomalocrinidae, Catillocrinidae, Cincinnaticrinae, Eustenocrinidae, Homocrinidae, Iocrinidae, Pisocrinidae, Tornatilicrinidae, and undescribed crinoids.


A
0.06
0.05
0.04
0.03
0.02
0.01
0
Mean Distance
Tl Tu e h b m t g H S M O P C R H R A T
Early Ord
Middle Ord
Late Ord
Early Sil
480 470 460 450 440 430
Geologic Time (Ma)
B
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
PCO 2
0 0.05 0.1 0.15 0.2
PCO 1
Myelodactylidae
Calceocrinidae
Hybocrinidae
Other Disparids

Comparison of Studies

The results of the current study differ from those of Foote (1999) in that (1) disparity reaches its Ordovician peak early in the first stratigraphic bin, (2) there is a strong drop in disparity from the late Middle Ordovician to the Late Ordovician, (3) the period of static morphologic disparity is constrained to the Late Ordovician, (4) the Silurian is marked by a large increase in morphologic disparity especially in the higher PCO axes.

To understand the difference between the current study and the previous results, several different factors need to be considered, the first of which is the difference in methods used to code the characters and analyze the data. The effect of the addition of new characters not used in the previous study was minor and consisted of characters that only occurred in a small number of species. These characters were included to more completely describe the morphology displayed in Early Paleozoic crinoids, especially those from the Early Ordovician (Ausich 1986; Guensburg and Sprinkle 2003; Gahn et al. 2006). None of these characters were correlated highly with the first ten PCO axes, however, and thus did not play a large role in the resulting trends.

The treatment of missing data and non-applicable data, effectively shifting to an additive coding scheme, could also be a factor in the differences in patterns. When the current morphology data set was reanalyzed using the methods of Foote (1999), the disparity curve was indeed dampened in the Early Ordovician and the Silurian expansion was amplified (Figure 5). Thus the new method possibly caused the high Early Ordovician disparity values, but because of small sample size, those values were already suspect. The Silurian morphologic diversification is amplified with myelodactylids playing a large role in the diversification, with their partial disparity (individual contribution of a species of group of species to an overall disparity value, Foote 1993a) rising from 15.2% to 35.2% of the total disparity during the Rhuddanian. Overall however, the methods used to differentiate missing and non-applicable characters are not biasing the results toward the Silurian morphologic diversification and, thus, other reasons for the difference must be explored.

Increasing the number of stratigraphic bins in the study necessary reduces the smoothness of patterns exhibited by broader bins. Regardless, there is a highly significant difference between the updated curve and Foote’s (1999) rebinned disparity curve (Spearman's rho; p=0.73). Since the choice of characters, coding scheme, and binning scheme are not the cause for the difference between the current and previous studies, the difference between the two disparity curves likely results from the increase in the taxa included in the study in two important ways. First, an increase in taxa fills the morphospace, permits better stratigraphic resolution, and decreases the error associated with the curve. Second, there is an effect related to the increase in the number of species coded per genus. Even with a requirement of species differing by at least one character, some genera differ en masse in regard to a subset of characters from other crinoids. Methodologically, ten species differing collectively in four or five characters from the rest of the species has a more pronounced effect on the resulting morphopace than a single species having a unique morphology. Therefore, distinctive and species-rich clades (e.g. myelodactylids, cleiocrinids) play a prominent role in the curve whereas single species with unique morphology (e.g. *Acolocrinus, Colpodecrinus*) or clades with unique though variable morphology (e.g. calceocrinids) play a lesser role. It follows that the Silurian rise in disparity is visible due, primarily, to the inclusion of eleven species of myelodactylids in the current study, as opposed to two in Foote's (1999) morphologic data set.

The Silurian Recovery and the role of Myelodactylids

To understand the nature of the Silurian morphologic diversification, the Late Ordovician extinction must first be considered. Two extinction intervals are recognized during the Late Ordovician (Eckert 1988; Sprinkle and Guesnburg 2003). The first occurred at the end of the Marshbrookian with a loss of up to half of the crinoid genera, coinciding with both a regression in eastern North America and the Vermontian phase of the Taconic Orogeny causing the progradation of clastics hundreds of kilometers westward (Holland and Patzkowsky 1997). The influx of clastics may have destabilized substrates and disrupted the predominantly carbonate communities (Eckert 1988). However, this event also coincided with a restriction of known crinoid assemblages to eastern North America, with a few exceptions in Iowa (Slocum and Foerste 1924) and Wyoming (Kolata 1976). Using sampling standardization, recent studies have indicated that, even with a loss of several widespread and abundant crinoid genera (e.g. hybocrinids), this extinction event may be largely an artifact of the rock record (Fig. 5a) (Ausich and Peters 2005; Peters and Ausich 2008).

However, the subsequent end-Ordovician extinction appears to be robust even with sample standardization. The end-Ordovician extinction was a two phase event, in which the first phase has been linked to rapid large-scale glaciation on Gondwana and a global regression (Brenchley 2003). This event, which is displayed in the isotopic

(Brenchley et al. 2001) and sedimentologic record (Hambrey 1985), lowered the number of faunal provinces (Sheehan and Coorough 1990) and may have triggered regional anoxic events (Owen and Robertson 1995).

Both the selectivity of the extinction event and changing environmental conditions opened up potential new ecospace for crinoids. Lower tier pelmatozoans, such as Porocrinidae, Hybocrinidae, and blastozoans became extinct during the Late Ordovician leaving only a few clades (e.g. Calceocrinidae) to occupy this niche. The preferential extinction of lower tier crinoids could be related to the shift from largely firm- or hardground communities associated with rapid carbonate cementation during “calcite sea” conditions (Stanley and Hardie 1999), to muddier substrates during the Silurian. Muddy substrates posed several problems for Ordovician crinoids, especially those in the lower tier. Crinoids during the Late Ordovician largely had holdfasts that required hard substrates for attachment (Brett 1981) and muddy substrates are problematic in clogging the feeding system in lower tier crinoids (Seilacher 1990). Coiled stems and cirri allowed myelodactylids to flourish in these communities by using the cirri as support systems on unconsolidated sediment (Donovan and Franzén-Bengtson 1988; Donovan and Sevastopulo 1989). Many aspects of myelodactylid functional morphology are contentious, but, the cirri have been interpreted as forming a protective cage surrounding the calyx, preventing the fouling of the feeding system or aiding in the protection of the crown in the trauma position (Eckert and Brett 1985).

Disparity during the Silurian recovery surpassed that of the Ordovician, which coincides with both the evolution of new unique forms exploiting newly vacated habitat coupled with the retention of most general crinoid forms. This finding is consistent with the hypothesis that large morphological expansions occur with the expansion of taxa into previously unoccupied ecological space. The large role that new clades, myelodactylids in this case, play in the nature of early Paleozoic crinoid disparity is hardly unique in the history of crinoids. Several post-Paleozoic crinoid clades expanded into new ecological niches in the Triassic-Jurassic by evolving new morphologic forms, thus contributing greatly to crinoid disparity (Foote 1999). Comatulids, for example, lost their stem and occupied a cryptic, mobile guild that allowed an occupation of Cenozoic shallow water communities (Magnus 1963; Meyer and Macurda 1977; Hagdorn and Campbell 1992). Comatulids were responsible for approximately 15% of crinoid disparity during the Early Cenozoic (Foote 1999), which is comparable to the contribution of myelodactylids during the Rhuddanian. Cyrtocrinids are a highly paedomorphic clade of crinoids that expanded during the Jurassic into the rocky habitats that they occupy today (Donovan 1992; Heinzeller et al. 1996; Donovan and Pawson 2008). The omission of this highly derived group of crinoids decreases the apparent disparity by nearly half in the Early Cretaceous (Foote 1999), just as would the omission of myelodactylids during the Aeronian. Therefore, to a large degree, variations in crinoid disparity over time are driven mostly by the expansion of crinoids with unique morphologies into new niches, as opposed to the persistence of general morphologies.

Silurian Diversification versus the Post-Paleozoic Recovery

Mass extinctions open ecological space that allows the surviving taxa to diversify and fill the available niche space (Rosenzweig and McCord 1991). The associated expansion of taxa in morphospace is, therefore, dependent on the open ecological space, as well as the developmental and genetic flexibility to evolve new forms that can utilize newly available resources. It is difficult to distinguish between these two impetuses in the fossil record. Assessing the availability of open ecospace (unutilized resources) is difficult because of the inability to consider a large proportion of the community because of loss during fossilization (Schopf 1978), as well as difficulties recognizing limiting resources and competition. Several methods have been used to analyze the amount of developmental and genetic flexibility within a clade through time (Wagner 1996; Eble 2000; Campaglio 2002, 2004) but direct measurements are difficult within modern taxa and even more so within clades for which knowledge of the complete ontogenetic sequences or sufficient sample sizes are lacking.

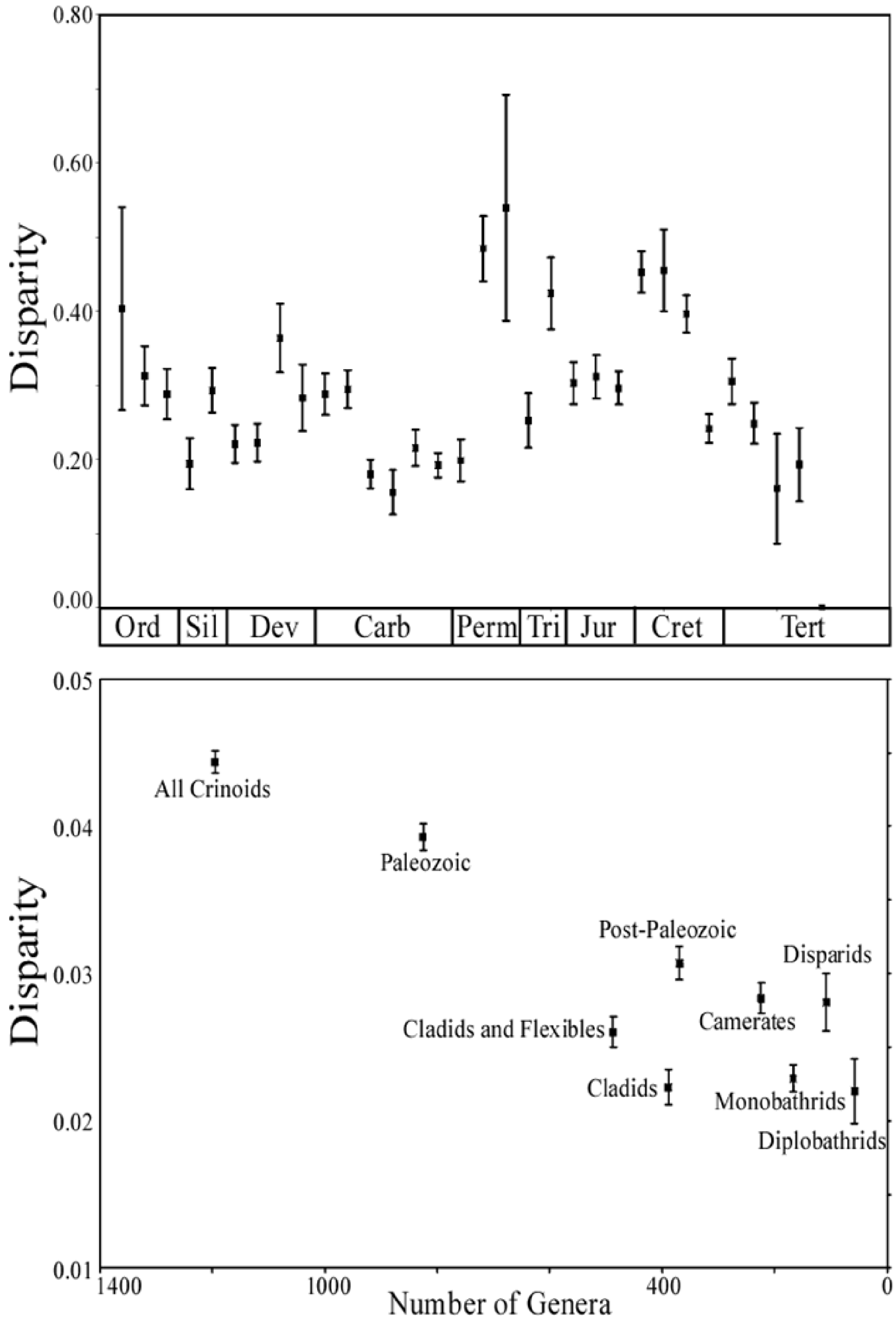
New discoveries about the nature of microRNAs have recently shed light on this debate (Stefani and Slack 2008; Makeyev and Maniatis 2008). MicroRNAs are part of the gene regulator network and act to downregulate the transcription and translation of a particular gene. This action has been shown to decrease intraspecific morphologic variability (Li et al. 2006) and may explain the decrease in polymorphism observed in trilobites through time (Webster 2007). By increasing the heritability of specific morphologies, the evolution of microRNAs may theoretically enable increased complexity and the appearance of novel morphologies (Peterson et al. in press). Therefore, a decrease in intraspecific variability may be coupled with an increase in class or order level disparity. The morphologic effect of microRNA evolution at multiple scales in the taxonomic hierarchy is a largely theoretical, though promising area of future research.

Foote (1999) found that post-Paleozoic crinoids exploited a wide array of ecological strategies while having stereotypy (i.e. lower disparity) in many aspects of form compared with Paleozoic crinoids, i.e. covering a smaller area of morphospace. He further concluded that differences between the Ordovician and post-Paleozoic radiations were consistent with increased rigidity (canalization) in developmental processes and genetic systems. The end-Ordovician mass extinction was less severe than the end Permian extinction; therefore, presumably with less open ecospace, crinoids were able to attain and even surpass previous levels of morphologic disparity, during the Silurian.

There could be several explanations for this pattern, (1) genetics and developmental process were still plastic early in the Paleozoic and rigidity did not set in until the late Paleozoic, or genetic and developmental constraints remained constant over time and (2) there was more external predation and competition later in the Paleozoic that limited the amount of available ecospace open after the Permian extinction, or (3) the characteristics "available" among the survivors determined the degree of morphologic diversification. Of these three explanations, the third seems most likely and testable. The initial Ordovician radiation was seeded by the taxonomically depauperate, although morphologically diverse and plastic (i.e. nonstandardized calyx plating) protocrinids (Figs. 1, 2). This starting point enabled the evolution of many different forms. Similarly, five out the six major clades of crinoids survived the end-Ordovician extinction and, thus, the starting point for the recovery was already diverse.

In contrast, after the Permian extinction, only one order of crinoids survived; and therefore, the amount of morphologic potential was likely highly constrained. The cladid clade had maximum disparity during the Permian, but following the extinction the clade surpassed the level of disparity observed for the majority of the Paleozoic, even though crinoids were probably excluded from much of the ecological space they occupied during the Paleozoic (Meyer and Macurda 1977). While the total disparity of post-Paleozoic crinoids was lower than that of the Paleozoic, the post-Paleozoic disparity is comparable or even higher than those of individual Paleozoic crinoid clades (Fig. 11). Therefore, post-Paleozoic crinoids, which expanded into new ecologic positions, actually showed greater morphologic flexibility than Paleozoic clades at a similar taxonomic level. Morphologic potential is, as expected, correlated with taxonomic level. However, based on the closer analysis of the Ordovician and Permian extinctions, there is no evidence of a decrease in the flexibility of genetic or developmental systems in later crinoids. The loss of morphologic potential seen in crinoids is instead a loss of variation caused by a winnowing out of potential ancestral stocks rather than shifts in the morphologic potential of individual taxa.

FIGURE 19. A. Disparity, measured as the mean squared distance between species in morphospace, for the cladid-articulate clade through the Phanerozoic using the methods and morphologic data set of Foote (1999). The disparity curve includes cladids, flexibles, cyathocrinids, and all Post-Paleozoic crinoids based on the phylogeny of Ausich (1998). B. Total disparity of crinoids during their entire range for different sets of crinoids also using Foote's 1999 morphologic data set. Although, sample size appears to play a role in the trends, based on the high disparity and sample size of Paleozoic and all crinoids, the correlation is not significant.


0.80
0.60
0.40
0.20
0.00
Disparity
Ord
Sil
Dev
Carb
Perm
Tri
Jur
Cret
Tert
0.05
0.04
0.03
0.02
0.01
Disparity
All Crinoids
Paleozoic
Post-Paleozoic
Disparids
Camerates
Cladids and Flexibles
Cladids
Monobathrids
Diplobathrids
1400
1000
400
0
Number of Genera

If increasing developmental and genetic rigidity played a major role in crinoid evolution it occurred, therefore, prior to the Silurian recovery. Early Ordovician crinoids have highly variable plating and lack firm circlet construction (Guensburg and Sprinkle 2003). These crinoids covered a wide area in morphospace and their descendants both expanded the boundaries and filled the morphospace (Fig. 1). As these latter crinoids evolved they became more distinct and more stereotyped from each other by the Late Ordovician (Figs. 2, 3), thus presumably losing the ability to cross the boundaries between clades. Therefore, examinations of morphologic plasticity and genetic and developmental constraints should focus on the rigidity of form that occurred in crinoids from the Early to Middle Ordovician.

Conclusions

(1) A more inclusive and stratigraphically resolved examination of Early Paleozoic crinoid morphologic disparity exhibits several patterns that are consistent with those observed previously by Foote (1999). These include a rapid early expansion of morphospace in the Early Ordovician, a minor peak in the late Middle Ordovician, and a long period of static disparity during the Late Ordovician.

(2) The current results differ significantly from those presented by Foote (1999) by indicating that crinoid disparity confidently reached a peak early in the Ordovician and then had a large expansion of morphospace during the Silurian recovery following the end-Ordovician extinction.

(3) The results do not show a bias resulting from sampling differences between stratigraphic bins and the differences in the two studies are not caused by differences in

stratigraphic binning or the differences in coding or analytical methods. The changes in disparity patterns are instead the result of the addition of newly discovered and described fauna as well as the inclusion of more species per genus.

(4) The Silurian morphological expansion is largely because of the evolution and proliferation of myelodactylids. The preferential extinction of lower tier crinoids and the expansion of soft muddy habitats created an ecological niche that myelodactylids filled during the Late Ordovician and Silurian. This result is not unique and follows the patterns displayed by the evolution of the comatulids and cyrtocrinids much later in the Mesozoic, thus strengthening the link between ecological constraints and opportunities and the breadth of morphology.

(5) Crinoid disparity increased during the Silurian due to a large expansion of one clade of disparids along with the retention of the other major clades of crinoids. Alternatively, crinoid disparity decreased following the Permian extinction with the extinction of three of the four major clades of crinoids. However, the clade that survived expanded past its Paleozoic limits just as disparids did during the Silurian. Thus, the decrease in disparity following the Permian extinction was probably due to a winnowing process, with loss of potential ancestral stocks rather than an increase in developmental and genetic constraints. These types of constraints may play a significant role in crinoid morphological history. However, the loss of morphologic potential most likely occurred during the Early Ordovician, and the later constraints on disparity were more likely due to ecology and the contingencies of lineage terminations rather than developmental or genetic canalization.

CHAPTER 3

Comparing taxonomic and geographic scales in the morphologic disparity of Ordovician through Early Silurian Laurentian Crinoids

Abstract. — Understanding the effects of different scales of study on estimates of morphological disparity are important in the interpretation of morphologic radiations and macroevolution. The results of varying taxonomic (species and genus) and geographic (regional, biofacies, and community) scale are examined in a broad study of Ordovician though Early Silurian crinoids. Using discrete morphologic characters, we examined the disparity of 421 crinoids from 65 Laurentian biofacies. Crinoid disparity differs when analyzed at the regional and biofacies levels. Regardless of fluctuations in regional crinoid disparity, average within biofacies disparity was static throughout the Ordovician deviating only during the Silurian, because of the proliferation of the morphologically aberrant myelodactylid crinoids. The choice of taxonomic level does not have an effect at the biofacies level. However, at the regional level, the two taxonomic scales (genus and species) can produce different results because of variation in the number of species per genus through time and the amount of morphologic variation within individual genera. Weighting disparity by abundance is a metric combining morphology and community structure. Average weighted disparity at the community level showed similar patterns to that of the biofacies level disparity curve, but this metric has a greater degree of variation between biofacies. Biofacies with a low ratio of weighted and unweighted

disparity display the patterned community structure (based on aerosol filtration theory) that is often reported in crinoid assemblages. Tentative results indicate that these structured communities began appearing no later than the Late Middle Ordovician.

Introduction

The quantification of the breadth of morphologies present through time is an important aspect of macroevolutionary studies. Morphological diversity, or disparity, is a powerful tool in describing patterns and morphologic implications of taxonomic radiations (Lee 1992; Fortey et al. 1996; Wagner 1997; Wills 1998; Foote 1999; Moyne and Neige 2007), extinction events (McGowen 2004; Ciampaglio 2004), environmental perturbations (Claude et al. 2003), and ecological shifts (Jernvall et al. 1996; Ciampaglio 2002). The coupling of disparity analyses with the dramatically improving understanding of the genome has led to a greater understanding of the evolutionary and genetic mechanisms that control variety of forms present within ecosystems and through time (Valentine 1995; Foote 1999, Valentine and Jablonski 2003; Webster 2007; Peterson et al. 2009).

Although taxonomic and morphologic diversity are inherently related, they often exhibit drastically different temporal patterns (Foote 1993; Fortey et al. 1996; Eble 2000; Ciampaglio 2004). Nonselective extinction, for example, can result in stable or heightened disparity during periods of declining taxonomic diversity (Foote 1993). However, the combination of the two methods can give a more thorough view of evolutionary processes than either could alone (Foote 1993; Fortey et al. 1996; Neige 2003; Moyne and Neige 2007). The study of disparity has lagged behind that of taxonomic diversity because of operational difficulties with quantifying morphology, the vast array of potential methods for doing so, and uncertainty in understanding the biases associated with disparity. Although several studies have attempted to overcome these problems (Foote 1992; Ciampaglio et al. 2001; Villier and Eble 2004; Deline 2009), more work is needed to better understand the dynamics of disparity in relation to ecology and geography in particular (Foote 1997).

Disparity analyses can potentially be affected by both the temporal and geographic scale of the study. The choice of temporal scale has been shown to have varying effects on the measure of disparity (Villier and Eble 2004; Deline and Ausich in prep.) and the choice of temporal bins can, therefore, alter results of morphological study, as observed in examinations of taxonomic diversity (Bambach 2006) and evolutionary rates (Gingerich 1983).

With respect to geography, studies of taxonomic diversity at local levels (alpha diversity) have provided new insights into Phanerozoic history of biodiversity (Bambach 1977; Powell and Kowalewski 2002; Bush and Bambach 2004; Zhuravlev and Naimark 2005), organization of communities (Bush et al. 2007), and the local effects of mass extinctions (Westrop and Adrain 1998). Studies at the local or paleocommunity level also sidestep some of the major biases associated with the analysis of biodiversity, such as the variation of rock availability (Raup 1972; Peters and Foote 2001) and differences in the amount of paleontologic study across the globe (Sheehan 1977). The relationship between morphologic disparity at the global, regional, and local scales is still not well understood. Examinations of local disparity can address how the morphology of an assemblage relates to environmental conditions, how the morphologic structure of a community changes through time, and whether the breadth of morphologies increases through time because of niche partitioning and increased competition.

Another much discussed issue regarding the scale of study of taxonomic and morphologic diversity is whether species- or genus-level analyses are more appropriate and better suited to understanding macroevolutionary patterns. The use of species-level data tends to amplify many sampling biases relative to the use of generic data, in that genera likely have more complete, and therefore more meaningful, temporal ranges because of overall preservation than do species (Raup and Boyajian 1988; Villier and Eble 2004). However, given that the morphology of constituent species may vary significantly, the use of a single species to represent a genus may yield an inaccurate view of morphology. That said, previous analyses have indicated that genus and species-level disparity analyses provide roughly equivalent results (Foote 1999; Villier and Eble 2004).

Here we examine how crinoid disparity trends change in association with the scale at which it is studied, both taxonomically and geographically, from the level of community, to biofacies, and, ultimately across the entire region. We will explore the effects of taxonomic scale of study by inclusively sampling species within genera at a broader taxonomic level (i.e. class) to determine if and how the level of taxonomic sampling affects results. We address these issues in the context of the Early Paleozoic radiation, Late Ordovician mass extinction, and subsequent recovery in the Silurian. Previous studies of Early Paleozoic crinoid disparity have shown a rapid rise in disparity during the Earliest Ordovician prior to the taxonomic radiation (Foote 1994, 1999; Deline and Ausich in prep). This rapid expansion in morphospace occupation was followed by a period of morphologic stability throughout the rest of the Ordovician, which was broken by a sharp rise in disparity associated with the proliferation of myelodactylids (disparid crinoids with unusual coiled stem with cirri) following the faunal turnover and environmental shifts of the Late Ordovician mass extinction (Deline and Ausich in prep). With a newly updated taxonomic treatment and diversity analysis (Ausich and Peters 2005; Peters and Ausich 2008), as well as a reexamination of disparity patterns (Deline and Ausich in prep) we can assess the influence of taxonomic and geographic scale, and community structure on estimates of disparity.

Materials

Early in the Paleozoic, crinoids diversified rapidly both taxonomically and morphologically (Foote 1994, 1999; Peters and Ausich 2008), as was the case for many other Early Paleozoic clades (Gould, 1989; Briggs et al. 1992a, 1992b; Wills; 1998). Crinoids were environmentally and geographically widespread throughout the Paleozoic, persisting through several extinction and recovery events (Eckert 1988; Simms and Sevastopulo 1993; Ausich et al. 1994; Peters and Ausich 2008). Crinoids were abundant in shallow marine settings and they can occasionally be identified and reconstructed based on disarticulated elements (Brower and Veinus 1974; Meyer et al. 2002; Hunter and Zonneveld 2008). Since crinoids require special circumstance to be well-preserved (i.e. rapid deposition of storm-suspended sediment), many factors such as postmortem transport, sorting, and time-averaging are much less of an issue in crinoid assemblages than for taxa that are more readily preserved even after post-mortem transport or longer-term exposure on the sea floor (Donovan 1991; Brett et al. 1997; Ausich 2001). Most crinoid morphological features (i.e. crown, column, and holdfast) are calcified and, therefore, little information is lost due to the decay of soft tissues (Ausich 2001).

With this in mind, the morphologic dataset used in this study consists of 421 Early Ordovician through Llandovery crinoid ‘species’. All species in the analysis were required to differ morphologically, so that, if two species described in the literature had no discernibly different traits among those quantified in this study they were treated as a single species. Similarly, if two samples of the same species from separate times or localities differed morphologically, they were treated as separate species. The 421 species were contained in 182 genera with an average of 2.31 species per genus; 53.8% of the genera were represented by a single species. Twenty-four of the species have yet to be formally described, but many of these species occurred in Lower Ordovician strata and most likely represent new genera (Gahn et al. 2006). A few undescribed Late Ordovician or Early Silurian crinoids were included within the study, but can easily be assigned to previously described genera.

Crinoid occurrence data were compiled from Webster (2003) and the Paleobiology Database (http://paleodb.org) by Peters and Ausich (2008). This database was updated with surveys of museum and private collections as well as field collections. The present was limited to Laurentia owing to difficulties in high-resolution correlation among different paleogeographic provinces, and to lessen the effects of unequal geographic sampling in the global compilation. Peters and Ausich (2008) combined individual collections into “biofacies”, which represent a known assemblage from a limited stratigraphic and geographic setting. These biofacies usually represent the work of multiple taxonomists and consist of several field censuses. When a biofacies spanned several time intervals it was broken into multiple biofacies; the 65 biofacies included in the study are shown in Table 7. Peters and Ausich (2008) assigned each of these biofacies to one of the substages defined by Fortey et al. (2000), summarized in Table 8.

Crinoid abundance values were based on published field censuses, surveys of museum and private collections, and field sampling. Sample abundance values could not be obtained for a third of the biofacies and relative abundance was therefore based on published observations. For most of these assemblages abundance values could be obtained for a majority, but not all of taxa within the assemblage. These crinoids were often noted as being common or rare in the systematic literature, and were given relative abundance in line with the known abundances in the assemblage. Biofacies disparity which was based on relative abundance is noted in the resulting figures.

Table7. List of the biofacies included in the current study. Biofacies with stared specimens are based on relative abundance rather than sample counts.

Biofacies	Location	Time bin(s)	Species	Speciemens
Fillmore Fm. and Wah Wah Fm.	UT	1,2	4	6
Garden City Fm.	ID	2	11	19
Lower Fillmore Fm.		3	3	7*
Upper Fillmore Fm. 2	UT	3	7	7
Benbolt Fm.	TN, VI	9	25	422
Dryden Ls.	VA	9	5	na
Heiskell Fm.	TN	9	3	na
Lebanon Ls.	TN	9	26	187
Lincolnshire Fm.	TN, VA	9	7	44
Mifflin Fm.	IL	9	3	48
Mountain Lake Mbr., Bromide Fm.	OK	9	20	4471
Ottosee Sh.	TN	9	8	25*
Platteville Group	IL, WI, MN	9	13	105

Pooleville Mbr., Bromide Fm.	OK	9	18	469
Wardell Fm.	TN	9	3	34
Spechts Ferry Fm.	MN	9, 10	3	24
Dunlieth Fm., Galena Group	IL, WI, MN	10	10	136*
Rivoli Mbr, Dunleith Fm.	IA, IL	10	3	na
Sherwood Mbr., Dunleith Fm.	IA, IL	10	8	28
Trenton Ls.	NY, Ontario, MI	10	17	303*
Curdsville Mbr., Hermitage Fm	KY	10, 11	20	113*
Decorah Subgroup	IL, WI, MN	10, 11	13	95
Grand Detour Fm.	IL, WI	10, 11	9	38
Guttenberg Fm.	IL, WI	10, 11	4	12
Hull Mbr., Ottawa Fm.	Ontario	10, 11	39	938*
Kimmswick Ls.	MO	10, 11	4	6
Sinsinewa Mbr., Wisf Lake Fm.	IA, IL	11	6	na
Kope Fm	OH, KY, IN	11, 12	8	834*
Cobourg Mbr., Ottawa Fm.	Ontario	12	6	na
Cynthiana Fm	KY	12	5	129*
Sherman Fall Mbr., Ottawa Fm.	Ontario	12	3	na
Upper Fort Atkinson Fm.	IA, IO	12, 13	5	28*
Corryville Fm.	OH, KY, IN	12, 13	9	49*
Fairview Fm.	OH, KY, IN	12, 13	11	677
Big Horn Dm.	MT	14, 15	4	10
Liberty Fm.	OH, KY, IN	14, 15	5	57
Maquoketa Sh.	IA	14, 15	8	57*
Waynesville Fm.	OH, KY, IN	14, 15	15	108
Whitewater Fm.	OH, KY, IN	14, 15	5	40*
La Vache Mbr., Vauréal Fm.	Anticosti Island	15	6	90
Cyrene Fm.	MO	16	3	7
Girardeau Ls.	MO	16	15	196
Laframboise Mbr., Ellis Bay Fm.	Anticosti Island	16	5	46*
Lousy Cove Mbr., Ellis Bay Fm.	Anticosti Island	16	4	155
Cabot Head Fm.	NY, Ontario	17	10	73
Fox Point Mbr., Becscie Fm.	Anticosti Island	17	5	29
Chabot Mbr., Becscie Fm.	Anticosti Island	17	3	24
Brassfield Fm.	OH	18	32	125
East Point Mbr., Jupiter Fm.	Anticosti	18	4	62

	Island			
Goéland Mbr., Jupiter Fm.	Anticosti Island	18	6	51
Hickory Corners Mbr. (basal portion), Reynales Fm.	NY	18	7	34
MacGilvray Mbr., Gun River Fm.	Anticosti Island	18	4	27
Richardson Mbr., Jupiter Fm.	Anticosti Island	18	3	30
Wallington Mbr., Reynales Fm.	NY	18	3	32
Chicotte Fm.	Anticosti Island	19	10	39
Cybele Mbr., Jupiter Fm.	Anticosti Island	19	6	57*
Middle Farmers Creek Mbr, Hopkinton Fm.	IA	19	13	552
Lower and Middle Farmers Creek Mbr., Hopkinton Fm.	IA	19	7	1005
Ferrum Mbr., Jupiter Fm.	Anticosti Island	19	7	108*
Scotch Grove Fm., *Caryocrinites* sp. B Assn.	IA	19	3	681
Scotch Grove Fm.; *Siphonocrinus nobilis* and *Petalocrinus* n. sp. Assn	IA	19	5	825
Welton Mbr., Scotch Grove Fm., *Dimerocrinites sculptus* and *Callocystites* - *Lysocystis* Assn.	IA	19	10	881
Lower Welton Mbr. to Johns Creek Quarry Mbr., Scotch Grove Fm.	IA	19	6	769
Lower Welton Mbr., Scotch Grove Fm., *Hagnocrinus* - *Luxocrinus* Assn.	IA	19	10	1170
Wolcott Ls.	NY	19	9	56

Table 7. Time intervals used in the study based on substages defined by Fortey et al. (2000).

	Time interval	Abbreviation	Age of base	Duration	Biofacies
19	Telychian	T	436	7.8	11
18	Aeronian	A	439	3	7
17	Rhuddanian	R	443.7	4.7	3
16	Hirnantian	H	445.6	1.9	4
15	Rawtheyan	R	447.4	1.8	6
14	Cautleyan	C	449	1.6	5
13	Pusgillian	P	451	2	3
12	Onnian-Actonian	O	453.6	2.6	7
11	Marshbrookian	M	455.8	2.2	9
10	Soudleyan	S	456.9	1.1	11
9	Harnagian-Costian	H	459	2.1	12
8	*gracilis* Zone	g	460.9	1.9	0
7	*teretiusculus* Zone	t	463.7	2.8	0
6	*murchisoni* Zone	m	464.8	1.1	0
5	*bifidus* Zone	b	466.2	1.4	0
4	*hirundo* Zone	h	470.8	4.6	0
3	*extensus* Zone	e	478.6	7.8	2
2	Late Tremadoc	Tu	485.5	6.9	2
1	Early Tremadoc	T1	488.3	2.8	1

Methods

To adequately compare the wide range of morphologies present in crinoids we used discrete morphological characters. In this study, we coded the species based on 92 characters, roughly corresponding to those used by Foote (1999). These characters cover the entire morphology of crinoids (i.e. arms, calyx, column, and holdfast) and include a mixture of presence/absence (e.g. presence of arms) and multistate features (e.g. shape of the cup). Given the unique morphologies that are present in Early Paleozoic crinoids, many characters are included that were present only in a single genus or species.

As discussed in Deline (2009), the coding scheme here differs from that of Foote (1999) in the treatment of *unpreserved* (missing due to lack of preservation) and *inapplicable* (missing because of the absence of a previous character, e.g. arm branching for a crinoid lacking arms) characters. Both greatly increase the amount of missing data in the analysis and can produce artifacts in the results. Foote (1999) tested the effects of both unpreserved and inapplicable characters by omitting characters with a high proportion of missing data, but these produced similar results. Coding these two states in the same way or omitting characters with high proportions of missing data could potentially lower disparity because of the exclusion of so features of well-preserved, though morphologically aberrant taxa (e.g. *Acolocrinus*, which does not possess arms). To include aberrant taxa while also distinguishing between unpreserved and inapplicable taxa, a different coding scheme was implemented here: unpreserved or missing data were treated as NA, inapplicable characters were coded as 0, and morphologic states of the same character in species that possessed the character were coded as multistate characters. In this case presence/absence characters were coded as 2 and 1, respectively, as opposed to 1 and 0. As an example, for the type of arm branching, if the arms were not preserved it was coded as NA (e.g. *Eomyelodactylus rotundatus*), if the crinoid did not have arms (e.g. *Acolocrinus*) or the arms were not branched (e.g. *Hybocrinus*) it was coded as 0, and crinoids with branching arms (e.g. *Cremacrinus*) were coded as 1, 2, 3, ect. depending on the type of branching.

Gower's (1971) coefficient was used to assess morphologic similarities among species. Because this coefficient does not have metric properties (i.e. shared 0's in the dataset do not affect the similarity values), it excludes shared inapplicable characters from the calculation of similarity. However, with an additive coding scheme, anatomical features that have several subsidiary characters associated with them carry greater influence in the analysis. When two species were mismatched with regard to a character with subsidiary features, it forced all of the associated traits to also be mismatched. Therefore, even though the subsidiary characters were inapplicable they still decreased the similarity coefficient between the two species, this is appropriate because from an evolutionary, ecological, constructional, or developmental perspective it is desirable for large-scale features (e.g. the presence of arms, anal tube, column, or infrabasal circlet) to have a greater influence in the analysis than minor superficial characters such as plate ornamentation.

For a more detailed example of the implementation of this coding scheme see Deline (2009). One important aspect of the scheme is that a match in a primary character holds the same weight as a match in a subsidiary character. This differentiates this scheme from character weighting in systematic studies. Deline and Ausich (in prep) examined the differences in results between the current and Foote's (1999) coding scheme and found only minor differences in the results and that the Principal Coordinate Analysis axes correlated with both primary and subsidiary characters.

The similarity matrix was then analyzed using Principal Coordinates Analysis (PCO). This was favored over Principal Components Analysis, because PCO allows more latitude in the choice of similarity coefficient (in this case, Gower's coefficient) and because it better handles missing data (Lofgren et al. 2003). To examine the effects of taxonomic scale on the study, disparity at the species level was compared to that at the genus level. The position of a genus within morphospace was calculated as an average of the positions of the individual species within morphospace.

Disparity is then defined as the average squared distance between species or genera in the morphospace defined by either a) the first two or b) the first ten PCO axes, although the results of the more inclusive analyses (first ten PCO axes) are presented unless otherwise noted. This disparity metric was chosen because it better characterizes the distribution of species than the area occupied in morphospace and it is also less sensitive to sample size (Ciampaglio et al. 2001).

Giving equal value to rare and common taxa and ignoring community structure in calculations of disparity is appropriate in broad surveys of evolutionary patterns However, other methods can be used that address the ecology of the community in regard to morphology, such as weighting local disparity by species abundance (Deline 2009). This measure gives a view of both the morphology and community structure and could possibly give some insight into dynamics of the functional disparity of a community through time and across environments. This metric also has the advantage of being less sensitive to sampling biases than local disparity (Deline 2009). Weighted disparity, was calculated as the average squared pairwise distance between individuals in morphospace, disregarding intraspecific variation (i.e. all individuals within a species occupy the same position in morphospace).

Error bars were calculated by random resampling of the data following the methods of Efron (1982). In the case of the average local disparity, error bars were calculated with a double bootstrap in order to include the error associated within and between biofacies. The double bootstrap was calculated by pulling a random sample of species with replacement from a randomly selected biofacies 1000 times, then taking the standard error of those disparity values.

The presence of missing or inapplicable characters within the dataset can potentially create triangular inequalities among taxa when using PCO with non-metric similarity coefficients, such as Gower's. That is, non-euclidean distances are required when two distinct taxa appear identical in regard to other taxa, which are missing the characters in which the taxa differ. This problem will then create negative eigenvalues in PCO analyses. These negative eigenvalues usually occur in the minor PCO axes, and thus do not produce a large effect on the primary structure of the analysis. However, the triangular inequalities could theoretically distort the analysis (Kirkpatrick and Lofsvold 1992). To determine if triangle inequalities affected the analyzed PCO axes (i.e. 1-10), we used the "squeezing" routine of Kirkpatrick and Lofsvold (1992).

All statistical tests were conducted using PAST (Hammer et al. 2001) and all analyses were calculated using R 2.3.1 (R Development Core Team, 2006).

Results

Figure 20 shows the Principal Coordinate Analysis (PCO) scores for first two axes for all 421 Ordovician through Early Silurian crinoid species. The PCO analysis resulted in negative eigenvalues, but the ‘squeezing’ routine of Kirkpatrick and Lofsvold (1992) indicated that the primary structure (first 50 PCO axes) was not affected. The first two and ten axes represented 33.3% and 65.7%, respectively, of the sum of the eigenvalues. The proportion of the sum of the eigenvalues captured by each of the first ten axes is given in table 9. The low percentage of variation explained by the primary axes is expected given the large variation in morphology of Early Paleozoic crinoids. The loadings for the first ten axes were then compared with the character states for the 421 crinoid species and characters that were strongly correlated ($r^2>0.5$) with the axes are listed in table 9. The first two axes differentiate the major clades of Paleozoic crinoids a) disparids and hybocrinids, b) cladids and flexibles, c) monobathrid camerates, and d) diplobathrid camerates. The groups differed in characters associated with the infrabasal circlet, complexity of the cup, and opening of the circlets, as well as differences in filter morphology such as the presence of pinnules and the distance between arms. The large gap between the crinoids with (diplobathrid camerates, flexibles, and cladids) and without (monobathrid camerates, disparids, and hybocrinids) infrabasal circlets is largely due to the addictive nature of the coding scheme. The boundary in morphospace between camerates and non-camerates is blurred because it is based on characters with few or no subsidiary features. In addition, several clades of crinoid developed features that converge on other groups (e.g. flexibles evolving more complex cups through time).

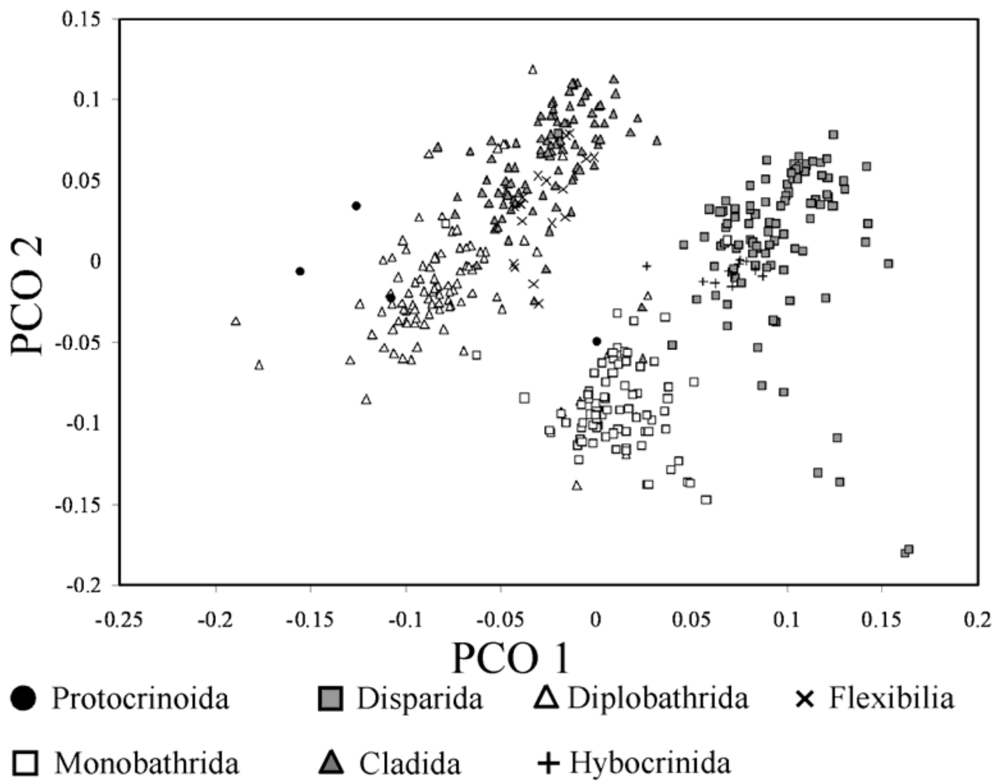


FIGURE 20. Distribution of 421 Ordovician through Early Silurian crinoid species on the first two principal coordinate axes.

Several subsequent PCO axes (Table 9) correlate with features that distinguish crinoid clades with unique morphologies. Axis 4 correlates with coiled stems and cirri, which occur predominantly in myelodactylids during the Early Paleozoic. Calceocrinids, which have a highly derived morphology, are separated by axis 8 and cleiocrinids are distinguished from other crinoids on axis 9. The PCO analysis does not give an exclusively phylogenetic signal as some axes related to features that occur in multiple clades of crinoids, such as minor characters (e.g. cup ornamentation, axes 7 and 10) which presumably did not play a large role in the ecology of the organism. Alternatively, other homoplastic characters, such as the presence and type of anal tube (axis 3), have been shown to have strong environmental (Baumiller 1990) and ecological significance (Gahn and Baumiller 2001; Baumiller and Gahn 2002).

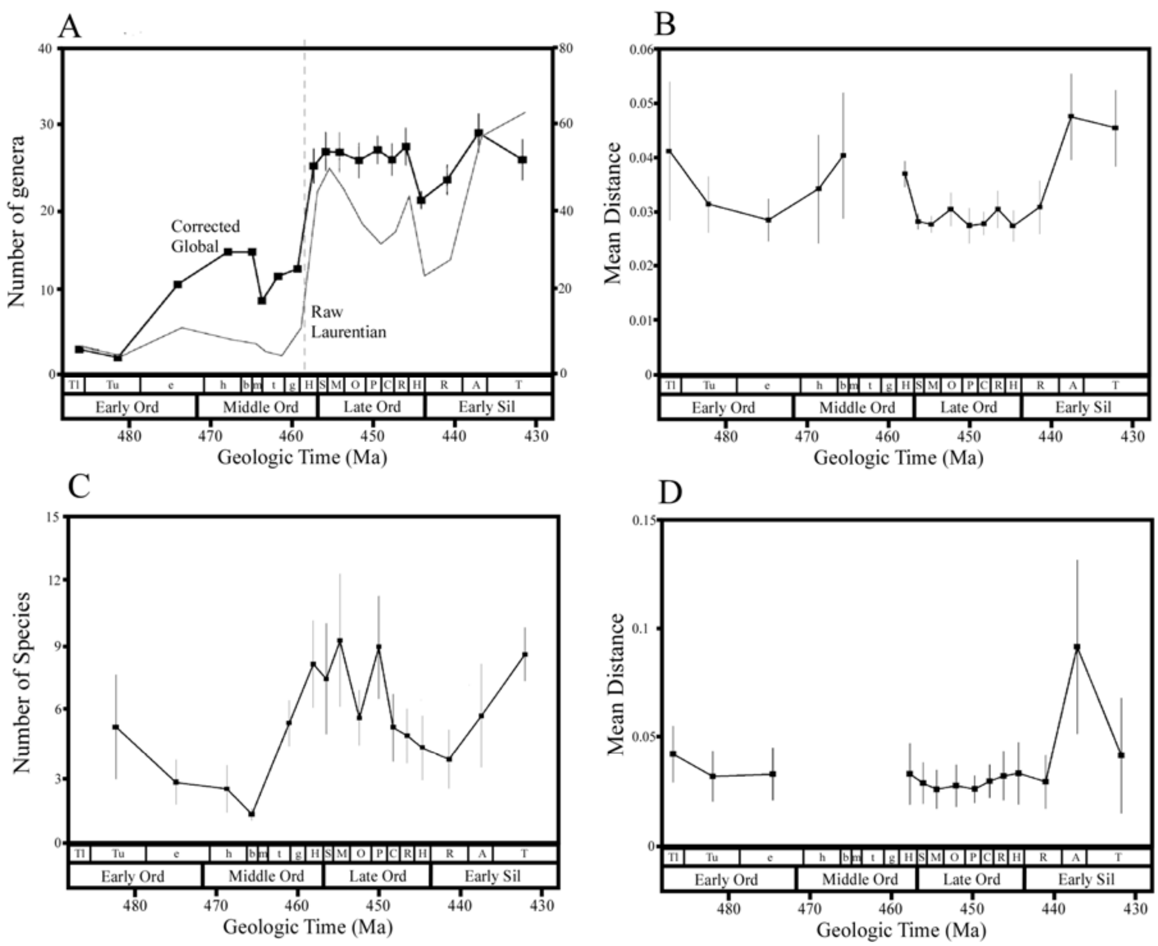
Table 9. Properties of the first 10 PCO axes. Characters states that are highly correlated with the individual loadings of each axis are given.

PCO Axes	Proportion of the sum of the Eigenvalues	Correlated Characters
1	0.180	Type and presence of Basal Circlet, Opening of Circlets, Presence and number of compound radials
2	0.153	Presence and the type of fixed brachials and interbrachials
3	0.081	Presence and type of Anal tube or sac and number of anal plate incorporated into the cup
4	0.054	Stem coiling and the presence of cirri
5	0.040	Presence and type of Arm Branching and Cup shape
6	0.036	Presence and type of Arm Branching and Cup shape
7	0.033	Cup Ornamentation
8	0.031	Type of arm branching and Cup Ornamentation
9	0.027	Opening of the basal circlet and merging the basal and radial circlets
10	0.022	Opening of the radial circlet and Cup Ornamentation
total	0.657	

Average biofacies disparity can then be compared with regional disparity (Deline and Ausich, in prep) and taxonomic diversity at both the local and regional scales (Peters and Ausich 2008) (Figure 21). The disparity within biofacies was stable from the Ordovician through the Rhuddanian regardless of variations in local or regional taxonomic diversity. Unlike the regional study, there was no Late Middle Ordovician peak in disparity and Late Early Silurian disparity is comparable to Ordovician levels. During the Ordovician the average disparity of an individual biofacies was comparable to the disparity across the entire region. A peak in within biofacies disparity occured during the Aeronian as is also observed in the regional disparity, though it is poorly constrained due to high levels of variability between biofacies (Fig. 22). Individual biofacies varied in disparity more during the Early Silurian, although the trend appears to be driven by low-diversity assemblages that had a single taxon with unusual morphology (Fig. 23), such as myelodactylids. Overall, the number of species within a biofacies does not affect to the disparity value (Fig. 23).

To evaluate the effects of taxonomic scale on disparity, average position of morphospace was calculated for each genus based on positions of their constituent species. This morphospace was then used to create regional and within biofacies genus disparity curves (Fig 24). At the regional level the two curves deviate during the Early Late Ordovician and Silurian. The Early Late Ordovician had the highest ratio of species to genus in any interval in the study. Consolidating species into genera can theoretically increase disparity values if the constituent species are close together within morphospace.

FIGURE 21. A. Ordovician through Early Silurian Lauentian raw genus richness. A majority of occurrences data is reported from Laurentian assemblages, such that Laurentian and global richness show similar patterns. Global sample standardized generic crinoid taxonomic diversity is also shown to indicate that the Mid-Late Ordovician extinction event is largely an artifact from sampling. Modified from Peters and Ausich (2008). B. Early Paleozoic crinoid disparity from Laurentia based on a character based analysis of 479 crinoid species previously analyzed by Deline and Ausich (in prep.). C. Average uncorrected species-richness within biofacies from Peters and Ausich (2008). D. Average species morphologic disparity within biofacies.



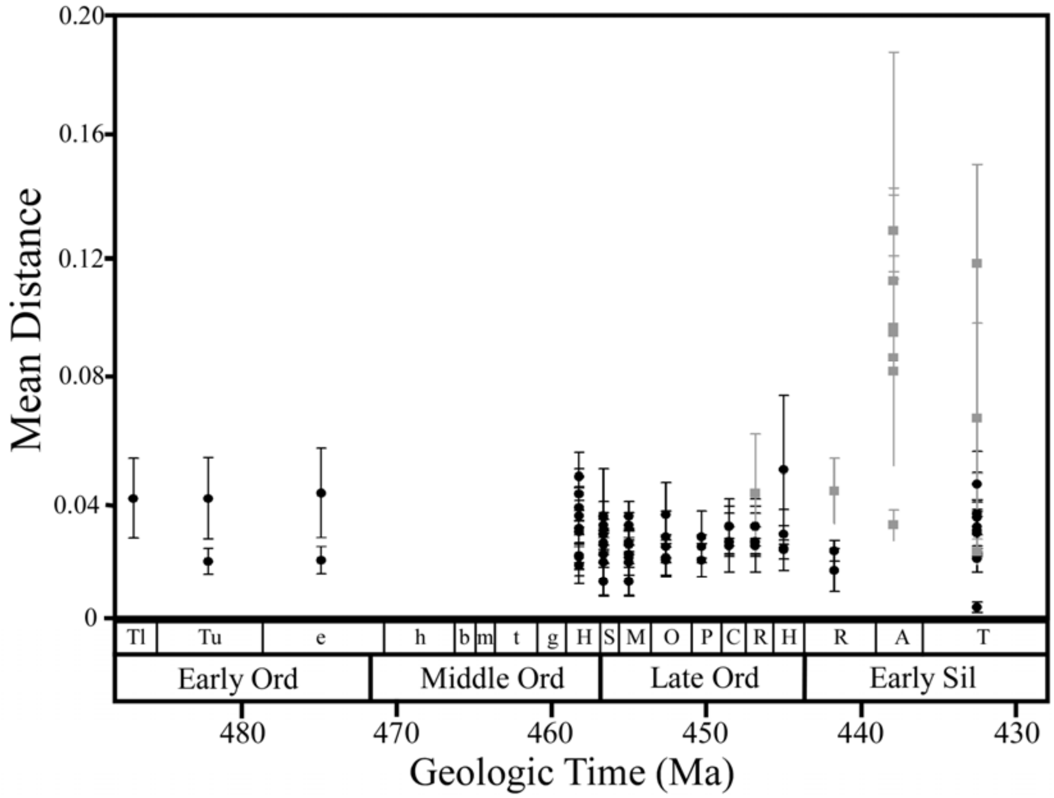


FIGURE 22. Disparity values for all 65 Ordovician through Early Silurian biofacies. Biofacies in gray have assemblages that contain myelodactlid crinoids. Error bars for the disparity value of each biofacies was calculated as the standard error of 1000 bootstrap resamples (Efron 1982). Description of the individual biofacies is presented in Table 7.

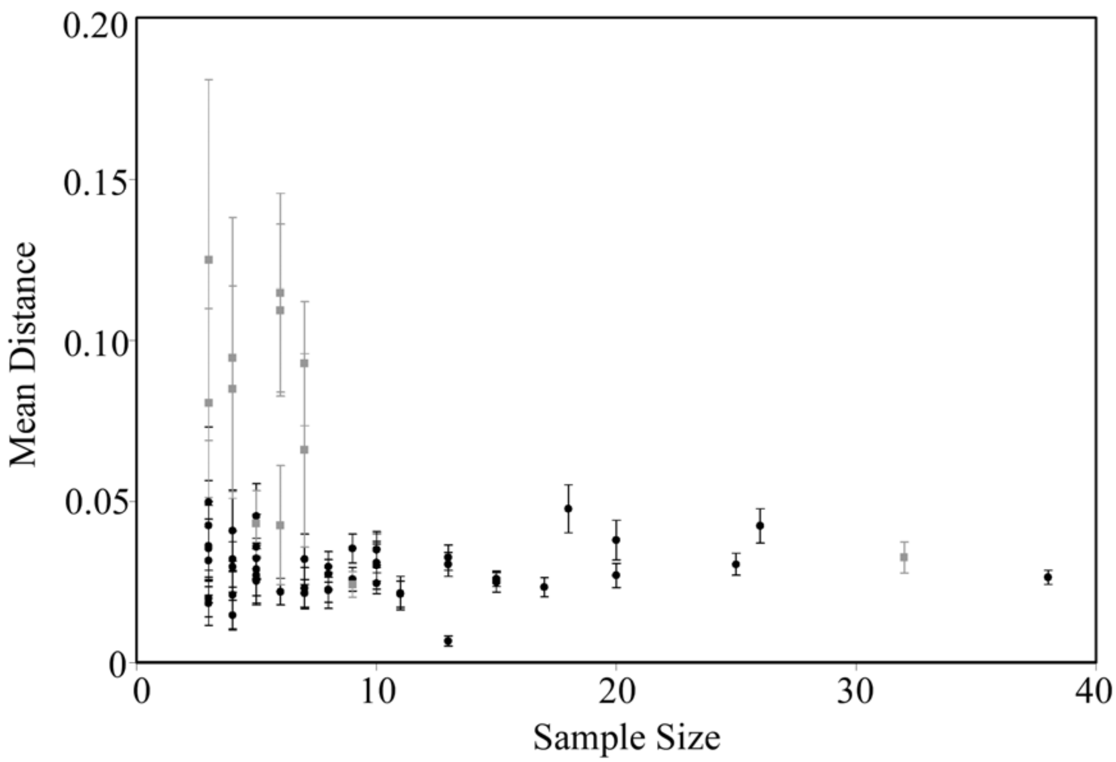
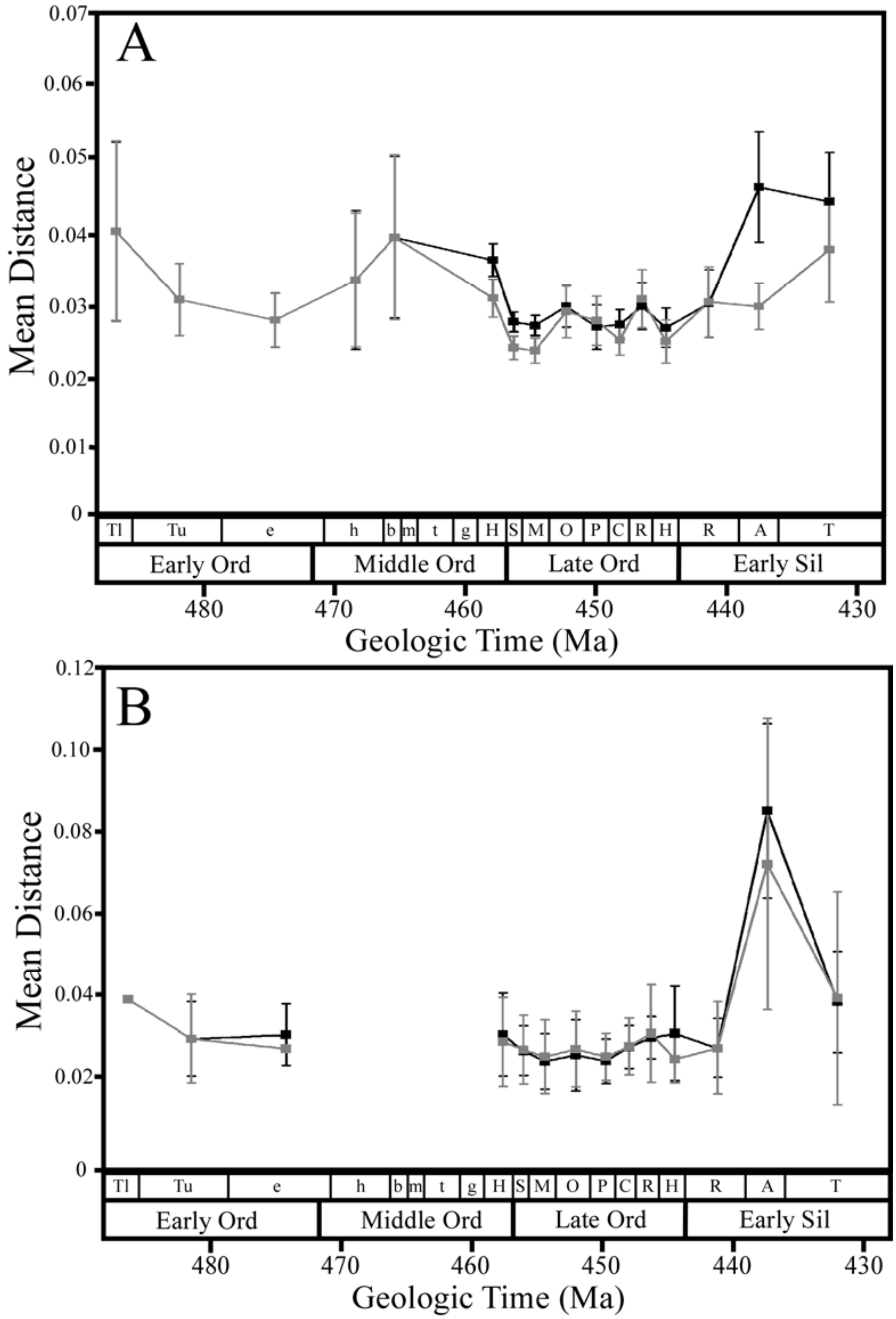


FIGURE 23. Local disparity compared with the number of species described with each of the 65 biofacies. Biofacies in gray have assemblages that contain myelodactlid crinoids.

However, if within genus variation is playing a large role in the diversity curve as is observed in the Late Middle Ordovician, disregarding this variation reduces the estimated disparity during that interval. Similarly, the Silurian peak is dampened due to the consolidation of a single genus, the myelodactylids, which created the Silurian peak in the regional species curve (Deline and Ausich, in prep). Taxonomic scale has little effect at the biofacies level (Fig. 24b), because most biofacies only had one or two species per genus. Most biofacies had equivalent genus and species-level disparity values. However, biofacies with higher genus level disparity (Guttenberg Fm., Lincolnshire Fm., Vaurel Fm., Scotch Grove Fm., Richardson Mbr. Jupiter Fm.) all had one or two fewer genera


A
B
Mean Distance
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0.01
0
0.12
0.10
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Tl
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H
S
M
O
P
C
R
H
R
A
T
Early Ord
Middle Ord
Late Ord
Early Sil
480
470
460
450
440
430
Geologic Time (Ma)

FIGURE 24. The results of disparity analysis using genus (black) and species (gray) morphologic data. A. regional and B. local estimates of disparity. The position of a genus in morphospace is calculated as the centroid of its constituents within a time bin or biofacies.

than species, such that the consolidation of species that are close together in morphospace actually increased the disparity of the biofacies (Fig. 25). Three localities (Jupiter Fm., Gun River Fm., and the Hickory Corners mbr. of the Reynales Fm.) had lower genus-level disparity because they contain multiple myelodactylids, and decreases generic disparity through the consolidation of the aberrant taxa. The Lebanon Limestone had lower genus level disparity because two of the genera (*Cleiocrinus* and *Reteocrinus*) have species that are highly variable within morphospace.

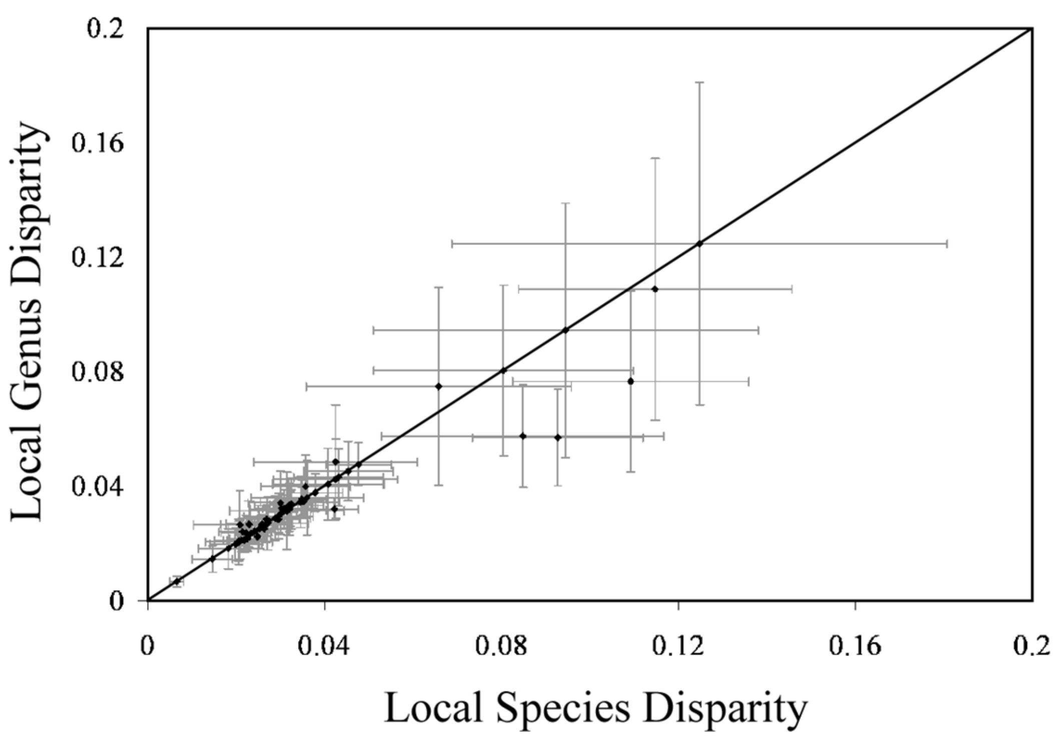
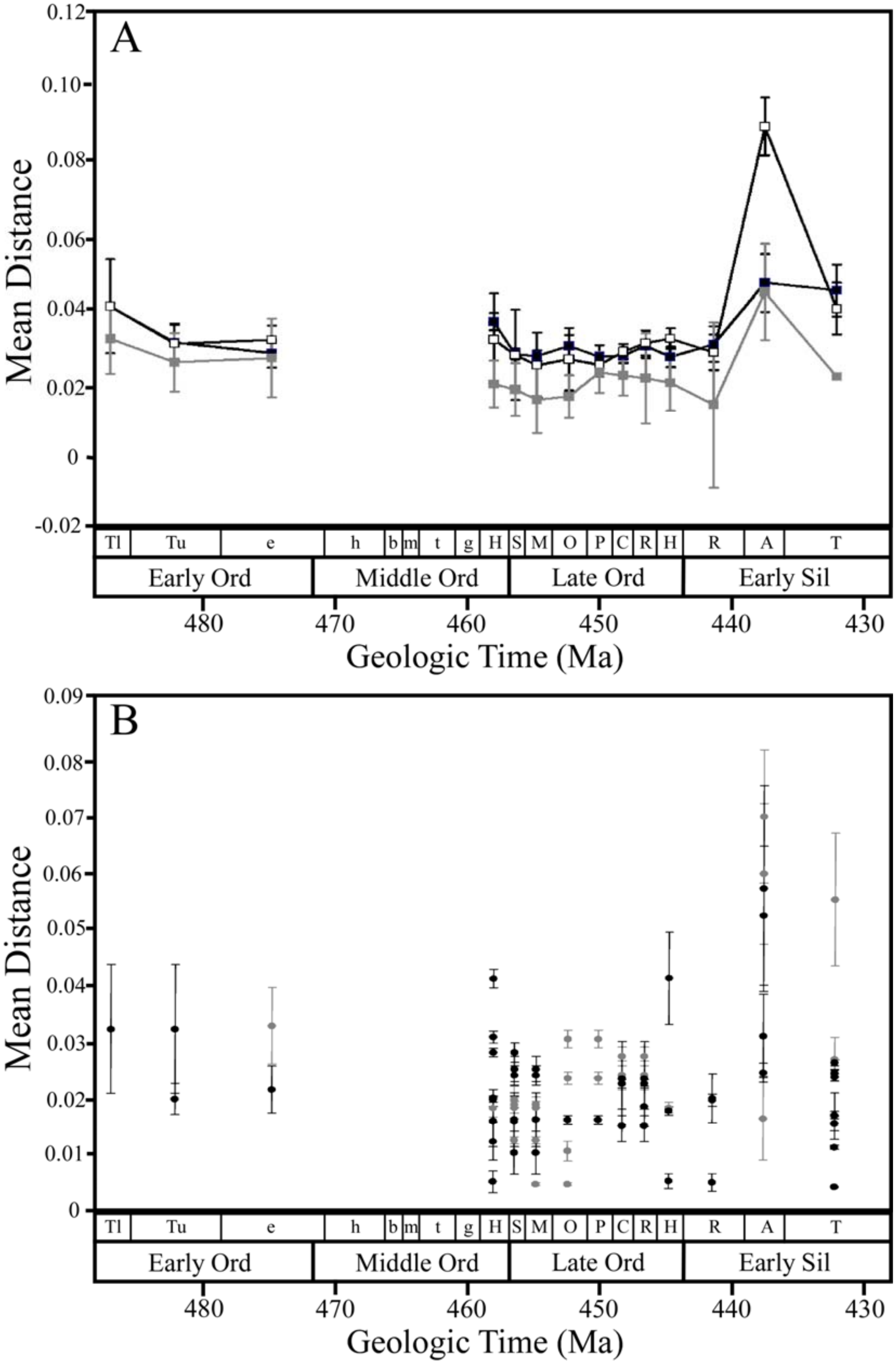


FIGURE 25. A comparison of the estimates of within biofacies disparity examined using species and genus level data.

To examine morphologic patterns at a finer geographic or paleocommunity scales, disparity weighted by abundance was examined through time and within individual biofacies (Fig 26). Again, weighted disparity is a combination metric of disparity, distribution of morphologic subgroups, and evenness. As expected, it shows a different pattern than either regional or local disparity. The weighted disparity curve was flat with a slight (i.e. non-significant) rise in the second half of the Late Ordovician, not seen in the average biofacies disparity curve, followed by a large rise in disparity during the Aeronian as was seen in the local disparity curve. The weighted disparity of individual biofacies showed a very similar pattern to those of the local non-weighted disparity (Fig 26b). One difference is that there is greater spread between the biofacies using weighted disparity. The Early Silurian rise in disparity was occurring predominantly in small collections (n<100), but there is no relationship between the number of individuals within the sample communities and the weighted disparity (Fig 27).

FIGURE 26. A. Ordovician through Early Silurian crinoid disparity curves calculated at the regional scale (black squares), average biofacies scale (white squares), and average biofacies scale weighted by abundance (gray squares). All specimens within a species are assumed to occupy the same position in morphospace (i.e. intraspecific variation is not included in the analysis). B. Weighted disparity of individual biofacies though time. Biofacies in black were calculated by count of sample collections, while those in gray are estimates based on reports of relative abundance.



A
B
Mean Distance
0.12
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0.04
0.02
0
-0.02
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Late Ord
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Geologic Time (Ma)

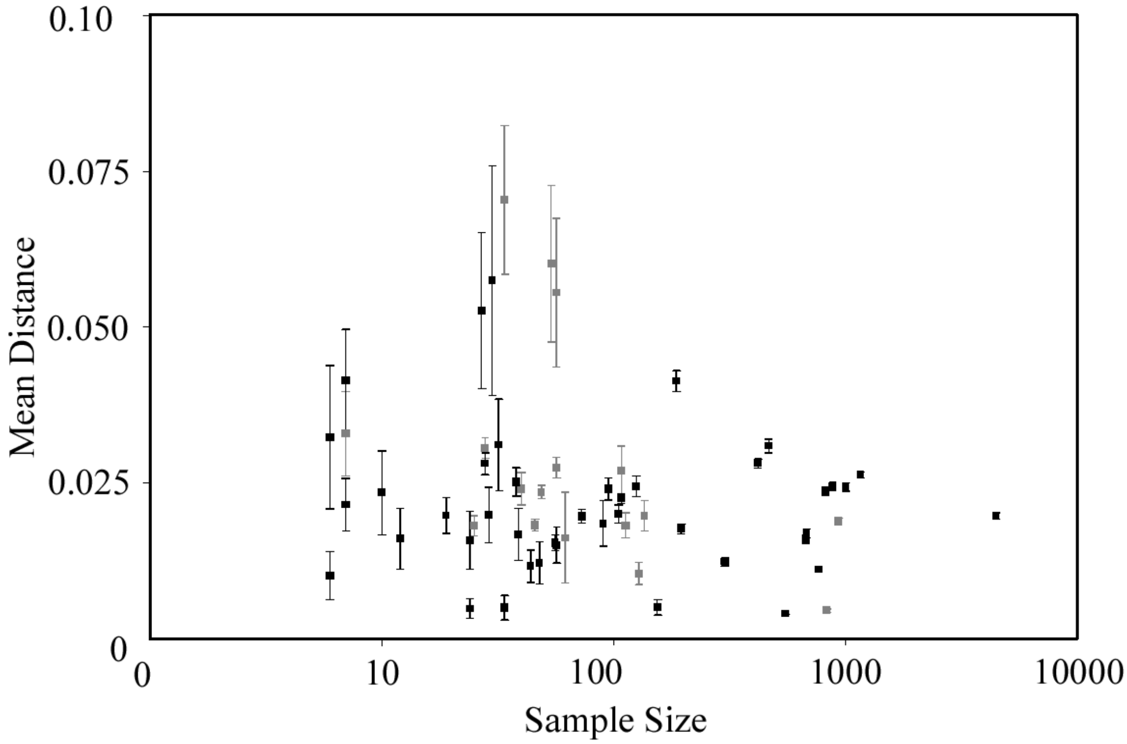

FIGURE 27. Weighted disparity compared with the number of specimens reported or estimated within the 65 individual biofacies. Biofacies in black were calculated by count of sample collections, while those in gray are estimates based on reports of relative abundance.

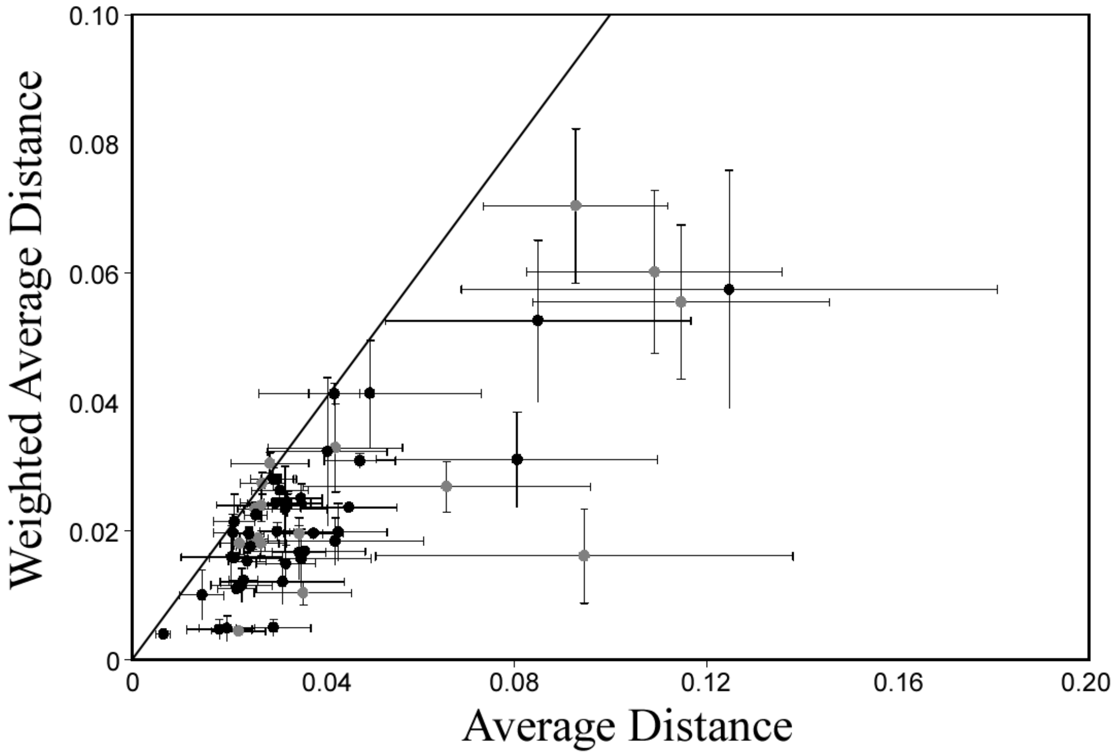

FIGURE 28. A comparison of weighted and unweighted disparity of the 65 analyzed crinoid biofacies. Biofacies in black were calculated by count of sample collections, while those in gray are estimates based on reports of relative abundance.

Weighted and un-weighted biofacies disparity are inherently related and this can be seen when they are directly compared (r^2=0.6; Fig 28). Biofacies range from having equitable disparity metrics to highly uneven. The former occurs when the biofaces has a high evenness value and the balance of abundances of the major morphologic subgroups of crinoids was roughly similar to that of the species within those groups (e.g. Dunleith Fm., Fillmore Fm., and Lebanon Ls.). A much lower weighted disparity value is observed in uneven biofaces with one or two dominant morphologic subgroups (e.g. Jupiter Fm., Reynales Fm., Kope Fm., and Ellis Bay Fm.). In rare cases, such as the Maquoketa Fm. and the Fort Atkinson Fm., weighted disparity was higher than unweighted. In this case, the paleocommunities are even and the most common taxa occupy opposite sides of morphospace.

Local Disparity

Local taxonomic diversity is a measure used to examine the packing of taxa into local community, assemblage, or biofacies and can reflect the division of ecological resources (Sepkoski 1988). Studies of alpha diversity during the Ordovician have shown several prominent patterns, namely that increases in local diversity cannot account for the sharp increase in global diversity, such that the regional and global diversity seen during the Early Paleozoic is possibly largely influenced by the appearance and expansion of new community types (Sepkoski 1988). Local diversity has also been utilized to show the reorganization and homogenization of trilobite communities following mass extinctions (Westrop and Adrain 1998). These studies show that examinations at the local scale can provide insights into the dynamics of diversification, community structure, and extinction that cannot be observed solely by investigations at broader scales. Against this backdrop, morphologic disparity was explored in relation to geographic scale.

It should be noted that despite the use of largely sample-size independent measures of disparity (Ciampaglio et al. 2001), sampling biases can nevertheless be present due to nonrandom segregation in morphospace between common and rare taxa (Deline 2009). This might be of concern in the present study because large differences in the level of collecting and study among biofacies. Though the presence of aberrant taxa within low diversity or poorly sampled assemblages my give artificially high biofacies disparity, overall there is no apparent pattern between sample size and biofacies-level disparity (Fig 23) and the bias was, therefore, assumed to be minimal in this case.

Local (within biofacies) and regional crinoid taxonomic diversity showed a similar pattern of a 150-200% increase in diversity during the Middle Ordovician followed by a 25-30% drop in diversity during the Late Ordovician Mass Extinction (Fig 21), indicating that an increase in beta diversity within the region or the addition of new environments was not needed to account for the rise in regional diversity. The Ordovician, however, local disparity did not vary, as observed in the regional scale study (Figs 21, 22). Therefore, even though regional disparity was higher during the Late Middle Ordovician, the breadth of morphology within biofacies is no different from that of the Late Ordovician. This was most likely due to the early presence and subsequent persistence of all of the four major morphologic groups of crinoids within biofacies through time, which may also explain why the magnitude of disparity does not differ with scale such that individual biofacies on average contain the full range of morphologies observed within the region (Fig. 26). Environmental differences among biofacies (depth, substrate, sedimentation type and amount) do not appear to play a major role in the disparity within a biofacies. These factors often play large roles in the community structure of a biofacies (Ausich 1980; Kammer et al. 1987; Meyer et al. 2002), but the major morphologies are usually present in all biofacies and thus the disparity is equitable among environments.

Local disparity rises sharply during the Silurian, which was largely due to the proliferation of the aberrant morphology of the myelodactylids, especially within low diversity biofacies (Figs. 22, 23). The removal of myelodactylids from the analysis levels

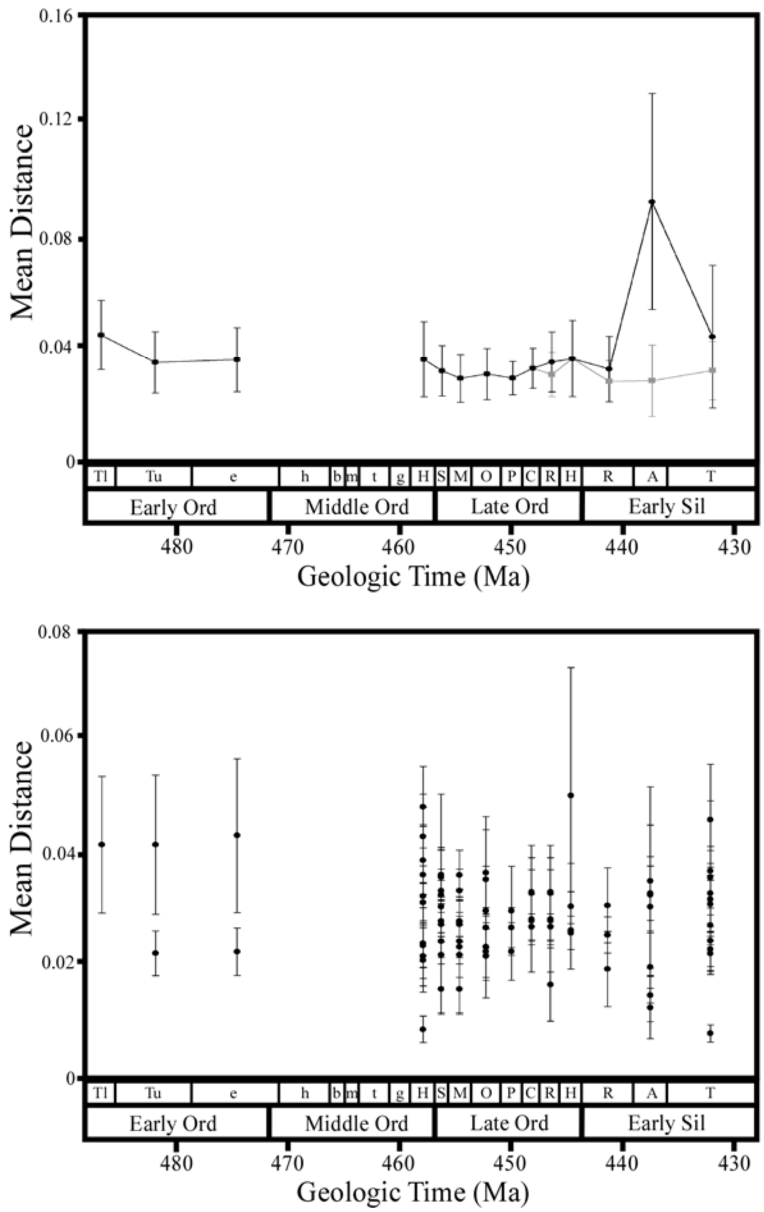

FIGURE 29. Individual (A) and average (B) biofacies disparity excluding myelodactylid crinoids.

out the biofacies disparity curve (Fig. 29) and taxonomically diverse and well-sampled communities that included myelodactylids (e.g. Brassfield Fm., Wolcott Fm.) have comparable disparity levels (0.0325 and 0.0241) to the Ordovician average (0.0301). Though the evolution of coiled stems, derived columnals, and cirri may have allowed for the expansion of myelodactyids into new environments (Eckert and Brett 1985), the within biofacies disparity increased duringthe Aeronian is largely an artifact of sampling. Therefore, the large increase in local taxonomic diversity may more so represent packing of more species within a community than the appearance of morphological innovations that allow the utilization of new resources within the community. This would be consistent with low levels of competition during the Early Paleozoic as opposed to the tiered communities of crinoids observed during the Mississippian (Ausich 1980; Ausich and Bottjer 1982)

Effects of Taxonomic Scale

Previous studies (Foote 1999; Villier and Eble 2004) have indicated that disparity analyzes of genera and species produced similar results. This conclusion is expected when a genus is represented by a single specimen or a single species occurring within a single stratigraphic interval. However, a genus can also be represented by a broad sampling of all of the constituent species within a genus throughout the generic range, which may produce drastically different results. Analysis at the genus level is considered to reduce many of the biases associated with sampling; however, assuming a random or uniform distribution of the amount of morphologic variation contained within a genus could also lead to biases in disparity studies. The choice of taxonomic scale for an analysis will have differing effects depending on the geographic and temporal scale of study. Broader geographic or temporal bins often contain more species per genus than narrow bins, thus increasing the chance that the choice of taxonomic scale will affect the analysis.

In the current study, the choice of taxonomic scale related differently to the different geographic scales of examination. In the case of local disparity (Fig. 24b) the choice of genera or species was of little consequence to the end results, because within biofacies genera are often represented by a single species having on average 1.16 species per genus compared to 2.31 in the regional-scale study.   With more species per genus in the regional study the choice of taxonomic scale caused a change in the results of the regional scale study. The main difference between the genus and species disparity curves occurred during the Harnagian to Marshbrookian stages of the Ordovician and during the Early Silurian. During the Ordovician a large number of diverse assemblages have a higher proportion of species per genus than other intervals (2.57 compared to 1.50 species per genus). The Silurian conversely, has an equitable number of species per genera compared to other intervals (Aeronian; 1.29), but the combination of aberrant genera (myelodactylids) into a single point in morphospace drastically reduced disparity. Therefore, even though the choice of taxonomic scale often does not influence the results (Foote 1999; Villier and Eble 2004), in certain scenarios, such as when there is a non-random distribution through time in the number of species per genera and the consolidation of morphologically aberrant species into a single genus will produce different patterns.

Community Structure and Ecology

Disparity weighted by abundance gives a community-level view of morphology that blends the proportion of morphologic subgroups, evenness, and overall disparity. This metric also has the advantage of not being as sensitive to sample size as unweighted disparity (Deline 2009). A low weighted disparity value could result from several different scenarios: (1) if a community has a low species-level disparity the weighted disparity will also be low (e.g. Cabot Head Fm. and Becscie Fm.), or if the community has a higher unweighted disparity value and (2) the community was very uneven and dominated by one or two species, which would drive down the weighted disparity (e.g. Fairview Fm., Mountain Lake Mbr., Bromide Fm.), or (3) the community had a high evenness value, but all of the common crinoids belong in one or two of the morphologic subgroups seen in Fig 20. (e.g. Girardeau Fm.).

With the many factors governing morphology and community structures in crinoid assemblages (Ausich 1980; Kammer et al. 1987, Meyer et al. 2002) interpreting the patterns in weighted disparity is difficult. Environment and energy regime have often been invoked to describe distribution and abundance patterns in crinoids but a direct relationship between energy regime and the ratio of weighted to unweighted disparity is not evident. The Lebanon Ls. (Guensberg 1984) and the Reynales Fm. (Eckert and Brett 2001) had similar environmental conditions (shallow subtidal); however, the ratio of weighted and unweighted biofacies disparity was drastically different, 0.98 and 0.38, respectively. Similarly, the Kope Fm. (Jennette and Pryor 1993; Holland et al. 2001) and Maquoketa (Witzke and Bunker 1996.) had similar deposition settings (offshore) with drastically different ratios, 0.20 and 1.00, respectively.

Alternatively, it appears that weighted disparity may give insight into the degree to which crinoid communities are structured based on aerosol filtration theory (Kammer et al. 1987). This theory suggests that higher energy environments have assemblages of crinoids that contain more species and a greater abundance of crinoids with dense filtration fans. Several of the PCO axes correlate highly with features that have been used to describe the aerosol filtration, energy regime niches, such as the presence of pinnules, the number of arms, types and order of arm branches, and the separation of arms at the cup. Therefore, crinoids that cluster together within morphospace often fall within similar niches in regard to energy regime. When crinoid abundance patterns and community structure follow this theory the ratio of weighted to unweighted disparity is much lower because the common crinoids within an assemblage all belong to one or two morphologic subgroups even if the assemblage is very taxonomically diversity with a high disparity value, which explained the patterns (2) and (3) described above (Deline 2009).

These patterns may break down in intermediate environments, highly tiered environments in which high abundance creates lower energy regime niches closer to the sediment water interface, during faunal invasions, and possibly early during crinoid history. Whether early crinoid communities followed the distributional controls predicted by aerosol filtration theory is poorly understood. Low values of weighted disparity in regard to unweighted disparity indicate crinoid assemblages that follow the distributional patterns predicted by aerosol filtration theory. As seen in figure 26b, biofacies with low weighted to unweighted ratios first appeared at the end of the Middle Ordovician. It should be noted that this result is tentative due to sampling issues during the Early and Middle Ordovician. However, it is clear that this community structure occurs within some, but not all, biofacies during Late Middle Ordovician and the distributional controls are in place, at the latest, by this time.

Another tentative result is the shift to slightly higher average weighted biofacies disparity during the Late Ordovician relative to the unweighted curve (Fig 26). This may relate to the increase at that time in the evenness in Paleozoic communities that has been observed previously (Peters 2004). Assemblages from the Late Late Ordovician such as the Waynesville Fm. (PIE 0.89), Girardeau Fm. (PIE 0.84), and Maquoketa Fm. (PIE 0.79) all have high evenness values (PIE values Hurlbert 1971), but there is no evidence that evenness in crinoid communities is increasing through time (Fig. 30). Another cause of this rise could be environmental; during the Late Ordovician several glacial cycles have been described (Brenchley 2003) that correspond to large regressions (Holland and Patzkowsky 1997). These environmental fluctuations caused large shifts in the geographic positions of faunas, which could potentially disrupt community structures and faunal gradients. This could potentially disrupt the aerosol filtration influenced communities and thus cause a rise in weighted disparity compared with earlier assemblages. Both of these factors could potentially play a role in driving these trends in community structure and morphology, but finer stratigraphic resolution and biogeographic data is needed to further explore this issue.

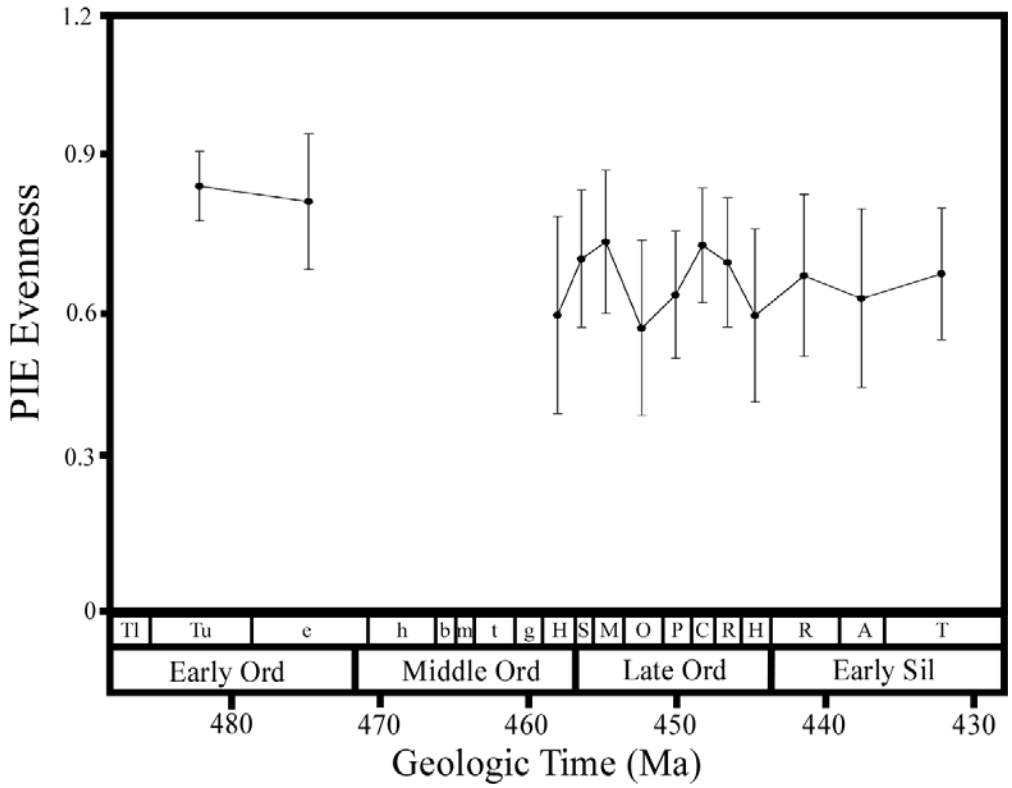

FIGURE 30. Average biofacies crinoid evenness through the early Paleozoic. Evenness is measured as the probability of intraspecific encounter (PIE, Hurlbert 1971). Error bars are based on the standard error of 1000 double bootstrap resamples.

Conclusions

(1) Previous studies have examined the consequences of the choice of taxonomic level (species compared with genus) on the estimation of morphologic disparity (Foote 1999; Villier and Eble 2002) and found that both levels produce similar results. The effects of taxonomic choice were reexamined here in a broader disparity study at the class level. The choice of taxonomic level plays little role in the estimation of biofacies level disparity because there was a low number of species per genus within individual

biofacies. For the majority of the time series, there is no distinction between regional species and genus level disparity. However, because of variation in the number of species per genus through time or the consolidation of aberrant species into a single genus differences can arise.

(2) Crinoid disparity shows different patterns at the regional (Laurentia) and local (biofacies) levels. Average within-biofacies disparity showed little change through the Early Paleozoic with the exception of the Aeronian, which was driven by the proliferation of myelodactylid crinoids. The magnitude of average biofacies disparity was comparable to that of the entire region. Average disparity of individual biofacies does not appear to vary based on environmental conditions.

(3) Weighted disparity is a measure of morphology as well as community properties. Localities with a low ratio of weighted to unweighted disparity have strongly structured communities based on the patterns attributed to aerosol filtration theory. Tentative results suggest that communities structured following the predictions of aerosol filtration theory appeared no later than the Late Middle Ordovician and increases in disturbance or shifts in environments might have caused a slight upward shift in weighted disparity during the Late Ordovician. Additional sampling of crinoid biofacies, especially within the Middle Ordovician, and finer stratigraphic and geographic data are needed to further examine these issues.

CONCLUSIONS

(1) Analysis of eight assemblages of Late Ordovician crinoids indicate that rare species do not contribute more to biofacies disparity than common species. Despite this, there is a potential bias from differential sampling in cases where rare species are segregated in morphospace from common taxa.

(2) A reexamination of Early Paleozoic crinoid morphologic disparity at a finer stratigraphic resolution and a greater taxonomic coverage exhibits several patterns that are consistent with those described by Foote (1999). These include a rapid early expansion of morphospace in the Early Ordovician, a minor peak in the late Middle Ordovician, and a long period of static disparity during the Late Ordovician.

(3) The two studies differ in the Silurian recovery, in which the current study shows a large morphological expansion, caused by the evolution and proliferation of myelodactylids. The preferential extinction of lower tier crinoids and the expansion of soft substrates created an ecological niche that myelodactylids filled during the Late Ordovician and Silurian.

(4) Crinoid disparity shows different patterns at the continental (Laurentia) and local (biofacies) levels. Average within biofacies disparity was static through the Early Paleozoic with the exception of the Aeronian, which was elevated by myelodactylid crinoids within poorly sampled biofacies. The magnitude of average biofacies disparity was equitable to that of the entire region and variation in biofacies disparity does not appear to be influenced by different environmental conditions.

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APPENDIX 1

Morphological Characters

A list of discreete morphologic characters that were used in the current study which are based on those used by Foote (1999). Characters that are used only in Chapters 2 and 3 are denoted with a star. For all characters if the feature is not preserved or unknown it is coded as NA. For a full description of the implementation of the characters see chapter 2.

1) Form of Pelma

1. **Absent- unattached**
2. **Multiplated holdfast column**
3. **Absent- directly attached**

2) Xenomorphic column

0. No Column Present

1. Absent

2. Present

3) Heteromorphic column

0. No Column Present

1. Absent

2. Present

4) Coiled Column

0. No Column Present

1. Absent

2. Present

5) Meric Column

0. No Column Present

1. Absent

2. Present

6) Shape of Columnals

0. No Columnals Present

1. Round

2. Elliptical

3. Tetragonal

4. Tetralobate or Square

5. Pentagonal

6. Pentalobate or Stellate

7) Shape of the Lumen

0. No Columnals Present

1. Round

2. Elliptical

3. Tetragonal

4. Tetralobate or Square

5. Pentagonal

6. Pentalobate or Stellate

7. Decalobate

8. Heptagonal

8) Relative Height of Columnals

0. No Columnals Present

1. Discoidal (H:W < 0.5)

2. Elongate (H:W > 0.5)

9) Columnal Articulations

0. No Columnals Present

1. Synostosis or Cryptosymplexy

2. Symplexy

3. Synarthy

10) Cirri

0. No Column Present

1. Absent

2. Present

11) Regular Arrangement of Cirri

0. No Cirri Present

1. Absent

2. Present

12) Number of Cirri per Nodal

0. No Cirri Present

1. <5

2. 5

3. >5

13) Specialized Distal Structure

1. Absent

2. Present

14) Form of Distal Structure

0. No Distal Structure Present

1. Irregular Plates

2. Radix

3. Discoidal or Crustose

4. Anchor

5. Float

6. Coiled

15) Regular Calyx Plating

1. Absent

2. Present

16) Radials

1. Absent

2. Cryptic

3. Exposed

17) Number of Radials

1. 1

2. 2

3. 3

4. 4

5. 5

6. 6

18) Fused Radails

1. Absent

2. Present

19) Opening of Radial Circlet

1. Absent

2. Present

20) Nature of Radial Circlet Opening

0. Opening not Present

1. Anal Interray Only, Open by Anal(s)

2. Anal Interray Only, Open by Basal

3. Open in all Interrays

4. Open in Less than Five Interrays

21) Radial Prongs or Sinus

1. Absent

2. Present

22) Unequal Development of Radials

1. Absent

2. Present

23) Compound Radials

1. Absent

2. Present

24) Number of Compound Radials

0. Compound Radials not Present

1. 1

2. 2

3. 3

4. 4

5. 5

25) Basals

1. Absent

2. Cryptic

3. Present

26) Number of Basals

1. 1

2. 2

3. 3

4. 4

5. 5

6. 6

27) Opening in Basal Circlet

1. Absent

2. Present

28) Nature of the Opening in the Basal Circlet

0. Opening not Present

1. Anal Interray Only, Open by Anal(s)

2. Anal Interray Only, Open by Intrabasal

3. Open in all Interrays

4. Open in Less than Five Interrays

29) Unequal Development of Basals

1. Absent

2. Present

30) Size of Basal Circlet Relative to Radial Circlet

1. Less than Half the Area

2. Subequal

3. Greater than twice the Area

31) Infrabasals

1. Absent

2. Present

32) Number of Infrabasals

0. Infrabasals Absent

1. 1

2. 2

3. 3

4. 4

5. 5

6. 6

33) Opening of Infrabasal Circlet

0. Infrabasal Circlet Absent

1. Absent

2. Present

34) Unequal Development of Infrabasals

0. Infrabasal Circlet Absent

1. Absent

2. Present

35) Size of Infrabasal Circlet Relative to Radial Circlet

0. Infrabasal Circlet Absent

1. Less than Half the Area

2. Subequal

3. Greater than Twice the Size

36) Number of Anal Plates in Dorsal Cup at or Below Level of Radial Circlet

1. 0

2. 1

3. 2

4. 3

5. 4

6. 5

37) Accessory Plates*

1. Absent

2. Present

38) Intercalary Plates*

1. Absent

2. Present

39) Shape of Dorsal Cup

1. Cylinder or Disk

2. Cone

3. Bowl

4. Globe

5. Inverted Cone

6. Inverted Bowl

7. Splayed Bowl

8. Goblet

9. Club

10. Bicone

40) Shape of Dorsal Cup (sag.)

1. Low (W:H > 1.5)

2. Medium

3. High (H:W > 1.5)

41) Shape of Dorsal Cup (trans.)

1. Round

2. Polygonal or Convex

3. Lobate or Stellate

42) Symmetry of Dorsal Cup

1. Asymmetric

2. Strongly Bilateral

3. Triradial

4. Tetraradial

5. Pentameral with Strong Bilateral Overprint

6. Strongly Pentameral

7. Hexradial

43) Concave Base

1. Absent

2. Present

44) Cup Diameter Greater than 2.5 Times Stem Diameter

0. Stem Absent

1. Absent

2. Present

45) Projections (Wings, Blade, or Spines)

1. Absent

2. Major

3. Minor

46) Median Ray Ridges

1. Absent

2. Present

47) Stellate Ridges or Other Ridges

1. Absent

2. Present

48) Arms

1. Absent

2. Prsent

49) Number of Distinct Arms at Point Where They Become Free

0. Arms Absent

1. 1

2. 2

Ect.

50) Maximal number of Arms Directly Attached to a Single Radial

0. Arms Absent

1. 1

2. 2

3. > 2

51) Relative Development of Arms

0. Arms Absent

1. Subequal

2. Slightly Unequal

3. Strongly Unequal

52) Seperation of Arms at Cups

0. Arms Absent

1. Appressed or Nearly So

2. Less than 1.5 Arms Width

3. Greater than 1.5 Arm Widths Apart

53) Lateral Arm Fusion Detween Rays

0. Arms Absent

1. Absent

2. Present

54) Branched Arms

0. Arms Absent

1. Absent

2. Present

55) Effective Number of Orders of Arm Branching

0. Arms Absent

1. 1

2. 2

3. >2

56) Heterotomous Branching

0. Arm Absent or Arms Unbranched

1. Absent

2. Present

57) Nature of Heterotomous Branching

0. Arm Absent or Arms Unbranched

1. Bilateral

2. Endotomous

3. Exotomous

4. Other Regular

5. Irregular

58) Biserial Arm Plating

0. Arms Absent

1. Absent

2. Prsent

59) Patelloid Process (if Uniserial) or Other Lateral Projection

0. Arms Absent

1. Absent

2. Present

60) Cuneate or Asymmetric Brachials (If Uniserial)

0. Arms Absent

1. Absent

2. Present

61) Brachial Shape

0. Arms Absent

1. < 0.5

2. 0.5 – 1.0

3. 1.0 – 2.0

4. >2.0

62) Lateral Fusion Within Rays

0. Arms Absent

1. Absent

2. Present

63) Arm Attitude at Base

0. Arms Absent

1. Rising Above Caylx

2. Sidewards

3. Pendant

64) Recumbant Arms (as in Agostocrinus)

0. Arms Absent

1. Absent

2. Present

65) Incorporation of radial Aligned Brachials into Cup

1. Absent

2. Present

66) Number of Ranges of Brachials into Cup

1. 1

2. 2

Ect.

67) Interbrachials (Including Fixed Pinnules) in Cup

1. Absent

2. Present

3. Present in less than Five Rays

68) Form of Proximal Interbrachials

0. Interbrachials Absent

1. Small, Irregular

2. Larger, Regular

3. Single Large Plate

69) Pinnules

0. Arms Absent

1. Absent

2. Present

70) Characteristic Maximal Number of Pinnules Per Brachial

0. Arms Absent or Pinnules Absent

1. 1

2. 2

Ect.

71) Recumbant Ambulacra (as in Hybocrinus)*

1. Absent

2. Present

72) Number of Recumbant Ambulacra*

0. Recumbant Ambulacra Absent

1. 1

2. 2

Ect.

73) Recumbant Ambulacra Extending More than Halfway Down Cup*

0. Recumbant Ambulacra Absent

1. Absent

2. Present

74) Ratio of Arm Length to Cup height

0. Arms Absent

1. 0 < 1

2. 1 < 2

3. 2 < 4

4. > 4

75) Torted Arms

0. Arms Absent

1. Absent

2. Present

76) Anal Opening through Dorsal Cup

1. Absent

2. Present

77) Anal Tube or Sac

1. Absent

2. Prsent

78) Position of Anal Tube or Sac

0. Anal Tube or Sac Absent

1. Posterior

2. Central or Anterior

79) Tube Extending Greater than Twice Cup Height

0. Anal Tube or Sac Absent

1. Absent

2. Present

80) Ridges on Proximal Part of Anal Tube or Sac

0. Anal Tube or Sac Absent

1. Absent

2. Present

81) Irregular Plating of Anal Tube or Sac

0. Anal Tube or Sac Absent

1. Absent

2. Present

82) Development of Tegmen (Other than Anal Tube or Sac)

1. Absent

2. Present

83) Tegmen (Other than Anal Tube or Sac) Extending Greater than Twice the Height of the Cup

1. Absent

2. Short Pyramid

3. Present

84) Position of First Ray Branch

1. Br1

2. Br2-3

3. Br4-6

4. Br> 6

85) Shape of Column Articulation

0. Column Absent or Articulation Absent

1. Circular

2. Pentagonal

3. Discreete

4. Petaloid

5. Pentalobate

6. Square

86) Radials and Basals in a Single Circlet

1. Absent

2. Prsent

87) Pores/ Pustules in Caylx Plates

1. Absent

2. Present

88) Forces Plating (as in Eknomocrinus)*

1. Absent

2. Present

89) Edrioasteroid-like Arm Plating (as in Balbocrinus)*

1. Absent

2. Present

90) "Rhombs" (as in Colpodocrinus) or Large Pore slips/ Ridge Canals

1. Absent

2. Present

91) Coiling of Anal Tube or Sac

0. Anal Tube or Sac Absent

1. Absent

2. Present

92) Partition Plates*

1. Absent

2. Present

APPENDIX 2

Chapter 1; Species Character States

Morphological character states of the 137 crinoid species examined in Chapter 1. Descriptions of the characters and individual states are given in appendix 1. Crinoids were coded morphologically based on inspection of published crinoid plates and inspection of museum, private, and field collections.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Abludoglyptocrinus charltoni	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1	1
Abludoglyptocrinus laticostatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Acolocrinus arbucklensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1	1
Acolocrinus crinerensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1	1
Acolocrinus hydraulicus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	2	2
Agostocrinus xenus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1	2
Alisocrinus tetrarmatus	3	1	1	1	1	1	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1	2
Alisocrinus? heterodactylus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Anomalocrinus antiquus	3	NA	1	1	2	1	NA	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	3
Anomalocrinus incurvus	3	1	1	1	2	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	2	2	2	3	5	1	0	1	1
Anthracocrinus primitivus	3	NA	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Apodasmocrinus daubei	3	1	2	1	2	5	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1	2
Apodasmocrinus punctatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1	2
Apodasmocrinus sp. cf. A. *daubei*	3	1	2	1	2	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1	2
Archaeocrinus buckhornensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Archaeocrinus conicus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Archaeocrinus peculiaris	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Archaeocrinus snyderi	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Archaeocrinus subovalis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Balacrinus sp.	3	1	2	1	2	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Bromidocrinus nodosus	3	1	2	1	1	5	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Calceocrinus longifrons	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	4	2	2	1	1	2	2	3	3	4	1	0	2	2
Canistrocrinus richardsoni	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*	*2*
Canistrocrinus typus	3	NA	NA	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	1	3	5	1	0	1	2
Carabocrinus sp.	3	1	1	1	1	1	6	1	2	1	0	0	NA	0	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1	2
Carabocrinus cf. *treadwelli*	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Carabocrinus dicyclicus	3	1	1	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1	2
Carabocrinus magnificus	3	NA	NA	NA	NA	n	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1	2
Carabocrinus micropunctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	2	2
Carabocrinus stellifer	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1	2
Carabocrinus treadwelli	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Cincinnaticrinus pentagonus	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0	2
Cincinnaticrinus varibrachialis	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0	2
Cleiocrinus bromidensis	3	1	NA	NA	NA	NA	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	2
Cleiocrinus laevis	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	3	5	1	2	3	1	1	1	0	3	5	2	3	1	0
Cleiocrinus ornatus	3	1	1	1	1	6	6	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	0
Cleiocrinus springeri	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	0
Cleiocrinus tessellatus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	0
Clidochirus serrulatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	1
Colpodecrinus quadrifidus	3	1	2	1	2	3	4	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1	2
Columbicrinus crassus	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	2

Species	31	32	33	34	35	36	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Abludoglyptocrinus charltoni	1	0	0	0	0	1	3	2	1	4	1	2	1	2	1	2	10	2	1	3	1	1	0	1	0	1	1	2	1	1	1
Abludoglyptocrinus laticostatus	1	0	0	0	0	1	3	2	3	6	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1	1	2	2	1	1
Acolocrinus arbucklensis	1	0	0	0	0	1	4	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acolocrinus crinerensis	1	0	0	0	0	1	8	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acolocrinus hydraulicus	1	0	0	0	0	2	8	2	2	1	2	2	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Agostocrinus xenus	1	0	0	0	0	2	3	2	2	2	2	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1	1	1	2	1	2
Alisocrinus tetrarmatus	1	0	0	0	0	2	3	2	1	6	1	2	1	2	2	2	20	1	1	2	1	1	0	1	0	1	1	1	2	1	1
Alisocrinus? heterodactylus	1	0	0	0	0	1	3	2	3	1	1	2	1	2	1	2	20	1	1	2	1	1	0	0	0	1	1	1	2	1	1
Anomalocrinus antiquus	1	0	0	0	0	1	3	1	3	6	1	2	1	1	1	2	5	1	1	3	1	2	3	2	1	1	1	1	4	1	1
Anomalocrinus incurvus	1	0	0	0	0	1	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	2	5	1	1	1	2	1	1
Anthracocrinus primitivus	2	5	1	1	1	3	3	1	1	5	2	2	1	1	1	2	15	1	1	3	1	1	0	0	0	1	1	1	2	1	1
Apodasmocrinus daubei	1	0	0	0	0	2	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1	1	1	2	1	1
Apodasmocrinus punctatus	1	0	0	0	0	1	3	1	2	6	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1	1	1	2	1	1
Apodasmocrinus sp. cf. A. *daubei*	1	0	0	0	0	2	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1	1	1	2	1	1
Archaeocrinus buckhornensis	2	5	1	1	1	1	8	3	1	5	2	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus conicus	2	5	1	1	1	1	9	3	1	5	2	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus peculiaris	2	5	1	1	1	2	3	2	1	1	2	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	2	1	1	2	1	1
Archaeocrinus snyderi	2	5	1	1	1	0	3	2	2	1	1	2	1	1	1	2	10	1	1	3	1	2	3	1	0	1	1	2	2	1	1
Archaeocrinus subovalis	2	5	1	1	1	1	3	2	2	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1	1	2	1	1	1
Balacrinus sp.	3	5	1	1	1	1	8	2	3	6	1	2	1	2	2	2	10	1	1	3	1	2	1	1	1	1	1	1	1	1	1
Bromidocrinus nodosus	2	5	1	1	1	1	4	2	1	1	1	2	1	1	2	2	10	1	1	3	1	1	0	1	0	2	1	1	2	1	1
Calceocrinus longifrons	1	0	0	0	0	3	10	2	2	1	1	2	1	1	1	2	3	1	3	1	1	2	2	2	1	1	1	1	2	1	1
Canistrocrinus richardsoni	*1*	*0*	*0*	*0*	*0*	*1*	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*1*	*2*	*20*	*1*	*1*	*3*	*1*	*2*	*1*	*1*	*0*	*1*	*1*	*2*	*2*	*1*	*1*
Canistrocrinus typus	1	0	0	0	0	2	3	2	5	1	2	1	2	1	2	2	20	1	1	3	1	2	2	1	0	1	1	2	1	1	1
Carabocrinus sp.	NA	NA	NA	NA	NA	NA	3	2	3	5	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1	1	1	2	1	1
Carabocrinus cf. *treadwelli*	3	5	1	1	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1	1	1	3	1	1
Carabocrinus dicyclicus	3	5	1	1	1	4	8	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1	1	1	1	1	1
Carabocrinus magnificus	3	5	1	1	1	4	8	2	1	1	1	2	2	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carabocrinus micropunctatus	3	5	1	1	1	4	3	2	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Carabocrinus stellifer	3	5	1	1	1	4	4	1	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Carabocrinus treadwelli	3	5	1	1	1	1	4	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1	1	1	3	1	1
Cincinnaticrinus pentagonus	1	0	0	0	0	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0	1	1	2	1	1
Cincinnaticrinus varibrachialis	1	0	0	0	0	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0	1	1	2	1	1
Cleiocrinus bromidensis	3	5	1	1	1	1	7	1	1	6	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus laevis	2	5	1	1	1	0	7	3	1	1	1	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus ornatus	2	5	1	1	1	1	7	3	1	6	1	2	1	1	1	2	80	1	1	3	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cleiocrinus springeri	2	5	1	1	1	1	7	1	1	5	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus tessellatus	2	5	1	1	1	1	7	1	1	5	1	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Clidochirus serrulatus	3	5	1	1	1	2	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	2	5	1	1	2	2	1	1
Colpodecrinus quadrifidus	3	4	1	1	2	1	8	3	1	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1	1	1	2	1	1
Columbicrinus crassus	1	0	0	0	0	1	1	2	1	5	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1	1	2	3	1	1

Species	64	65	66	67	68	69	70	74	75	76	77	78	79	80	81	82	83	84	85	86	87	90	91
Abludoglyptocrinus charltoni	1	2	6	2	1	2	1	NA	1	1	1	0	0	0	0	2	1	2	1	1	1	1	1
Abludoglyptocrinus laticostatus	1	2	4	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2	1	1
Acolocrinus arbucklensis	0	1	0	1	0	1	0	0	0	2	1	0	0	0	0	1	1	0	0	0	1	1	1
Acolocrinus crinerensis	0	1	0	1	0	1	0	0	0	2	1	0	0	0	0	1	1	0	0	0	2	2	1
Acolocrinus hydraulicus	0	1	0	1	0	2	11	0	0	1	1	0	0	0	0	1	1	0	NA	1	1	1	1
Agostocrinus xenus	2	1	0	1	0	1	0	1	1	1	1	0	0	0	0	2	1	0	NA	1	1	1	1
Alisocrinus tetrarmatus	1	2	7	2	2	2	1	3	1	1	1	0	0	0	0	2	1	2	1	1	1	1	1
Alisocrinus? heterodactylus	1	2	7	2	1	2	1	NA	1	1	NA	NA	NA	NA	NA	n	n	2	NA	1	1	1	1
Anomalocrinus antiquus	1	1	0	1	0	1	0	3	1	1	1	0	0	0	0	2	1	1	0	1	1	1	1
Anomalocrinus incurvus	1	1	0	1	0	2	1	4	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
Anthracocrinus primitivus	1	2	6	2	2	2	1	NA	1	1	2	1	1	NA	NA	1	0	2	NA	2	1	1	1
Apodasmocrinus daubei	1	2	2	1	0	2	1	4	1	1	2	1	2	1	2	1	1	0	4	1	1	1	1
Apodasmocrinus punctatus	1	1	0	1	0	1	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2	1	1
Apodasmocrinus sp. cf. A. *daubei*	1	2	2	1	0	2	1	4	1	1	2	1	2	1	2	1	1	0	4	1	1	1	1
Archaeocrinus buckhornensis	NA	2	5	2	2	NA	NA	NA	1	1	NA	NA	NA	NA	NA	n	n	2	NA	1	1	1	1
Archaeocrinus conicus	NA	2	5	2	2	NA	NA	NA	1	1	NA	NA	NA	NA	NA	n	n	2	NA	1	1	1	1
Archaeocrinus peculiaris	1	2	3	2	1	2	1	NA	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1	1	1
Archaeocrinus snyderi	1	2	5	2	2	2	1	NA	1	1	1	0	0	0	0	NA	NA	2	1	1	1	1	1
Archaeocrinus subovalis	1	2	7	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1	1	1
Balacrinus sp.	1	2	5	2	2	2	1	NA	1	1	1	0	0	0	0	2	1	1	1	1	2	1	1
Bromidocrinus nodosus	1	2	9	2	2	2	1	NA	1	1	2	1	1	1	1	2	1	2	2	1	1	1	1
Calceocrinus longifrons	1	1	0	1	0	1	0	4	1	2	2	1	1	1	1	1	1	2	NA	1	2	1	1
Canistrocrinus richardsoni	*1*	*2*	*3*	*2*	*2*	*2*	*1*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*1*	*2*	*1*	*1*	*1*	*1*	*1*
Canistrocrinus typus	1	2	4	2	2	2	1	3	1	1	2	1	NA	1	1	NA	NA	1	NA	1	1	1	1
Carabocrinus sp.	1	1	0	1	0	2	1	NA	1	1	1	0	0	0	0	2	1	1	1	1	1	1	1
Carabocrinus cf. *treadwelli*	1	1	0	1	0	1	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1	1	1
Carabocrinus dicyclicus	1	1	0	1	0	1	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1	1	1
Carabocrinus magnificus	NA	1	0	1	0	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1
Carabocrinus micropunctatus	1	1	0	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2	1	1
Carabocrinus stellifer	1	1	0	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1
Carabocrinus treadwelli	1	1	0	1	0	1	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1	1	1
Cincinnaticrinus pentagonus	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1	1	1
Cincinnaticrinus varibrachialis	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1	1	1
Cleiocrinus bromidensis	NA	2	NA	2	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1	1
Cleiocrinus laevis	1	2	6	2	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1	NA	2	2	1	1
Cleiocrinus ornatus	1	2	17	2	2	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	2	1	1	1
Cleiocrinus springeri	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Cleiocrinus tessellatus	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Clidochirus serrulatus	1	1	0	1	0	1	0	2	1	1	1	0	0	0	0	1	1	1	NA	1	1	1	1
Colpodecrinus quadrifidus	1	2	4	2	2	1	0	2	1	1	NA	NA	NA	NA	NA	n	n	2	3	1	1	2	1
Columbicrinus crassus	1	1	0	1	0	2	1	4	1	1	2	1	1	1	1	1	1	2	2	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Columbicrinus sulphurensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	2
Compsocrinus miamiensis	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Compsocrinus nodosus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	1	0	3	5	1	0	2	2
Cremacrinus sp.	3	1	1	1	1	1	1	1	?	1	0	0	1	0	2	3	1	1	1	0	1	0	1	0	3	5	1	0	2	2
Cremacrinus latus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	1	1	0	1	2
Cremacrinus punctatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2	2
Cremacrinus ramifer	3	1	1	1	1	1	NA	NA	NA	1	0	0	NA	NA	2	3	1	1	1	0	1	0	1	0	3	3	1	0	2	2
Crinerocrinus parvicostatus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	6	1	2	2	1	1	1	0	3	5	1	0	1	2
Culicocrinus? girardeauensis	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Cupulocrinus canaliculatus	3	1	2	1	1	7	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Cupulocrinus jewetti	3	2	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Cupulocrinus minimus	3	2	NA	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Cupulocrinus plolydactylus	3	1	1	1	1	1	1	2	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	1
Cupulocrinus sp. cf. *C. gracilis*	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Dendrocrinus bibrachialis	3	1	1	1	1	6	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1	2
Dendrocrinus cauduceus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Dendrocrinus constrictus	3	2	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2	2
Dendrocrinus curvijunctus	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Dendrocrinus n. sp. aff. *navigiolum*	3	1	2	1	1	1	NA	1	NA	2	1	1	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Dendrocrinus posticus	3	1	1	1	1	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Dendrocrinus villosus	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2	2
Diablocrinus sp.	3	1	2	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Diabolocrinus arbucklensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	1
Diabolocrinus constrictus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	1
Diabolocrinus n. sp.	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Diabolocrinus oklahomensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	1
Diabolocrinus poolevillensis	3	1	2	1	1	1	NA	1	2	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	1
Diabolocrinus vesperalus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Difficilicrinus coneyi	3	NA	NA	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	2
Doliocrinus monilicaulis	3	1	2	1	1	1	5	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	2
Doliocrinus pustulatus	3	1	2	1	1	1	5	1	NA	1	0	0	NA	NA	2	5	5	1	1	0	1	1	2	2	3	5	1	0	1	2
Dystactocrinus constrictus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1	2
Ectenocrinus simplex	3	2	2	1	1	1	5	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1	2
Eopatelliocrinus latibrachiatus	3	1	2	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Eopatelliocrinus scyphogracilis	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Eopinnacrinus pinnulatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	2	5	1	0	1	2
Euptychocrinus fimbriatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Gaurocrinus nealli	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Geraocrinus sculptus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1	1
Glyptocrinus decadactylus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Glyptocrinus fornshelli	3	1	2	1	1	5	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2

Species	31	32	33	34	35	36	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Columbicrinus sulphurensis	1	0	0	0	0	1	1	2	2	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1	1	2	2	1	1
Compsocrinus miamiensis	*1*	*0*	*0*	*0*	*0*	*1*	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*1*	*2*	*14*	*1*	*2*	*3*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*1*	*1*	*1*	*1*
Compsocrinus nodosus	1	0	0	0	0	1	3	2	3	1	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1	1	1	2	1	1
Cremacrinus sp.	1	0	0	0	0	1	10	2	2	2	1	2	1	1	1	2	6	1	3	1	1	2	3	2	5	1	1	1	2	1	1
Cremacrinus latus	1	0	0	0	0	1	10	2	2	1	1	1	1	1	1	2	5	1	3	1	1	2	3	2	5	1	1	1	2	1	1
Cremacrinus punctatus	1	0	0	0	0	1	10	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	3	2	5	1	1	1	2	1	1
Cremacrinus ramifer	1	0	0	0	0	1	10	2	2	2	1	2	1	1	1	2	3	3	3	1	1	2	2	2	5	1	1	1	3	1	1
Crinerocrinus parvicostatus	2	5	1	1	1	1	4	1	1	6	1	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Culicocrinus? girardeauensis	*1*	*0*	*0*	*0*	*0*	*1*	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*1*	*1*	*2*	*10*	*1*	*1*	*3*	*1*	*1*	*0*	*0*	*0*	*1*	*1*	*1*	*2*	*1*	*1*
Cupulocrinus canaliculatus	3	5	1	1	1	2	2	2	2	2	1	1	1	1	1	2	2	1	1	2	1	2	2	1	0	1	1	1	2	1	1
Cupulocrinus jewetti	3	5	1	1	1	2	2	2	2	2	1	2	1	1	2	2	5	1	1	1	1	2	3	1	0	1	1	1	2	1	1
Cupulocrinus minimus	3	5	1	1	1	2	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	2	NA	NA	NA	1	1	1	2	1	1
Cupulocrinus plolydactylus	3	5	1	1	1	2	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1	1	1	2	1	1
Cupulocrinus sp. cf. *C. gracilis*	3	5	1	1	1	0	2	2	3	5	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1	1	1	1	1	1
Dendrocrinus bibrachialis	3	5	1	1	1	3	3	2	1	1	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1	1	1	2	1	1
Dendrocrinus cauduceus	3	5	1	1	1	2	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1	1	1	2	1	1
Dendrocrinus constrictus	3	5	1	1	1	4	2	3	2	1	1	1	1	1	1	2	5	1	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Dendrocrinus curvijunctus	3	5	1	1	1	2	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1	1	1	2	1	1
Dendrocrinus n. sp. aff. *navigiolum*	3	5	1	1	1	2	2	3	2	1	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1	1	1	2	1	1
Dendrocrinus posticus	3	5	1	1	1	2	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	1	0	1	1	1	2	1	1
Dendrocrinus villosus	3	5	1	1	1	2	2	2	2	1	1	1	1	1	1	2	5	1	NA	2	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Diablocrinus sp.	2	5	1	1	1	1	3	2	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	1	0	1	1	2	2	1	1
Diabolocrinus arbucklensis	2	5	1	1	1	2	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2	1	2	2	1	1
Diabolocrinus constrictus	2	5	1	1	1	2	3	1	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	1	1	2	2	1	1
Diabolocrinus n. sp.	2	5	1	1	1	1	3	1	1	6	2	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	2	1	1
Diabolocrinus oklahomensis	2	5	1	1	1	2	3	1	3	1	2	2	1	1	2	2	0	1	1	3	1	1	0	0	0	1	1	2	2	1	1
Diabolocrinus poolevillensis	2	5	1	1	1	2	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2	1	2	2	1	1
Diabolocrinus vesperalus	2	5	1	1	1	1	3	1	1	6	2	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2	1	1	2	1	1
Difficilicrinus coneyi	1	0	0	0	0	1	1	2	2	2	1	1	1	1	1	2	5	1	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Doliocrinus monilicaulis	1	0	0	0	0	1	1	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1	1	1	2	1	1
Doliocrinus pustulatus	1	0	0	0	0	1	1	2	2	1	1	1	1	1	1	2	5	1	1	2	1	1	0	0	0	1	0	2	2	1	1
Dystactocrinus constrictus	1	0	0	0	0	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	2	2	4	1	1	1	2	1	1
Ectenocrinus simplex	1	0	0	0	0	1	2	2	2	5	1	1	1	1	1	2	10	1	1	1	1	2	2	2	2	1	1	1	3	1	1
Eopatelliocrinus latibrachiatus	1	0	0	0	0	1	3	2	2	5	1	2	1	1	1	2	10	1	1	3	1	1	0	0	0	1	1	1	3	1	1
Eopatelliocrinus scyphogracilis	1	0	0	0	0	1	2	2	2	5	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1	1	1	3	1	1
Eopinnacrinus pinnulatus	3	5	1	1	1	3	3	1	1	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1	1	2	2	1	1
Euptychocrinus fimbriatus	3	5	1	1	1	2	3	2	3	1	1	2	1	2	1	2	10	1	1	3	1	1	0	0	0	1	1	1	3	1	1
Gaurocrinus nealli	2	5	1	1	1	1	3	2	3	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1	0	2	1	1	1
Geraocrinus sculptus	1	0	0	0	0	2	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	2	4	2	2	1	1	1	2	1	1
Glyptocrinus decadactylus	1	0	0	0	0	2	2	3	3	6	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1	1	2	2	1	1
Glyptocrinus fornshelli	*1*	*0*	*0*	*0*	*0*	*1*	*9*	*3*	*1*	*5*	*1*	*2*	*1*	*2*	*2*	*2*	*10*	*1*	*1*	*3*	*1*	*1*	*0*	*1*	*0*	*1*	*1*	*1*	*2*	*1*	*1*

Species	64	65	66	67	68	69	70	74	75	76	77	78	79	80	81	82	83	84	85	86	87	90	91
Columbicrinus sulphurensis	1	2	2	1	0	2	1	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1	1	1
Compsocrinus miamiensis	*1*	*2*	*6*	*2*	*2*	*2*	*1*	*3*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*	*1*	*1*
Compsocrinus nodosus	1	2	3	2	1	2	1	NA	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1	1	1
Cremacrinus sp.	1	1	0	1	0	1	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1	1	1
Cremacrinus latus	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	2	1	1
Cremacrinus punctatus	1	1	0	1	0	1	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2	1	1
Cremacrinus ramifer	1	1	0	1	0	1	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	2	1	1
Crinerocrinus parvicostatus	1	2	4	2	2	NA	NA	NA	NA	n	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1	1	1
Culicocrinus? girardeauensis	*1*	*2*	*8*	*2*	*1*	*2*	*1*	*3*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*	*1*	*1*
Cupulocrinus canaliculatus	1	1	0	1	0	1	0	3	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1	1	1
Cupulocrinus jewetti	1	2	1	1	0	1	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	1	1	1
Cupulocrinus minimus	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1	1	1
Cupulocrinus plolydactylus	1	1	0	1	0	1	1	4	1	1	2	1	1	1	1	1	1	3	NA	1	1	1	1
Cupulocrinus sp. cf. *C. gracilis*	1	1	0	1	0	1	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1	1	1
Dendrocrinus bibrachialis	1	1	0	1	0	NA	NA	NA	1	1	NA	NA	NA	NA	NA	n	n	NA	NA	1	1	1	1
Dendrocrinus cauduceus	1	1	0	1	0	1	0	NA	1	1	1	1	NA	1	1	1	1	NA	NA	1	1	1	1
Dendrocrinus constrictus	1	1	0	1	0	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	0	1	2	1	1
Dendrocrinus curvijunctus	1	1	0	1	0	1	0	NA	1	1	2	1	NA	1	1	1	1	3	NA	1	1	1	1
Dendrocrinus n. sp. aff. *navigiolum*	1	1	0	1	0	1	0	3	1	1	NA	NA	NA	NA	NA	n	n	1	NA	1	1	1	1
Dendrocrinus posticus	1	1	0	1	0	1	0	4	1	1	2	2	2	1	1	1	1	3	NA	1	1	1	1
Dendrocrinus villosus	1	1	0	1	0	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1	1	1
Diablocrinus sp.	1	2	2	1	0	2	1	3	1	1	1	1	1	1	1	1	1	2	NA	1	1	1	1
Diabolocrinus arbucklensis	1	2	2	2	2	2	1	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1	1	1
Diabolocrinus constrictus	1	2	2	2	1	2	1	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1	1	1
Diabolocrinus n. sp.	1	2	4	2	1	NA	NA	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1	1	1
Diabolocrinus oklahomensis	1	2	2	2	2	2	1	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1	1	1
Diabolocrinus poolevillensis	1	2	2	2	1	2	1	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1	1	1
Diabolocrinus vesperalus	1	2	4	2	2	2	1	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1	1	1
Difficilicrinus coneyi	1	1	0	1	1	NA	NA	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1	1	1
Doliocrinus monilicaulis	1	2	1	2	1	1	0	4	1	1	2	1	1	1	1	1	1	4	NA	1	1	1	1
Doliocrinus pustulatus	1	2	1	1	0	2	1	NA	1	1	2	1	1	1	1	1	1	0	NA	1	2	1	1
Dystactocrinus constrictus	1	2	2	1	0	1	0	4	1	1	1	0	0	0	0	1	1	2	4	1	1	1	1
Ectenocrinus simplex	1	2	2	1	0	1	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
Eopatelliocrinus latibrachiatus	1	2	4	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1	1	1
Eopatelliocrinus scyphogracilis	1	2	4	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1	1	1
Eopinnacrinus pinnulatus	1	1	0	1	1	2	1	4	1	1	2	1	NA	1	1	1	1	1	NA	1	1	1	1
Euptychocrinus fimbriatus	1	2	4	2	2	2	1	2	1	1	2	1	1	1	1	1	1	2	NA	1	2	1	1
Gaurocrinus nealli	1	2	7	2	1	2	1	NA	1	1	2	1	NA	NA	NA	NA	NA	2	2	1	1	1	1
Geraocrinus sculptus	1	1	0	1	0	1	0	4	1	1	2	1	NA	1	1	1	1	NA	NA	1	1	1	1
Glyptocrinus decadactylus	1	2	6	2	1	2	1	3	1	1	1	0	0	0	0	2	1	2	1	1	1	1	1
Glyptocrinus fornshelli	*1*	*2*	*5*	*2*	*2*	*2*	*1*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*	*1*	*1*

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Glyptocrinus tridactylus	3	NA	NA	NA	NA	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Grenprisia billingsi	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Gustabilocrinus latomium	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Gustabilocrinus plektanikaulos	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Hybocrinus bilateralis	3	2	2	1	2	1	NA	1	1	1	0	0	2	3	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1	2
Hybocrinus crinerensis	3	NA	NA	1	1	1	6	NA	1	1	0	0	NA	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1	2
Hybocrinus nitidus	2	0	0	0	0	0	0	0	0	1	0	0	2	2	2	3	5	1	1	0	1	2	1	1	3	5	1	0	1	2
Hybocrinus perperamnominatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1	2
Hybocrinus punctatocritatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1	2
Hybocrinus punctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1	2
Iocrinus subcrassus	3	1	2	1	1	6	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1	1
Isotomocrinus n. sp.	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	2	2	5	1	0	1	2
Isotomocrinus tenuis	3	1	2	1	1	5	1	1	2	1	0	0	2	2	2	3	5	1	1	0	1	0	1	0	3	5	1	0	1	2
Macrostylocrinus pristinus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Merocrinus impressus	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1	2
Ohiocrinus brauni	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0	2
Palaeocrinus angulatus	3	1	2	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1	2
Palaeocrinus avondalensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1	2
Palaeocrinus hudsoni	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	2	1	1	2
Palaeocrinus planobasalis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1	2
Palaeocrinus sp. cf. *P. planobasalis*	3	NA	NA	1	1	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	2	2
Parachaeocrinus decoratus	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	2	1
Paracremacrinus laticardinalis	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	2	1	0	1	2	2	1	3	4	1	0	2	1
Paradiabolocrinus irregularis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Paradiabolocrinus sinuorugosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Paradiabolocrinus stellatus	3	NA	NA	n	n	n	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Pararchaeocrinus convexus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	2	1	0	3	5	1	0	1	2
Peltacrinus sculptatus	3	1	2	1	2	7	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	2	5	1	0	1	2
Penicillicrinus parvus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	2	2
Periglyptocrinus spinuliferus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	2	5	1	0	1	2
Plicodendrocrinus casei	3	1	2	1	1	6	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1	2
Porocrinus bromidensis	3	2	1	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1	2
Porocrinus lebanonensis	3	2	1	1	1	1	5	1	1	1	0	0	1	0	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Porocrinus pentagonius	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1	2
Protaxocrinus girardeau	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Ptychocrinus parvus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Ptychocrinus splendens	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Pycnocrinus multibrachialis	3	NA	NA	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Pycnocrinus sardesoni	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	1
Quinquecaudex cincinnatiensis	3	1	1	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Quinquecaudex glabellus	3	1	2	1	2	6	6	1	2	1	0	0	2	2	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1	2

Species	31	32	33	34	35	36	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Glyptocrinus tridactylus	1	0	0	0	0	NA	8	2	3	5	1	2	1	2	2	2	15	1	1	2	1	2	2	2	5	1	1	2	2	1	1
Grenprisia billingsi	3	5	1	1	2	2	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	2	NA	1	1	1	2	1	1
Gustabilocrinus latomium	3	5	1	1	2	2	2	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1	1	2	2	1	1
Gustabilocrinus plektanikaulos	3	5	1	1	2	2	3	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1	1	2	2	1	1
Hybocrinus bilateralis	1	0	0	0	0	2	8	2	1	2	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1	1	1	4	1	1
Hybocrinus crinerensis	1	0	0	0	0	2	2	2	3	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1	1	1	NA	1	1
Hybocrinus nitidus	1	0	0	0	0	2	4	2	1	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1	1	1	2	1	1
Hybocrinus perperamnominatus	1	0	0	0	0	2	2	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA	1	NA	NA	1	1
Hybocrinus punctatocritatus	1	0	0	0	0	2	1	3	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA	1	NA	NA	1	1
Hybocrinus punctatus	1	0	0	0	0	2	4	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA	1	NA	NA	1	1
Iocrinus subcrassus	1	0	0	0	0	1	2	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	1	0	1	1	1	3	1	1
Isotomocrinus n. sp.	1	0	0	0	0	2	2	2	2	5	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA
Isotomocrinus tenuis	1	0	0	0	0	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1	1	1	2	1	1
Macrostylocrinus pristinus	1	0	0	0	0	1	3	2	3	6	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	1	1	1	1	1	1
Merocrinus impressus	3	5	1	1	2	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1	1	1	2	1	1
Ohiocrinus brauni	1	0	0	0	0	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0	1	1	2	1	1
Palaeocrinus angulatus	3	5	1	1	1	3	3	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	1	1	2	1	2	1	1
Palaeocrinus avondalensis	3	5	1	1	2	3	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA	1	NA	NA	1	1
Palaeocrinus hudsoni	3	5	1	1	2	3	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1	1	1	2	1	1
Palaeocrinus planobasalis	3	5	1	1	2	3	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA	1	NA	NA	1	1
Palaeocrinus sp. cf. *P. planobasalis*	3	5	1	1	1	3	3	1	1	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parachaeocrinus decoratus	2	5	1	1	1	3	3	1	1	1	1	2	1	2	2	2	10	1	1	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Paracremacrinus laticardinalis	1	0	0	0	0	1	0	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	2	2	5	1	1	1	2	1	1
Paradiabolocrinus irregularis	2	5	1	1	1	NA	3	1	1	1	2	2	1	2	2	2	10	1	NA	3	1	NA	NA	NA	NA	NA	1	NA	NA	NA	1
Paradiabolocrinus sinuorugosus	2	5	1	1	1	NA	3	1	1	1	2	2	1	1	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA	1	NA	NA	NA	1
Paradiabolocrinus stellatus	2	5	1	1	1	1	3	1	1	1	2	2	1	2	1	2	10	1	1	3	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pararchaeocrinus convexus	2	5	1	1	1	1	3	1	2	2	2	2	1	1	1	2	10	1	NA	2	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
Peltacrinus sculptatus	1	0	0	0	0	0	3	2	1	2	1	1	1	1	2	2	5	1	1	1	1	2	2	2	2	1	1	1	3	1	1
Penicillicrinus parvus	1	0	0	0	0	2	2	2	2	1	1	1	1	1	1	2	10	1	1	1	1	2	2	1	0	1	1	1	3	1	1
Periglyptocrinus spinuliferus	1	0	0	0	0	1	2	2	3	1	1	2	1	2	2	2	10	1	1	2	1	1	0	0	0	2	1	1	2	1	1
Plicodendrocrinus casei	3	5	1	1	1	2	2	2	2	1	1	1	1	1	2	2	5	1	1	3	1	2	2	1	0	1	1	1	2	1	1
Porocrinus bromidensis	3	5	1	1	2	3	4	2	1	1	0	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1	1	1	2	1	1
Porocrinus lebanonensis	3	5	1	1	1	2	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1	0	0	2	1	1
Porocrinus pentagonius	3	5	1	1	1	3	4	2	2	5	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1	1	1	2	1	1
Protaxocrinus girardeau	3	5	1	1	1	2	2	2	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1	1	1	2	1	1
Ptychocrinus parvus	2	5	1	1	1	1	8	3	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1	1	1	3	1	1
Ptychocrinus splendens	3	5	1	1	1	2	8	2	3	5	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	1	1	2	2	1	1
Pycnocrinus multibrachialis	1	0	0	0	0	NA	2	3	3	6	1	2	2	2	2	2	10	1	1	3	1	2	2	1	0	1	1	1	1	1	1
Pycnocrinus sardesoni	1	0	0	0	0	1	8	2	3	2	1	2	2	2	2	2	20	1	1	3	1	1	0	0	0	1	1	2	1	1	1
Quinquecaudex cincinnatiensis	3	5	1	1	1	2	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1	1	1	2	1	1
Quinquecaudex glabellus	3	5	1	1	2	3	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1	1	1	3	1	1

Species	64	65	66	67	68	69	70	74	75	76	77	78	79	80	81	82	83	84	85	86	87	90	91
Glyptocrinus tridactylus	1	2	4	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1	1	1
Grenprisia billingsi	1	1	0	1	0	1	0	NA	1	1	2	1	2	2	1	1	1	3	NA	1	1	1	1
Gustabilocrinus latomium	1	1	7	2	2	2	1	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1	1	1
Gustabilocrinus plektanikaulos	1	1	7	2	2	2	1	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1	1	1
Hybocrinus bilateralis	1	1	0	1	0	1	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1	1	1
Hybocrinus crinerensis	1	1	0	1	0	1	0	NA	1	1	1	0	0	0	0	1	1	0	0	1	2	1	1
Hybocrinus nitidus	1	1	0	1	0	1	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1	1	1
Hybocrinus perperamnominatus	1	1	0	1	0	NA	NA	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2	1	1
Hybocrinus punctatocritatus	1	1	0	1	0	NA	NA	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2	1	1
Hybocrinus punctatus	1	1	0	1	0	NA	NA	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2	1	1
Iocrinus subcrassus	1	1	0	1	0	1	0	4	1	1	2	2	2	2	1	1	1	3	3	1	1	1	1
Isotomocrinus n. sp.	1	1	0	1	0	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1
Isotomocrinus tenuis	1	1	0	1	0	1	0	3	1	1	2	1	2	1	2	1	1	3	3	1	1	1	1
Macrostylocrinus pristinus	1	2	3	2	2	2	1	3	1	1	1	0	0	0	0	1	1	2	NA	1	1	1	1
Merocrinus impressus	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1	1	1
Ohiocrinus brauni	1	1	0	1	0	1	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1	1	2
Palaeocrinus angulatus	1	1	0	1	0	1	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1	1	1
Palaeocrinus avondalensis	1	1	0	1	0	NA	NA	NA	1	1	1	0	0	0	0	1	1	2	NA	1	1	1	1
Palaeocrinus hudsoni	1	1	0	1	0	1	0	2	1	2	1	0	0	0	0	2	2	3	NA	1	1	1	1
Palaeocrinus planobasalis	1	1	0	1	0	NA	NA	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1	1	1
Palaeocrinus sp. cf. *P. planobasalis*	1	1	0	1	0	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	1	1	0	NA	1	1	1	1
Parachaeocrinus decoratus	1	2	6	2	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	1	2	0	1	1	1	1
Paracremacrinus laticardinalis	1	1	0	1	0	1	0	4	2	1	2	1	NA	1	1	1	1	2	NA	1	1	1	1
Paradiabolocrinus irregularis	1	2	7	2	1	NA	NA	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	2	1	1
Paradiabolocrinus sinuorugosus	1	2	7	2	1	NA	NA	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	1	1	1
Paradiabolocrinus stellatus	1	2	3	2	1	NA	NA	NA	NA	1	2	2	1	1	2	2	1	2	NA	1	*2*	1	1
Pararchaeocrinus convexus	1	2	3	2	2	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2	1	1
Peltacrinus sculptatus	1	1	0	1	0	1	0	4	1	1	2	1	1	1	1	1	1	3	0	1	1	1	1
Penicillicrinus parvus	1	2	2	1	0	1	0	4	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1	1	1
Periglyptocrinus spinuliferus	1	2	6	2	2	2	1	3	1	1	1	0	0	0	0	2	1	2	NA	1	2	1	1
Plicodendrocrinus casei	1	1	0	1	0	1	0	4	1	1	2	1	2	2	1	1	1	3	3	1	1	1	1
Porocrinus bromidensis	1	1	0	1	0	1	0	3	1	2	1	0	0	0	0	1	2	0	2	1	1	2	1
Porocrinus lebanonensis	1	1	0	1	0	1	0	3	1	1	1	0	0	0	0	1	1	0	1	1	1	1	1
Porocrinus pentagonius	1	1	0	1	0	1	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	1	1	1
Protaxocrinus girardeau	1	1	0	1	0	1	0	3	1	1	2	1	2	1	2	1	1	2	NA	1	1	1	1
Ptychocrinus parvus	1	2	6	2	2	2	1	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1	1	1
Ptychocrinus splendens	1	2	5	2	2	2	1	2	1	1	2	2	1	1	2	2	1	2	NA	1	1	1	1
Pycnocrinus multibrachialis	1	2	4	2	2	2	1	3	1	1	1	0	0	0	0	NA	1	1	1	1	1	1	1
Pycnocrinus sardesoni	1	2	10	2	2	2	1	NA	1	1	1	0	0	0	0	2	1	2	NA	1	1	1	1
Quinquecaudex cincinnatiensis	1	1	0	1	0	1	0	4	1	1	2	2	2	2	1	1	1	3	0	1	1	1	1
Quinquecaudex glabellus	1	1	0	1	0	1	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Quinquecaudex species A	3	2	1	1	2	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1	2
Reteocrinus fenestratus	3	2	1	1	1	1	NA	1	1	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	1	1	2
Reteocrinus magnificus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Reteocrinus polki	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	2
Reteocrinus variabilicaulis	3	1	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	2
Reterocrinus sp.	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1	2
Rhaphanocrinus sculptus	3	1	1	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2
Rhaphanocrinus simplex	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1	2
Ristnacrinus altobasalis	3	1	2	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1	2
Tornatilicrinus longicaudis	3	1	1	1	1	5	5	1	2	1	0	0	NA	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1	2
Triboloporus cryptoplicatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1	2
Tryssocrinus endotomous	3	2	2	1	1	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1	2
Undescribed cladid 1	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1	2
Wilsonicrinus culmeninuosus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1	2

Species	31	32	33	34	35	36	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
Quinquecaudex species A	3	5	1	1	2	0	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1	1	1	2	1	1
Reteocrinus fenestratus	3	5	1	1	2	1	1	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	NA	NA	1	2	1	2	1	1
Reteocrinus magnificus	3	5	1	1	1	0	3	2	3	6	1	2	1	2	2	2	10	1	1	2	1	2	2	1	0	1	1	1	1	1	1
Reteocrinus polki	3	5	1	1	1	2	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1	1	1	3	1	1
Reteocrinus variabilicaulis	3	5	1	1	1	2	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1	1	1	3	1	1
Reterocrinus sp.	3	5	2	1	1	2	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1	1	1	3	1	1
Rhaphanocrinus sculptus	3	5	1	1	1	NA	8	2	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1	1	2	1	1	1
Rhaphanocrinus simplex	2	5	1	1	1	1	8	3	3	1	2	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA	1	NA	NA	1	1
Ristnacrinus altobasalis	1	0	0	0	0	NA	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	1	0	0	0	1	1	1	4	1	1
Tornatilicrinus longicaudis	1	0	0	0	0	1	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	2	2	1	1	1	2	1	1
Triboloporus cryptoplicatus	3	5	1	1	1	3	4	2	1	1	1	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA	1	NA	NA	1	1
Tryssocrinus endotomous	1	0	0	0	0	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	2	2	1	1	1	2	1	1
Undescribed cladid 1	3	5	1	1	2	2	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1	1	1	2	1	1
Wilsonicrinus culmeninuosus	2	5	1	1	1	1	3	2	1	6	2	2	1	1	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1

Species	64	65	66	67	68	69	70	74	75	76	77	78	79	80	81	82	83	84	85	86	87	90	91
Quinquecaudex species A	1	1	0	1	0	1	0	3	1	1	2	1	1	1	1	1	1	4	0	1	1	1	1
Reteocrinus fenestratus	1	1	0	1	0	1	0	NA	1	1	2	1	2	2	1	1	1	3	0	1	2	1	1
Reteocrinus magnificus	1	2	4	2	1	2	1	4	1	1	1	0	0	0	0	2	1	1	2	1	2	1	1
Reteocrinus polki	1	2	8	2	1	2	1	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	2	1	1
Reteocrinus variabilicaulis	1	2	8	2	1	1	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	2	1	1
Reterocrinus sp.	1	2	8	2	1	2	1	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	1	1	1
Rhaphanocrinus sculptus	1	2	7	2	2	2	1	4	1	1	1	0	0	0	0	1	1	2	NA	1	1	1	1
Rhaphanocrinus simplex	1	2	4	2	2	NA	NA	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1	1
Ristnacrinus altobasalis	1	1	0	1	0	1	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1	1	1
Tornatilicrinus longicaudis	1	1	0	1	0	1	0	3	1	1	2	2	2	1	1	1	1	4	4	1	1	1	1
Triboloporus cryptoplicatus	1	1	0	1	0	NA	NA	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1	1	1
Tryssocrinus endotomous	1	1	0	1	0	1	0	4	1	1	2	1	2	1	1	1	1	3	0	1	1	1	1
Undescribed cladid 1	1	1	0	1	0	1	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1	1	1
Wilsonicrinus culmeninuosus	1	2	5	2	3	NA	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1	1	1

APPENDIX 3 (Chapter 1; Species PCO loadings)

The PCO species loadings for the 137 species analyses for chapter 3. The crinoids were coded using the discreete characters explained in Appendix 1. Gower's similarity metric was used on the dataset and was analysed using Principal Coordinate Analysis. All analyses were conducted using R.

	Cladids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Agostocrinus xenus*	-0.05939	0.01912	-0.09135	-0.02420	0.00159	-0.03131	-0.01887	0.02935	0.00416	-0.01735
2	*Carabocrinus sp.*	0.01119	-0.01422	-0.05656	0.06730	0.02091	-0.00065	0.01183	0.04441	-0.02538	0.01596
3	*Carabocrinus cf. treadwelli*	0.01832	-0.05950	-0.09177	0.02224	-0.02376	-0.03203	-0.02113	-0.02718	0.01520	0.04041
4	*Carabocrinus dicyclicus*	0.02187	-0.08762	-0.07652	0.06493	0.01311	-0.00885	0.02199	0.02497	-0.02840	-0.02089
5	*Carabocrinus magnificus*	0.08868	-0.15589	-0.05605	0.01974	0.02390	-0.02662	-0.05512	0.07903	0.01322	-0.00596
6	*Carabocrinus micropunctatus*	0.04414	-0.13868	-0.05875	0.01539	0.09372	-0.00628	0.02370	0.01505	0.03643	0.02529
7	*Carabocrinus stellifer*	0.05551	-0.13325	-0.04285	0.00921	0.03595	-0.03437	0.00735	0.06464	0.03240	0.01045
8	*Carabocrinus treadwelli*	0.01875	-0.05984	-0.09341	0.02200	-0.02482	-0.03006	-0.02136	-0.02529	0.01500	0.04018
9	*Colpodecrinus quadrifidus*	0.08284	0.00598	0.03623	0.05953	-0.01732	0.03623	-0.10937	0.00813	-0.03959	-0.02449
10	*Cupulocrinus canaliculatus*	-0.00472	-0.08856	0.03354	0.01674	-0.01515	-0.00226	-0.00640	-0.02281	0.00178	-0.01149
11	*Cupulocrinus jewetti*	0.02959	-0.06377	0.04555	0.01309	0.02108	-0.00423	0.01051	0.02438	-0.00729	0.02318
12	*Cupulocrinus minimus*	-0.04333	-0.10581	0.02652	-0.00707	-0.00399	-0.00543	0.01666	-0.03311	-0.01426	-0.01571
13	*Cupulocrinus plolydactylus*	-0.02126	-0.09531	0.03653	-0.03358	0.00359	0.01211	0.01928	0.00869	-0.02486	0.00997
14	*Cupulocrinus* species cf. *C. gracilis*	-0.00408	-0.04586	0.04812	0.01820	-0.02671	0.00787	-0.00686	0.00199	-0.01546	0.02864
15	*Dendrocrinus bibrachialis*	0.01250	-0.10259	0.02266	-0.00397	-0.01338	0.00862	-0.03228	-0.01195	0.01012	-0.03319
16	*Dendrocrinus cauduceus*	-0.02727	-0.08579	-0.00934	-0.02407	-0.00169	0.00543	0.00713	-0.00460	-0.01268	0.00375
17	*Dendrocrinus constrictus*	-0.02481	-0.13769	-0.02837	-0.04190	0.05927	0.01529	0.02598	-0.08990	0.01140	0.03711
18	*Dendrocrinus curvijunctus*	-0.02694	-0.10168	0.06241	-0.02673	-0.01038	-0.01270	-0.00686	-0.02476	0.00004	-0.02819
19	*Dendrocrinus* n. sp. aff. *navigiolum*	0.00068	-0.10438	0.00829	-0.00974	-0.01153	0.00650	-0.03195	-0.00957	-0.05403	-0.05476
20	*Dendrocrinus posticus*	-0.00745	-0.10671	0.05793	-0.02958	-0.00557	0.02275	-0.00886	0.00981	-0.01635	-0.00923
21	*Dendrocrinus villosus*	-0.00207	-0.10145	0.02223	-0.02536	0.00736	-0.01074	-0.00079	-0.02430	-0.01361	-0.03476
22	*Eopinnacrinus pinnulatus*	0.01523	-0.07637	0.06015	-0.01602	0.03022	-0.03792	-0.01430	-0.01730	0.01146	-0.01186
23	*Grenprisia billingsi*	-0.03024	-0.12452	0.08563	-0.01438	0.00540	0.01808	-0.01341	-0.00163	0.00875	-0.01702
24	*Merocrinus impressus*	-0.06735	-0.07284	0.02980	0.01687	-0.00994	-0.02068	-0.01069	-0.03807	-0.01376	-0.01174
25	*Palaeocrinus angulatus*	0.02750	-0.08926	0.00378	0.02235	0.00981	-0.00089	-0.03763	0.01971	-0.01733	0.01650
26	*Palaeocrinus avondalensis*	0.01381	-0.07219	-0.05617	0.04343	0.04326	-0.01636	-0.03776	0.00151	-0.02418	-0.00876

27 *Palaeocrinus hudsoni*	0.04333	-0.11830	-0.06317	0.11147	0.02737	0.02648	-0.01025	0.07279	0.01414	-0.02808
28 *Palaeocrinus planobasalis*	0.01322	-0.07405	-0.06115	0.04086	0.04591	-0.01940	-0.03763	0.00176	-0.02155	-0.01503
29 *Palaeocrinus* sp. cf. *P. planobasalis*	0.01512	-0.12353	-0.05989	-0.03673	0.03763	-0.06068	-0.01422	0.01919	-0.03267	0.06622
30 *Plicodendrocrinus casei*	-0.00947	-0.10582	0.08668	0.01197	0.02685	-0.03877	-0.02349	-0.00475	-0.03145	-0.01992
31 *Porocrinus bromidensis*	0.03045	-0.10643	-0.11643	0.06716	0.01585	-0.07834	-0.02256	-0.00258	-0.00123	-0.03094
32 *Porocrinus lebanonensis*	-0.00079	-0.04823	-0.08762	0.03952	-0.03070	-0.04080	-0.03584	-0.02558	0.03441	0.04699
33 *Porocrinus pentagonius*	0.01525	-0.08123	-0.06911	0.06789	-0.02731	-0.07870	0.02861	-0.01572	0.04087	-0.02424
34 *Triboloporus cryptoplicatus*	0.00729	-0.09442	-0.07630	0.00140	-0.01360	0.03743	-0.04709	-0.00421	0.01392	-0.02912
35 Undescribed cladid 1	-0.07609	-0.07302	-0.01218	0.06147	-0.07166	-0.01337	0.00386	-0.08534	-0.02721	0.01051

Disparids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Acolocrinus arbucklensis*	-0.17352	-0.03475	-0.20426	-0.13976	-0.06589	-0.03095	0.04582	0.02232	-0.04270	0.02564
2 *Acolocrinus crinerensis*	-0.19042	-0.03149	-0.22740	-0.13706	-0.01236	0.00401	0.07223	-0.02984	-0.02191	0.02956
3 *Acolocrinus hydraulicus*	-0.14981	-0.00548	-0.18793	-0.15030	-0.01143	-0.04053	0.03265	0.01952	-0.04128	-0.01714
4 *Anomalocrinus antiquus*	-0.11668	0.03091	-0.04242	0.06940	-0.03610	0.03572	-0.00191	0.03976	0.02289	0.03087
5 *Anomalocrinus incurvus*	-0.11296	0.01922	0.04868	-0.01018	0.03007	0.05039	-0.01259	0.07525	-0.01293	-0.01649
6 *Apodasmocrinus daubei*	-0.10762	0.05230	0.08368	-0.08090	-0.01961	-0.01690	-0.03020	0.03114	0.07868	-0.04019
7 *Apodasmocrinus punctatus*	-0.16645	0.01912	-0.02201	0.05245	-0.03292	0.01495	0.03157	-0.04778	0.06323	0.00204
8 *Apodasmocrinus sp. cf. A. daubei*	-0.10921	0.05131	0.07312	-0.07285	-0.00020	-0.02932	-0.00822	0.03358	0.06773	-0.02331
9 *Calceocrinus longifrons*	-0.15248	-0.04580	0.03227	-0.03307	0.08466	0.04719	0.05165	0.03407	-0.02025	0.03198
10 *Cincinnaticrinus pentagonus*	-0.15434	-0.00213	0.04991	0.00729	-0.00847	-0.01566	-0.00124	-0.00289	-0.01511	-0.04765
11 *Cincinnaticrinus varibrachialis*	-0.15320	-0.00095	0.04035	0.01176	0.01048	-0.02950	0.01914	0.00198	-0.02261	-0.03035
12 *Columbicrinus crassus*	-0.10991	0.04767	0.05954	-0.02849	-0.02738	-0.06741	0.01424	-0.00580	0.01528	0.00021
13 *Columbicrinus sulphurensis*	-0.09925	0.06218	0.05865	-0.05795	0.00857	-0.04356	0.00498	-0.00606	0.00737	-0.01922
14 *Cremacrinus sp.*	-0.12908	0.00433	-0.05622	0.06064	-0.00478	0.08284	-0.01858	0.01779	-0.05371	0.05763
15 *Cremacrinus latus*	-0.20064	-0.01800	0.04605	0.02332	0.03867	0.10649	-0.00142	-0.01731	0.03344	-0.00743

16 *Cremacrinus punctatus*	-0.15845	-0.00284	0.04468	-0.01258	0.06086	0.08177	0.01231	0.01221	-0.02091	0.02862
17 *Cremacrinus ramifer*	-0.14489	0.01382	-0.05362	0.07130	0.01992	0.10476	0.02325	-0.00340	-0.01653	0.04008
18 *Difficilicrinus coneyi*	-0.17268	0.02664	-0.03611	0.01031	-0.05878	0.02596	-0.02568	-0.00521	0.01862	-0.03649
19 *Doliocrinus monilicaulis*	-0.08044	0.06772	0.09736	-0.00728	-0.04697	0.00771	0.03040	-0.01860	0.00047	0.00724
20 *Doliocrinus pustulatus*	-0.11854	0.06718	0.05317	-0.06743	0.05791	-0.04526	0.02518	-0.05096	0.04114	-0.02458
21 *Dystactocrinus constrictus*	-0.11782	0.04005	0.01164	0.05868	-0.04390	0.02415	0.03104	-0.01151	-0.04250	-0.01861
22 *Ectenocrinus simplex*	-0.10819	0.03519	0.09390	0.01210	-0.03118	0.01770	0.05542	0.01524	-0.01075	0.00572
23 *Geraocrinus sculptus*	-0.12539	-0.00174	0.04154	-0.00649	0.02095	0.00777	-0.00383	0.04869	-0.02358	0.00532
24 *Iocrinus subcrassus*	-0.11538	0.00349	0.10158	0.02578	0.03183	-0.04657	-0.01015	0.03249	-0.03083	-0.01139
25 *Isotomocrinus n. sp.*	-0.13471	-0.00435	0.00225	-0.03414	-0.02487	-0.04784	0.04305	0.01411	-0.01235	0.00250
26 *Isotomocrinus tenuis*	-0.09504	0.01789	0.09748	0.01491	-0.06095	-0.01708	-0.00679	0.00611	0.00044	0.01101
27 *Ohiocrinus brauni*	-0.15529	-0.00351	0.11722	-0.01953	-0.00558	-0.01991	-0.00376	0.00064	-0.01956	-0.03592
28 *Paracremacrinus laticardinalis*	-0.16118	-0.00958	0.05526	-0.00526	0.02650	0.04576	0.01005	0.05813	-0.03450	0.03252
29 *Peltacrinus sculptatus*	-0.14724	-0.00773	0.08060	0.04176	0.02224	-0.01043	-0.03902	0.03802	0.02599	0.05647
30 *Penicillicrinus parvus*	-0.13943	0.02333	0.04430	0.01399	0.01790	-0.01240	0.01805	-0.02401	-0.01900	-0.00368
31 *Quinquecaudex cincinnatiensis*	0.01084	-0.10139	0.07020	-0.00711	-0.05482	-0.00116	0.00290	-0.02275	0.00840	0.04183
32 *Quinquecaudex glabellus*	0.00030	-0.12188	0.09708	0.00573	0.00984	0.02428	-0.03322	0.00056	0.02400	-0.04296
33 *Quinquecaudex species A*	-0.02589	-0.08277	0.08155	0.04079	-0.06892	0.01160	-0.04186	-0.03991	0.04607	0.04164
34 *Ristnacrinus altobasalis*	-0.15496	0.02863	-0.03737	0.03565	-0.04397	-0.07284	-0.00976	-0.05728	-0.00908	-0.01183
35 *Tornatilicrinus longicaudis*	-0.14453	0.00084	0.10408	0.00182	-0.06941	0.00486	0.01451	-0.00933	-0.02338	0.00071
36 *Tryssocrinus endotomous*	-0.14800	-0.00491	0.09025	0.00568	-0.04602	0.00348	0.03743	0.01893	0.02060	0.04483

Diplobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Anthracocrinus primitivus*	0.08171	0.04613	0.03404	-0.02727	-0.05025	-0.02698	-0.02912	-0.00918	0.01553	0.00749
2 *Archaeocrinus buckhornensis*	0.17171	0.03639	-0.02487	-0.05523	-0.06916	0.06036	-0.02033	-0.02832	-0.05508	0.02954
3 *Archaeocrinus conicus*	0.14644	0.00644	-0.02357	-0.06496	-0.08636	0.06209	-0.02801	-0.00913	-0.05025	0.02764
4 *Archaeocrinus peculiaris*	0.07630	-0.00412	-0.00033	-0.02923	0.00245	0.02323	-0.04441	0.01548	0.02558	-0.03114
5 *Archaeocrinus snyderi*	0.05747	0.03936	-0.01925	0.02479	-0.00378	0.04163	-0.02399	-0.01827	-0.04271	-0.04501
6 *Archaeocrinus subovalis*	0.10750	0.03578	0.02579	0.01014	-0.00135	0.01675	0.01158	-0.01869	-0.03871	-0.02241

7	*Balacrinus sp.*	0.14112	0.04037	-0.05140	0.06478	0.03261	0.04946	-0.01332	-0.03488	0.01345	-0.02265
8	*Bromidocrinus nodosus*	0.12206	0.02028	0.04410	-0.03315	0.01873	-0.01686	-0.01989	0.03821	0.00411	-0.02226
9	*Cleiocrinus bromidensis*	0.17898	-0.03182	-0.02062	0.00923	-0.08602	0.00687	0.04496	0.00901	-0.01165	-0.01156
10	*Cleiocrinus laevis*	0.27785	0.01098	-0.06395	-0.04259	0.04019	0.13186	0.08073	-0.02997	0.02193	-0.06550
11	*Cleiocrinus ornatus*	0.16455	0.00792	0.01398	0.01072	-0.08299	0.03409	0.06806	0.03012	-0.03324	-0.06069
12	*Cleiocrinus springeri*	0.19336	-0.06708	-0.01944	-0.02403	-0.11748	0.03003	0.07285	0.07408	0.03930	-0.02491
13	*Cleiocrinus tessellatus*	0.22731	-0.05914	-0.03107	0.03545	-0.06805	-0.03190	0.04503	0.11103	0.02469	0.02542
14	*Crinerocrinus parvicostatus*	0.17259	0.02671	-0.00761	-0.00711	-0.06065	0.03126	-0.03963	-0.02019	0.01135	0.03310
15	*Diablocrinus sp.*	0.02703	0.01327	0.01929	-0.00622	-0.04589	-0.00417	-0.01121	-0.00399	0.02684	0.01546
16	*Diabolocrinus arbucklensis*	0.14285	0.04411	0.02453	-0.06079	0.06076	-0.05562	-0.01554	0.01535	-0.02304	-0.00889
17	*Diabolocrinus constrictus*	0.13799	0.03890	0.02715	-0.05625	0.05729	-0.06147	-0.00457	0.01999	-0.01442	-0.00117
18	*Diabolocrinus n. sp.*	0.10895	0.01016	0.05931	-0.06274	-0.02844	0.01083	0.04276	0.01363	-0.01541	0.05188
19	*Diabolocrinus oklahomensis*	0.12895	0.02616	0.02541	-0.06142	0.04192	-0.06012	-0.01079	0.03214	-0.01269	-0.00154
20	*Diabolocrinus poolevillensis*	0.13568	0.03850	0.02871	-0.06265	0.06246	-0.05319	-0.00720	0.02495	-0.01563	-0.01311
21	*Diabolocrinus vesperalus*	0.11866	0.03278	0.04221	-0.07149	-0.03289	-0.02374	0.01916	-0.00234	0.02875	0.02668
22	*Euptychocrinus fimbriatus*	0.08655	0.01674	0.01669	-0.04921	0.05876	0.00124	-0.00214	-0.05997	0.02214	-0.00517
23	*Gaurocrinus nealli*	0.11987	0.03011	0.05494	-0.01478	-0.00615	0.02183	0.00557	-0.01248	-0.03478	-0.03097
24	*Gustabilocrinus latomium*	0.10305	-0.00001	-0.01281	-0.04154	-0.03218	-0.03496	-0.04412	-0.03086	0.02487	-0.01050
25	*Gustabilocrinus plektanikaulos*	0.10399	0.00037	-0.01502	-0.04220	-0.03198	-0.03335	-0.04490	-0.02809	0.02600	-0.00908
26	*Parachaeocrinus decoratus*	0.12653	0.01273	-0.03098	-0.01675	0.05592	-0.01575	0.00369	0.01153	-0.04425	0.06745
27	*Paradiabolocrinus irregularis*	0.14581	0.01817	-0.01280	-0.01231	0.08228	0.02531	-0.00588	-0.00490	0.04240	0.03604
28	*Paradiabolocrinus sinuorugosus*	0.10746	-0.00738	0.00174	-0.04689	-0.00397	0.02799	-0.01131	0.02458	0.02179	-0.00365
29	*Paradiabolocrinus stellatus*	0.16535	0.01504	0.05202	-0.10694	0.05560	0.08634	0.01159	-0.00479	0.06019	0.03159
30	*Pararchaeocrinus convexus*	0.10097	-0.00919	-0.00583	-0.05120	0.03148	0.08182	-0.00129	-0.03268	0.03235	0.01265
31	*Ptychocrinus parvus*	0.09183	0.07855	0.00940	0.02500	-0.01035	-0.02437	-0.03140	-0.03404	-0.02030	0.01510
32	*Ptychocrinus splendens*	0.13190	0.03038	0.05441	0.01295	0.03181	-0.03073	-0.01983	0.00446	-0.03382	0.03121

33 *Reteocrinus fenestratus*	0.01581	-0.12935	0.06869	0.01848	0.05378	0.00418	0.04047	-0.02049	0.03044	0.05744
34 *Reteocrinus magnificus*	0.11304	0.03499	-0.04184	0.06013	0.04760	0.00969	0.02985	-0.06274	-0.03378	0.01113
35 *Reteocrinus polki*	0.14625	-0.00015	0.05575	0.08358	0.04070	-0.02923	0.10288	-0.03448	0.04507	-0.00927
36 *Reteocrinus variabilicaulis*	0.13039	-0.00924	0.05489	0.08911	0.02749	-0.01798	0.09519	-0.03406	0.01683	-0.00133
37 *Reterocrinus sp.*	0.14953	-0.00051	0.06541	0.08895	0.00385	-0.06031	0.07516	-0.00433	0.01634	-0.01423
38 *Rhaphanocrinus sculptus*	0.12198	0.03753	-0.06871	0.02435	-0.01432	-0.02577	-0.01931	-0.05547	-0.01390	0.00410
39 *Rhaphanocrinus simplex*	0.10820	0.02261	-0.01146	-0.04031	0.00284	0.06027	-0.06007	-0.01950	-0.02783	-0.02677
40 *Wilsonicrinus culmeninuosus*	0.11113	0.00770	0.00605	-0.03470	-0.07355	0.03381	-0.02288	-0.01436	0.00705	0.01657

Flexibles	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Clidochirus serrulatus*	-0.03198	-0.10015	-0.01543	0.02702	0.00744	0.02177	0.02707	-0.01871	-0.04510	-0.04975
2 *Protaxocrinus girardeau*	0.00586	-0.08479	0.06195	0.00312	-0.04069	-0.01263	0.01777	-0.01882	-0.00878	0.03308

Hybocrinids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Hybocrinus bilateralis*	-0.12221	0.01564	-0.07615	0.00575	-0.01998	0.00050	-0.04573	0.03640	0.05153	-0.02375
2 *Hybocrinus crinerensis*	-0.13514	0.03012	-0.07361	0.01666	0.01387	-0.01051	-0.00823	-0.04134	0.05109	0.00914
3 *Hybocrinus nitidus*	-0.10084	0.03225	-0.09736	0.02718	-0.06017	0.05179	-0.07044	0.02971	0.09577	-0.01217
4 *Hybocrinus perperamnominatus*	-0.12185	-0.00377	-0.08084	-0.01284	0.05988	0.03269	0.00755	0.00180	0.02290	-0.03426
5 Hybocrinus punctatocritatus	-0.12650	-0.00242	-0.08523	-0.01516	0.05666	0.04269	0.00392	-0.01230	0.00741	-0.04284
6 *Hybocrinus punctatus*	-0.11960	-0.00315	-0.08508	-0.01433	0.05750	0.03678	0.00595	0.00827	0.02257	-0.03486

Monobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Abludoglyptocrinus charltoni*	0.02314	0.15520	-0.05511	0.03801	-0.02890	0.00546	0.07433	0.04143	0.00354	-0.06964
2 *Abludoglyptocrinus*	0.01092	0.15942	0.00296	0.01420	0.04354	-0.01653	0.00198	-0.01750	0.01171	0.01594

laticostatus										
3 *Alisocrinus tetrarmatus*	0.02556	0.14406	-0.06225	0.07935	-0.02395	-0.02880	0.06904	0.04159	0.04752	0.00422
4 *Alisocrinus? heterodactylus*	-0.00791	0.13239	-0.00027	-0.03076	-0.00163	0.01382	-0.01024	-0.00789	-0.00987	-0.01008
5 *Canistrocrinus richardsoni*	-0.00263	0.13108	0.03205	0.00833	-0.00542	0.02356	-0.00331	-0.01346	-0.03276	-0.00339
6 *Canistrocrinus typus*	0.01097	0.08736	0.05915	-0.02191	0.06136	-0.04731	-0.00646	0.01811	-0.04522	0.00155
7 *Compsocrinus miamiensis*	0.00639	0.15119	0.00228	-0.01333	-0.01191	0.00428	0.00001	-0.01046	-0.00350	0.00171
8 *Compsocrinus nodosus*	-0.02105	0.13118	0.00533	-0.02997	0.04423	0.00497	-0.01347	-0.01289	0.00693	-0.00087
9 *Culicocrinus? girardeauensis*	-0.00857	0.12185	0.00329	-0.01137	-0.02415	-0.01204	-0.00302	0.01229	0.00775	-0.00167
10 *Eopatelliocrinus latibrachiatus*	-0.00615	0.12261	0.00543	-0.02351	-0.04725	0.00753	-0.02681	0.00710	0.03389	0.01203
11 *Eopatelliocrinus scyphogracilis*	0.00703	0.14006	-0.00309	0.00965	0.00964	-0.03657	-0.01712	0.00816	0.02358	0.05113
12 *Glyptocrinus decadactylus*	0.00769	0.15702	-0.04737	0.03324	0.00694	-0.04151	0.00609	-0.01621	-0.02940	-0.01227
13 *Glyptocrinus fornshelli*	0.02140	0.15663	0.01775	0.01412	-0.01705	0.00406	-0.02417	0.02101	-0.01760	0.00145
14 *Glyptocrinus tridactylus*	0.00659	0.14574	0.03129	0.06524	0.02489	0.05563	-0.01752	0.05554	-0.01880	0.05424
15 *Macrostylocrinus pristinus*	-0.02212	0.11463	-0.05861	0.03059	-0.03076	-0.03373	-0.00504	-0.00543	-0.00643	0.03157
16 *Periglyptocrinus spinuliferus*	-0.00384	0.17269	-0.05831	0.03610	0.08948	0.00163	-0.01905	-0.03522	0.06057	0.00652
17 *Pycnocrinus multibrachialis*	-0.00448	0.14833	-0.04215	0.08401	0.01632	-0.01550	-0.01354	-0.01733	-0.07037	-0.00032
18 *Pycnocrinus sardesoni*	0.01311	0.17482	-0.07169	0.03260	0.03622	-0.03589	-0.02780	0.02518	-0.01735	-0.01700

APPENDIX 4

Chapter 1; Locality Descriptions

Descriptions of the eighte localities examined in chapter one. Included are the species lists and abundances from each of the localities, which are based on literature surveys, museum and private collections, and personal field work. Also included are the additive abundances and additive disparity of each assemblage and the partial disparity of each species within the assemblage. Descriptions of these metrics and the methods of calculation are given in the text.

Benbolt Ls.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Diabolocrinus vesperalus	200	0.47393	na	na	0.00298
Hybocrinus punctatus	99	0.23460	na	na	0.00201
Archaeocrinus peculiaris	35	0.08294	na	na	0.00195
Palaeocrinus planobasalis	30	0.07109	0.86256	0.02561	0.00152
Hybocrinus perperamnominatus	13	0.03081	0.89336	0.02753	0.00204
Acolocrinus hydraulicus	8	0.01896	0.91232	0.02886	0.00258
Apodasmocrinus punctatus	6	0.01422	0.92654	0.02957	0.00307
Carabocrinus stellifer	6	0.01422	0.94076	0.03220	0.00275
Carabocrinus micropunctatus	3	0.00711	0.94787	0.03268	0.00273
Paradiabolocrinus irregularis	3	0.00711	0.95498	0.03563	0.00357
Agostocrinus xenus	2	0.00474	0.95972	0.03293	0.00140
Carabocrinus cf. *treadwelli*	2	0.00474	0.96445	0.03032	0.00143
Diabolocrinus n. sp.	2	0.00474	0.96919	0.03027	0.00262
Difficilicrinus coneyi	2	0.00474	0.97393	0.03244	0.00327
Cremacrinus latus	1	0.00237	0.97630	0.03473	0.00389
Geraocrinus sculptus	1	0.00237	0.97867	0.03366	0.00211
Hybocrinus punctatocritatus	1	0.00237	0.98104	0.03261	0.00213
Isotomocrinus n. sp.	1	0.00237	0.98341	0.03173	0.00227
Palaeocrinus avondalensis	1	0.00237	0.98578	0.03064	0.00150
Paradiabolocrinus sinuorugosus	1	0.00237	0.98815	0.03125	0.00253
Pararchaeocrinus convexus	1	0.00237	0.99052	0.03143	0.00239

Rhaphanocrinus simplex	1	0.00237	0.99289	0.03176	0.00267
Ristnacrinus altobasalis	1	0.00237	0.99526	0.03206	0.00286
Triboloporus cryptoplicatus	1	0.00237	0.99763	0.03128	0.00171
Wilsonicrinus culmeninuosus	1	0.00237	1.00000	0.03153	0.00265

Decorah Shale

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Cremacrinus punctatus	50	0.52632	na	na	0.00627
Cupulocrinus jewetti	13	0.13684	na	na	0.00327
Cupulocrinus canaliculatus	7	0.07368	na	na	0.00366
Carabocrinus dicyclicus	5	0.05263	0.78947	0.01881	0.00377
Palaeocrinus angulatus	4	0.04211	0.83158	0.01567	0.00388
Grenprisia billingsi	3	0.03158	0.86316	0.01372	0.00501
Periglyptocrinus spinuliferus	3	0.03158	0.89474	0.02918	0.00760
Porocrinus pentagonius	3	0.03158	0.92632	0.02568	0.00354
Pycnocrinus sardesoni	3	0.03158	0.95789	0.03342	0.00780
Carabocrinus magnificus	1	0.01053	0.96842	0.03529	0.00793
Glyptocrinus tridactylus	1	0.01053	0.97895	0.03768	0.00616
Isotomocrinus tenuis	1	0.01053	0.98947	0.03600	0.00378
Pycnocrinus multibrachialis	1	0.01053	1.00000	0.03711	0.00626

Fairview

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Glyptocrinus decadactylus	500	0.73964	na	na	0.00776
Iocrinus subcrassus	107	0.15828	na	na	0.00223
Cincinnaticrinus pentagonus	39	0.05769	na	na	0.00324
Dystactocrinus constrictus	7	0.01036	0.96598	0.02096	0.00225
Ptychocrinus parvus	7	0.01036	0.97633	0.03001	0.00935
Ectenocrinus simplex	6	0.00888	0.98521	0.02500	0.00208
Anomalocrinus incurvus	3	0.00444	0.98964	0.02177	0.00211
Ohiocrinus brauni	3	0.00444	0.99408	0.02101	0.00329
Quinquecaudex cincinnatiensis	3	0.00444	0.99852	0.02485	0.00727
Cincinnaticrinus varibrachialis	1	0.00148	1.00000	0.02352	0.00319

Girardeau Ls.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Euptychocrinus fimbriatus	52	0.26531	na	na	0.00265
Ptychocrinus splendens	45	0.22959	na	na	0.00401
Alisocrinus tetrarmatus	23	0.11735	na	na	0.00395
Eopatelliocrinus scyphogracilis	21	0.10714	0.71939	0.01599	0.00376

Macrostylocrinus pristinus	20	0.10204	0.82143	0.01528	0.00310
Eopatelliocrinus latibrachiatus	14	0.07143	0.89286	0.01349	0.00323
Alisocrinus? heterodactylus	7	0.03571	0.92857	0.01223	0.00354
Dendrocrinus n. sp. aff. *navigiolum*	3	0.01531	0.94388	0.02116	0.00401
Plicodendrocrinus casei	3	0.01531	0.95918	0.02604	0.00410
Compsocrinus nodosus	2	0.01020	0.96939	0.02471	0.00358
Protaxocrinus girardeau	2	0.01020	0.97959	0.02620	0.00335
Clidochirus serrulatus	1	0.00510	0.98469	0.02792	0.00407
Culicocrinus? girardeauensis	1	0.00510	0.98980	0.02679	0.00322
Dendrocrinus constrictus	1	0.00510	0.99490	0.02958	0.00552
Dendrocrinus curvijunctus	1	0.00510	1.00000	0.02995	0.00407

Lebanon Ls.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Tryssocrinus endotomous	37	0.19786	na	na	0.00361
Gustabilocrinus plektanikaulos	25	0.13369	na	na	0.00188
Cleiocrinus tessellatus	21	0.11230	na	na	0.00501
Columbicrinus crassus	16	0.08556	0.52941	0.06723	0.00290
Hybocrinus bilateralis	14	0.07487	0.60428	0.05848	0.00299
Abludoglyptocrinus charltoni	13	0.06952	0.67380	0.05518	0.00331
Reteocrinus variabilicaulis	12	0.06417	0.73797	0.05152	0.00229
Reteocrinus polki	9	0.04813	0.78610	0.04858	0.00259
Carabocrinus sp.	8	0.04278	0.82888	0.04283	0.00134
Reteocrinus fenestratus	5	0.02674	0.85561	0.04225	0.00263
Porocrinus lebanonensis	4	0.02139	0.87701	0.03860	0.00153
Diablocrinus sp.	4	0.02139	0.89840	0.03514	0.00135
Cupulocrinus species cf. *C. gracilis*	2	0.01070	0.90909	0.03263	0.00153
Gustabilocrinus latomium	2	0.01070	0.91979	0.03104	0.00187
Quinquecaudex species A	2	0.01070	0.93048	0.03002	0.00202
Tornatilicrinus longicaudis	2	0.01070	0.94118	0.03163	0.00352
Cremacrinus sp.	2	0.01070	0.95187	0.03211	0.00313
Anomalocrinus antiquus	1	0.00535	0.95722	0.03207	0.00293
Apodasmocrinus sp. cf. *A. daubei*	1	0.00535	0.96257	0.03189	0.00291
Archaeocrinus snyderi	1	0.00535	0.96791	0.03080	0.00157
Cleiocrinus laevis	1	0.00535	0.97326	0.03680	0.00664
Cleiocrinus springeri	1	0.00535	0.97861	0.03850	0.00405
Undescribed cladid 1	1	0.00535	0.98396	0.03794	0.00248
Reterocrinus sp.	1	0.00535	0.98930	0.03781	0.00266
Doliocrinus monilicaulis	1	0.00535	0.99465	0.03749	0.00254
Balacrinus sp.	1	0.00535	1.00000	0.03735	0.00263

Mountain Lake mmb., Bromide Fm.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Hybocrinus nitidus	3447	0.77131	na	na	0.00341
Palaeocrinus hudsoni	513	0.11479	na	na	0.00297
Carabocrinus treadwelli	196	0.04386	na	na	0.00189
Diabolocrinus arbucklensis	108	0.02417	0.95413	0.03204	0.00379
Paracremacrinus laticardinalis	99	0.02215	0.97628	0.03815	0.00517
Apodasmocrinus daubei	39	0.00873	0.98501	0.03546	0.00384
Archaeocrinus conicus	26	0.00582	0.99083	0.03827	0.00358
Eopinnacrinus pinnulatus	14	0.00313	0.99396	0.03406	0.00209
Archaeocrinus buckhornensis	10	0.00224	0.99620	0.03700	0.00461
Doliocrinus pustulatus	5	0.00112	0.99731	0.03786	0.00439
Acolocrinus arbucklensis	2	0.00045	0.99776	0.04006	0.00573
Bromidocrinus nodosus	2	0.00045	0.99821	0.03949	0.00301
Colpodecrinus quadrifidus	2	0.00045	0.99866	0.03727	0.00218
Columbicrinus sulphurensis	1	0.00022	0.99888	0.03659	0.00377
Agostocrinus xenus	1	0.00022	0.99910	0.03546	0.00254
Dendrocrinus villosus	1	0.00022	0.99933	0.03426	0.00256
Diabolocrinus constrictus	1	0.00022	0.99955	0.03467	0.00360
Palaeocrinus sp. cf. *P. planobasalis*	1	0.00022	0.99978	0.03412	0.00301
Paradiabolocrinus stellatus	1	0.00022	1.00000	0.03492	0.00421

Pooleville mmb., Bromide Fm.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Archaeocrinus subovalis	180	0.38380	na	na	0.00346
Cremacrinus ramifer	65	0.13859	na	na	0.00498
Diabolocrinus poolevillensis	41	0.08742	na	na	0.00423
Hybocrinus crinerensis	40	0.08529	0.69510	0.04617	0.00472
Anthracocrinus primitivus	35	0.07463	0.76972	0.03804	0.00303
Parachaeocrinus decoratus	26	0.05544	0.82516	0.03517	0.00381
Porocrinus bromidensis	21	0.04478	0.86994	0.03459	0.00356
Peltacrinus sculptatus	18	0.03838	0.90832	0.03748	0.00505
Calceocrinus longifrons	15	0.03198	0.94030	0.03908	0.00549
Cleiocrinus bromidensis	12	0.02559	0.96588	0.04217	0.00570
Abludoglyptocrinus laticostatus	7	0.01493	0.98081	0.04266	0.00516
Cleiocrinus ornatus	2	0.00426	0.98507	0.04285	0.00503
Penicillicrinus parvus	2	0.00426	0.98934	0.04328	0.00483
Acolocrinus crinerensis	1	0.00213	0.99147	0.04592	0.00698
Diabolocrinus oklahomensis	1	0.00213	0.99360	0.04507	0.00394
Merocrinus impressus	1	0.00213	0.99574	0.04359	0.00348
Quinquecaudex glabellus	1	0.00213	0.99787	0.04279	0.00393

Crinerocrinus parvicostatus	1	0.00213	1.00000	0.04370	0.00541

Waynesville Fm.

Species	Abundance	% Abundance	Add. Abund.	Additive Disparity	Partial Disparity
Glyptocrinus fornshelli	20	0.18519	na	na	0.00522
Plicodendrocrinus casei	18	0.16667	na	na	0.00372
Dendrocrinus cauduceus	17	0.15741	na	na	0.00316
Gaurocrinus nealli	14	0.12963	0.63889	0.03795	0.00439
Cupulocrinus plolydactylus	8	0.07407	0.71296	0.03290	0.00341
Canistrocrinus typus	5	0.04630	0.75926	0.03018	0.00285
Cincinnaticrinus pentagonus	5	0.04630	0.80556	0.03341	0.00487
Iocrinus subcrassus	5	0.04630	0.85185	0.03149	0.00346
Reteocrinus magnificus	4	0.03704	0.88889	0.03190	0.00418
Rhaphanocrinus sculptus	4	0.03704	0.92593	0.03109	0.00393
Dendrocrinus posticus	3	0.02778	0.95370	0.03026	0.00375
Cupulocrinus minimus	2	0.01852	0.97222	0.02955	0.00387
Canistrocrinus richardsoni	1	0.00926	0.98148	0.03032	0.00408
Compsocrinus miamiensis	1	0.00926	0.99074	0.03138	0.00489
Ohiocrinus sp.	1	0.00926	1.00000	0.03237	0.00491

APPENDIX 5

Chapter 2; Species Character States

Morphological character states of the 479 crinoid species examined in Chapter 2. Descriptions of the characters and individual states are given in appendix 1. Crinoids were coded morphologically based on inspection of published crinoid plates and inspection of museum, private, and field collections.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Abacocrinus latus	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abacocrinus sp A	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abacocrinus sp B	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abludoglyptocrinus charltoni	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Abludoglyptocrinus laticostatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Abludoglyptocrinus pustulosus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Acacocrinus anebos	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Aclistocrinus articus	3	1	2	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Aclistocrinus capistratus	3	2	2	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Acolocrinus arbucklensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1
Acolocrinus crinerensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1
Acolocrinus hydraulicus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	2
Adelplicrinus fortuitus	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Aetocrinus gracilis	3	NA	2	1	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	2	1	1
Agostocrinus xenus	3	1	1	1	1	6	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Agostocrinus xenus (benbolt)	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Alisocrinus tetrarmatus	3	1	1	1	1	1	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Alisocrinus? heterodactylus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Allocrinus cf. A. *subglobosus*	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Allocrinus ornatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Allozygocrinus dubuquensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	2	3	1
Allozygocrinus exallos	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Alopocrinus parvus	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Anisocrinus prinstaensis	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	3	1	1	1	1	0	3	5	1	0	1
Anomalocrinus antiquus	3	NA	1	1	2	1	NA	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Anomalocrinus incurvus	3	1	1	1	2	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	2	2	2	3	5	1	0	1
Anthracocrinus primitivus	3	NA	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Apoarchaeocrinus anticostiensis	3	2	2	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Apodasmocrinus daubei	3	1	2	1	2	5	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1
Apodasmocrinus punctatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Apodasmocrinus sp. cf. *A. daubei*	3	1	2	1	2	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1
Archaeocalyptocrinus nodosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Archaeocalyptocrinus rowensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Archaeocrinus buckhornensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus conicus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus desideratus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus lacunosus	1	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus microbasalis	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus ottawaensis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus peculiaris	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	2	1	0	3	5	1	0	2
Archaeocrinus peculiaris (benbolt)	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Abacocrinus latus	2	1	0	0	0	0	2	1	1	2	2	NA	NA	1	2	1	2	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abacocrinus sp A	2	1	0	0	0	0	2	1	1	2	2	NA	NA	1	2	1	2	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abacocrinus sp B	2	1	0	0	0	0	2	1	1	3	2	NA	NA	1	2	1	2	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abludoglyptocrinus charltoni	1	1	0	0	0	0	1	1	1	3	2	1	4	1	2	1	2	1	2	10	2	1	3	1	1	0	1	0	1
Abludoglyptocrinus laticostatus	1	1	0	0	0	0	1	1	1	3	2	3	6	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Abludoglyptocrinus pustulosus	2	1	0	0	0	0	1	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Acacocrinus anebos	2	1	0	0	0	0	2	1	1	3	2	1	5	1	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Aclistocrinus articus	2	1	0	0	0	0	2	1	1	2	2	2	2	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	2
Aclistocrinus capistratus	2	1	0	0	0	0	1	1	1	2	2	2	6	1	2	1	1	1	2	10	1	1	1	1	1	0	0	0	2
Acolocrinus arbucklensis	1	1	0	0	0	0	1	1	1	4	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Acolocrinus crinerensis	1	1	0	0	0	0	1	1	1	8	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Acolocrinus hydraulicus	2	1	0	0	0	0	2	1	1	8	2	2	1	2	2	1	1	1	1	0	0	0	0	1	0	0	0	0	0
Adelplicrinus fortuitus	2	1	0	0	0	0	1	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Aetocrinus gracilis	NA	3	5	1	1	NA	9	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	3	1	0	1
Agostocrinus xenus	2	3	5	1	1	1	3	1	1	3	2	1	1	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Agostocrinus xenus (benbolt)	2	1	0	0	0	0	2	1	1	3	2	2	2	2	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Alisocrinus tetrarmatus	2	1	0	0	0	0	2	1	1	3	2	1	6	1	2	1	2	2	2	20	1	1	2	1	1	0	1	0	1
Alisocrinus? heterodactylus	2	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	1	2	20	1	1	2	1	1	0	0	0	1
Allocrinus cf. A. *subglobosus*	1	1	0	0	0	0	1	1	1	4	2	1	5	1	2	1	1	1	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Allocrinus ornatus	1	1	0	0	0	0	1	1	1	3	1	1	5	1	2	1	1	2	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Allozygocrinus dubuquensis	2	3	5	1	1	2	NA	1	1	8	3	1	1	1	2	1	1	1	2	NA	1	NA	NA	NA	NA	NA	NA	NA	NA
Allozygocrinus exallos	2	3	5	1	1	1	1	2	1	3	2	NA	NA	NA	NA	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alopocrinus parvus	2	1	0	0	0	0	1	1	1	3	2	2	6	1	2	1	2	2	2	10	1	1	NA	1	1	0	0	0	2
Anisocrinus prinstaensis	2	3	NA	1	1	NA	4	1	1	2	1	1	1	1	NA	1	1	1	2	10	1	1	NA	1	2	1	1	0	1
Anomalocrinus antiquus	3	1	0	0	0	0	1	1	1	3	1	3	6	1	2	1	1	1	2	5	1	1	3	1	2	3	2	1	1
Anomalocrinus incurvus	1	1	0	0	0	0	1	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	2	5	1
Anthracocrinus primitivus	2	2	5	1	1	1	3	1	1	3	1	1	5	2	2	1	1	1	2	15	1	1	3	1	1	0	0	0	1
Apoarchaeocrinus anticostiensis	1	2	5	1	1	1	2	1	1	4	2	NA	5	2	2	1	1	1	2	10	1	1	NA	1	1	0	0	0	1
Apodasmocrinus daubei	2	1	0	0	0	0	2	1	1	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Apodasmocrinus punctatus	2	1	0	0	0	0	1	1	1	3	1	2	6	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Apodasmocrinus sp. cf. *A. daubei*	2	1	0	0	0	0	2	1	1	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Archaeocalyptocrinus nodosus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	1	1	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Archaeocalyptocrinus rowensis	1	1	0	0	0	0	1	1	1	1	3	3	5	1	2	2	1	1	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Archaeocrinus buckhornensis	2	2	5	1	1	1	1	1	1	8	3	1	5	2	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus conicus	2	2	5	1	1	1	1	1	1	9	3	1	5	2	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus desideratus	0	3	5	1	1	1	1	1	1	3	2	3	1	2	2	1	1	1	2	40	1	2	2	1	2	2	1	0	1
Archaeocrinus lacunosus	2	2	5	1	1	1	NA	1	1	3	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	2
Archaeocrinus microbasalis	2	3	5	1	1	1	1	1	1	3	2	3	1	2	2	1	1	1	2	10	1	1	3	1	2	2	1	0	1
Archaeocrinus ottawaensis	2	3	5	1	1	1	NA	1	1	4	2	1	6	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	2
Archaeocrinus peculiaris	2	2	5	1	2	1	1	1	1	4	2	1	1	1	2	1	1	1	2	NA	1	1	2	1	NA	NA	NA	NA	NA
Archaeocrinus peculiaris (benbolt)	2	2	5	1	1	1	2	1	1	3	2	1	1	2	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	2

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Abacocrinus latus	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abacocrinus sp A	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abacocrinus sp B	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abludoglyptocrinus charltoni	1	2	1	1	1	1	2	6	2	1	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	1	1	1
Abludoglyptocrinus laticostatus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Abludoglyptocrinus pustulosus	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Acacocrinus anebos	NA	NA	NA	NA	NA	1	2	3	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Aclistocrinus articus	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	1	1	2	NA	1	1
Aclistocrinus capistratus	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	3	1	1	2	NA	2	NA	2	NA	NA	2	NA	1	1
Acolocrinus arbucklensis	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	1
Acolocrinus crinerensis	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	2
Acolocrinus hydraulicus	0	0	0	0	0	0	1	0	1	0	2	11	1	0	0	0	0	1	1	0	0	0	0	1	1	0	NA	1	1
Adelplicrinus fortuitus	1	1	1	1	1	1	2	3	2	1	1	0	1	0	0	2	1	1	2	1	1	1	2	2	1	3	0	1	1
Aetocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Agostocrinus xenus	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Agostocrinus xenus (benbolt)	1	1	2	1	2	2	1	0	1	0	1	0	1	0	0	1	1	1	1	0	0	0	0	2	1	0	NA	1	1
Alisocrinus tetrarmatus	1	1	2	1	1	1	2	7	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	1	1	1
Alisocrinus? heterodactylus	1	1	2	1	1	1	2	7	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Allocrinus cf. A. *subglobosus*	NA	NA	NA	NA	NA	1	2	3	2	3	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Allocrinus ornatus	NA	NA	NA	NA	NA	1	2	3	2	3	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Allozygocrinus dubuquensis	NA	NA	NA	NA	NA	1	2	3	2	1	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Allozygocrinus exallos	NA	NA	NA	NA	NA	NA	2	NA	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Alopocrinus parvus	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Anisocrinus prinstaensis	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Anomalocrinus antiquus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	2	1	1	0	1	1
Anomalocrinus incurvus	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1
Anthracocrinus primitivus	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	2	1	1	NA	NA	1	0	2	NA	2	1
Apoarchaeocrinus anticostiensis	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	0	NA	1	1
Apodasmocrinus daubei	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	0	4	1	1
Apodasmocrinus punctatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Apodasmocrinus sp. cf. *A. daubei*	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	0	4	1	1
Archaeocalyptocrinus nodosus	NA	NA	NA	NA	NA	NA	2	6	2	2	NA	NA	1	0	0	NA	NA	1	0	0	0	0	0	2	2	2	NA	1	1
Archaeocalyptocrinus rowensis	NA	NA	NA	NA	NA	NA	2	6	2	2	NA	NA	1	0	0	NA	NA	1	0	0	0	0	0	2	2	2	NA	1	1
Archaeocrinus buckhornensis	NA	NA	NA	NA	NA	NA	2	5	2	2	NA	NA	1	0	1	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Archaeocrinus conicus	NA	NA	NA	NA	NA	NA	2	5	2	2	NA	NA	1	0	1	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Archaeocrinus desideratus	1	1	2	1	1	1	2	8	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Archaeocrinus lacunosus	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Archaeocrinus microbasalis	1	2	2	1	1	1	2	8	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	1	1	1
Archaeocrinus ottawaensis	1	0	2	1	1	1	2	4	2	2	1	1	1	0	0	3	1	1	1	0	0	0	0	NA	NA	0	NA	1	1
Archaeocrinus peculiaris	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	2	2	NA	1	1	2	1	2	NA	1	2
Archaeocrinus peculiaris (benbolt)	1	1	2	1	1	1	2	3	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1

Species	88	89	90	91	92
Abacocrinus latus	1	1	1	NA	1
Abacocrinus sp A	1	1	1	NA	1
Abacocrinus sp B	1	1	1	NA	1
Abludoglyptocrinus charltoni	*1*	1	1	0	1
Abludoglyptocrinus laticostatus	1	1	1	NA	1
Abludoglyptocrinus pustulosus	1	1	1	NA	1
Acacocrinus anebos	1	1	1	NA	1
Aclistocrinus articus	*1*	1	1	0	1
Aclistocrinus capistratus	*1*	1	1	1	2
Acolocrinus arbucklensis	1	1	1	0	1
Acolocrinus crinerensis	1	1	2	0	1
Acolocrinus hydraulicus	1	1	1	0	1
Adelplicrinus fortuitus	*2*	1	1	1	1
Aetocrinus gracilis	1	1	1	1	1
Agostocrinus xenus	1	1	1	NA	1
Agostocrinus xenus (benbolt)	*1*	1	1	0	1
Alisocrinus tetrarmatus	*1*	1	1	0	1
Alisocrinus? heterodactylus	1	1	1	NA	1
Allocrinus cf. A. *subglobosus*	*1*	1	1	0	1
Allocrinus ornatus	*1*	1	1	0	1
Allozygocrinus dubuquensis	*1*	1	1	NA	1
Allozygocrinus exallos	1	1	1	NA	1
Alopocrinus parvus	1	1	1	NA	1
Anisocrinus prinstaensis	1	1	1	NA	1
Anomalocrinus antiquus	*1*	1	1	0	1
Anomalocrinus incurvus	1	1	1	1	1
Anthracocrinus primitivus	*1*	1	1	1	1
Apoarchaeocrinus anticostiensis	1	1	1	0	1
Apodasmocrinus daubei	1	1	1	1	1
Apodasmocrinus punctatus	*1*	1	1	0	1
Apodasmocrinus sp. cf. *A. daubei*	1	1	1	1	1
Archaeocalyptocrinus nodosus	*1*	1	1	0	2
Archaeocalyptocrinus rowensis	*1*	1	1	0	2
Archaeocrinus buckhornensis	1	1	1	NA	1
Archaeocrinus conicus	1	1	1	NA	1
Archaeocrinus desideratus	*1*	1	1	NA	1
Archaeocrinus lacunosus	*1*	1	1	NA	1
Archaeocrinus microbasalis	*1*	1	1	1	1
Archaeocrinus ottawaensis	1	1	1	0	1
Archaeocrinus peculiaris	*1*	1	1	NA	1
Archaeocrinus peculiaris (benbolt)	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Archaeocrinus snyderi	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Archaeocrinus subovalis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaetaxocrinus burfordi	3	2	1	1	2	1	6	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Archaetaxocrinus lanei	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	NA	NA	NA	NA	NA
Astakocrinus teren	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	2	1	0	1
Atactocrinus wilmingtonensis	3	NA	NA	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Atalocrinus actus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Atopocrinus priscus	3	2	1	1	2	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	2	3	5	1	0	1
Balacrinus sp.	3	1	2	1	2	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Balbocrinus sp.	3	1	1	1	2	5	NA	1	1	1	0	0	NA	NA	2	3	6	1	1	0	1	1	1	0	3	6	1	0	1
Becsciecrinus adonis	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Bikocrinus baios	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Bolicrinus deflatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Bolicrinus globosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Brechmocrinus eos	3	1	1	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Bromidocrinus nodosus	3	1	2	1	1	5	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Bucucrinus saccus	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Calceocrinus alleni	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	2	1	0	1	2	2	3	3	4	NA	NA	NA
Calceocrinus barrandii	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	4	1	1	0	1	2	2	2	3	4	1	0	2
Calceocrinus constrictus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Calceocrinus gamachicus	3	1	1	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Calceocrinus gossmani	3	1	2	1	1	1	NA	1	NA	1	0	0	2	3	2	3	5	2	2	1	1	2	2	3	3	1	1	0	1
Calceocrinus incertus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	4	2	2	1	1	2	2	2	3	4	1	0	2
Calceocrinus levorsoni	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	3	4	1	0	2
Calceocrinus longifrons	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	4	2	2	1	1	2	2	3	3	4	1	0	2
Calceocrinus multibifurcatus	3	1	1	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	4	2	2	1	1	2	2	3	3	4	1	0	2
Calceocrinus pusulosus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Calceocrinus sp?	3	2	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	NA	3	NA	NA	NA	NA
Calceocrinus tridactylus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	4	1	0	2
Caleidocrinus gerki	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Calliocrinus longspinus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1
Callistocrinus tesselatus	3	2	2	1	1	1	NA	1	NA	2	2	1	NA	NA	2	3	5	1	2	3	1	1	1	1	3	5	1	0	1
Canistrocrinus richardsoni	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Canistrocrinus typus	3	NA	NA	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	1	3	5	1	0	1
Carabocrinus sp.	3	1	1	1	1	1	6	1	2	1	0	0	NA	0	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Carabocrinus (Kimmswik)	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus boltoni	3	NA	1	1	2	1	6	1	NA	1	0	0	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	4	2	1	2
Carabocrinus sp. cf. *treadwelli*	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus conoideus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus dicyclicus	3	1	1	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus huronensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Archaeocrinus snyderi	2	2	5	1	1	1	0	1	1	3	2	2	1	1	2	1	1	1	2	10	1	1	3	1	2	3	1	0	1
Archaeocrinus subovalis	2	2	5	1	1	1	1	1	1	3	2	2	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1
Archaetaxocrinus burfordi	2	3	5	1	1	1	4	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Archaetaxocrinus lanei	NA	NA	NA	NA	NA	NA	NA	1	1	2	2	1	5	NA	NA	1	1	1	2	10	1	1	1	1	2	2	2	4	1
Astakocrinus teren	2	1	0	0	0	0	2	1	1	3	2	NA	5	1	2	1	1	1	2	10	1	1	NA	1	1	0	0	0	2
Atactocrinus wilmingtonensis	2	2	5	1	1	1	1	1	1	3	2	1	5	2	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atalocrinus actus	2	1	0	0	0	0	2	1	1	2	2	2	5	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	2
Atopocrinus priscus	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	7	1	1	2	1	1	0	0	0	1
Balacrinus sp.	2	3	5	1	1	1	1	1	1	8	2	3	6	1	2	1	2	2	2	10	1	1	3	1	2	1	1	1	1
Balbocrinus sp.	2	3	6	1	1	2	NA	1	1	2	2	2	1	1	2	1	1	2	2	6	1	1	3	1	1	0	0	0	1
Becsciecrinus adonis	NA	2	5	1	1	1	2	1	1	3	2	NA	5	2	2	1	2	1	2	10	1	1	NA	1	2	2	1	0	1
Bikocrinus baios	2	1	0	0	0	0	1	1	1	3	2	3	6	1	NA	1	2	2	2	10	1	1	NA	1	NA	NA	NA	NA	NA
Bolicrinus deflatus	1	1	0	0	0	0	1	1	1	3	2	2	5	1	2	1	2	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Bolicrinus globosus	1	1	0	0	0	0	1	1	1	4	2	2	5	1	2	1	2	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Brechmocrinus eos	2	3	5	1	1	2	4	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Bromidocrinus nodosus	2	2	5	1	1	1	1	1	1	4	2	1	1	1	2	1	1	2	2	10	1	1	3	1	1	0	1	0	2
Bucucrinus saccus	NA	2	5	1	1	1	2	1	1	3	2	NA	5	2	NA	2	1	1	2	40	1	1	NA	1	1	0	0	0	1
Calceocrinus alleni	NA	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	NA	1	1	NA	NA	NA	NA	NA
Calceocrinus barrandii	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	2	2	5	1
Calceocrinus constrictus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	2	2	2	1
Calceocrinus gamachicus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	2	2	5	1
Calceocrinus gossmani	2	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	3	2	3	1	1	2	1	1	0	1
Calceocrinus incertus	2	1	0	0	0	0	4	1	1	10	2	2	1	1	2	1	1	1	2	3	1	3	1	1	2	3	2	1	1
Calceocrinus levorsoni	2	1	0	0	0	0	2	1	1	10	1	2	2	1	2	1	1	1	2	3	2	3	1	1	2	3	2	4	1
Calceocrinus longifrons	2	1	0	0	0	0	3	1	1	10	2	2	1	1	2	1	1	1	2	3	1	3	1	1	2	2	2	1	1
Calceocrinus multibifurcatus	2	1	0	0	0	0	3	1	1	10	2	2	1	1	2	1	1	1	2	3	1	2	1	1	2	2	2	1	1
Calceocrinus pusulosus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	3	2	4	1
Calceocrinus sp?	2	1	0	0	0	0	NA	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	2	NA	NA	1
Calceocrinus tridactylus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	5	1
Caleidocrinus gerki	1	1	0	0	0	0	1	1	1	3	2	2	5	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Calliocrinus longspinus	2	1	0	0	0	0	NA	1	1	1	2	2	6	2	2	3	1	1	2	NA	1	1	1	1	NA	NA	NA	NA	NA
Callistocrinus tesselatus	2	2	5	1	1	1	1	1	1	8	2	1	1	1	2	1	2	1	2	30	1	2	1	1	2	2	2	3	1
Canistrocrinus richardsoni	2	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	2	1	2	20	1	1	3	1	2	1	1	0	1
Canistrocrinus typus	2	3	5	1	1	1	2	1	1	3	2	5	1	2	1	2	1	2	2	20	1	1	3	1	2	2	1	0	1
Carabocrinus sp.	2	NA	NA	NA	NA	NA	NA	1	1	3	2	3	5	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Carabocrinus (Kimmswik)	2	3	5	1	1	1	2	1	1	3	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	1
Carabocrinus boltoni	2	3	5	1	2	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus sp. cf. *treadwelli*	2	3	5	1	1	1	1	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Carabocrinus conoideus	2	3	5	1	1	1	4	1	1	NA	2	1	1	1	2	1	2	2	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Carabocrinus dicyclicus	2	3	5	1	1	1	4	1	1	8	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Carabocrinus huronensis	2	3	5	1	1	1	2	1	1	8	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Archaeocrinus snyderi	1	2	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	2	1	1	1
Archaeocrinus subovalis	1	2	1	1	1	1	2	7	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Archaetaxocrinus burfordi	1	1	2	1	1	1	2	2	2	2	1	0	1	0	0	NA	1	1	2	1	1	1	1	NA	NA	2	0	1	1
Archaetaxocrinus lanei	1	1	2	1	1	1	2	3	2	2	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Astakocrinus teren	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Atactocrinus wilmingtonensis	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Atalocrinus actus	1	1	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Atopocrinus priscus	1	2	2	1	1	1	2	2	1	0	2	2	1	0	0	NA	1	1	2	1	NA	NA	NA	1	1	2	NA	1	1
Balacrinus sp.	1	1	1	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	1	1	1	2
Balbocrinus sp.	1	1	2	1	1	1	2	5	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	2	1	1	0	1	1
Becsciecrinus adonis	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Bikocrinus baios	NA	NA	NA	NA	1	1	2	3	2	2	NA	NA	1	0	0	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Bolicrinus deflatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Bolicrinus globosus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Brechmocrinus eos	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	1
Bromidocrinus nodosus	1	1	2	1	1	1	2	9	2	2	2	1	1	0	0	NA	1	1	2	1	1	1	1	2	1	2	2	1	1
Bucucrinus saccus	1	2	NA	1	1	1	2	NA	2	2	2	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	NA	NA	1	1
Calceocrinus alleni	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	2	NA	NA	NA	NA	1	1	NA	NA	1	1
Calceocrinus barrandii	1	1	3	1	1	1	2	1	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	2	NA	1	2
Calceocrinus constrictus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	2	NA	1	1
Calceocrinus gamachicus	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Calceocrinus gossmani	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	2
Calceocrinus incertus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	NA	NA	NA	1	2	NA	1	1
Calceocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Calceocrinus longifrons	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	2	2	1	1	1	1	1	1	2	NA	1	2
Calceocrinus multibifurcatus	1	2	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	NA	NA	1	1	2	NA	1	2
Calceocrinus pusulosus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	1	NA	1	1
Calceocrinus sp?	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Calceocrinus tridactylus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Caleidocrinus gerki	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	2	1	2	NA	1	1
Calliocrinus longspinus	1	NA	NA	1	1	1	2	NA	NA	NA	NA	NA	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	2
Callistocrinus tesselatus	1	1	3	1	1	1	2	7	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	NA	NA	3	NA	1	1
Canistrocrinus richardsoni	*1*	*2*	*2*	*1*	*1*	*1*	*2*	*3*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*1*	*2*	*1*	*1*	*1*
Canistrocrinus typus	1	2	1	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	2	1	NA	1	1	NA	NA	1	NA	1	1
Carabocrinus sp.	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	1	1	1	1
Carabocrinus (Kimmswik)	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	1	NA	1	1
Carabocrinus boltoni	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	2	1	0	0	0	0	1	1	NA	NA	1	1
Carabocrinus sp. cf. *treadwelli*	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
Carabocrinus conoideus	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Carabocrinus dicyclicus	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1
Carabocrinus huronensis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1

Species	88	89	90	91	92
Archaeocrinus snyderi	1	1	1	0	1
Archaeocrinus subovalis	1	1	1	NA	1
Archaetaxocrinus burfordi	1	1	1	1	1
Archaetaxocrinus lanei	1	1	1	NA	1
Astakocrinus teren	1	1	1	NA	1
Atactocrinus wilmingtonensis	1	1	1	1	1
Atalocrinus actus	*1*	1	1	NA	1
Atopocrinus priscus	1	1	1	1	1
Balacrinus sp.	*1*	1	1	0	1
Balbocrinus sp.	2	2	1	0	1
Becsciecrinus adonis	1	1	1	NA	1
Bikocrinus baios	1	1	1	NA	1
Bolicrinus deflatus	*1*	1	1	0	1
Bolicrinus globosus	*1*	1	1	0	1
Brechmocrinus eos	1	1	1	1	1
Bromidocrinus nodosus	1	1	1	1	1
Bucucrinus saccus	1	1	1	NA	1
Calceocrinus alleni	*1*	1	1	1	1
Calceocrinus barrandii	1	1	1	1	1
Calceocrinus constrictus	1	1	1	1	1
Calceocrinus gamachicus	1	1	1	NA	1
Calceocrinus gossmani	1	1	1	1	1
Calceocrinus incertus	*1*	1	1	NA	1
Calceocrinus levorsoni	1	1	1	1	1
Calceocrinus longifrons	*1*	1	1	1	1
Calceocrinus multibifurcatus	*1*	1	1	NA	1
Calceocrinus pusulosus	1	1	1	1	1
Calceocrinus sp?	1	1	1	NA	1
Calceocrinus tridactylus	*1*	1	1	1	1
Caleidocrinus gerki	1	1	1	1	1
Calliocrinus longspinus	1	1	1	1	2
Callistocrinus tesselatus	*1*	1	1	0	1
Canistrocrinus richardsoni	*1*	1	*1*	*NA*	1
Canistrocrinus typus	1	1	1	1	1
Carabocrinus sp.	*1*	1	1	0	1
Carabocrinus (Kimmswik)	1	1	1	NA	1
Carabocrinus boltoni	1	1	1	0	1
Carabocrinus sp. cf. *treadwelli*	*1*	1	1	0	1
Carabocrinus conoideus	1	1	1	0	1
Carabocrinus dicyclicus	*1*	1	1	1	1
Carabocrinus huronensis	*1*	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Carabocrinus magnificus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Carabocrinus micropunctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	2
Carabocrinus oogyi	3	1	1	1	2	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus radiatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus slocomi	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus stellifer	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus treadwelli	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus valis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carbocrinus radiatus	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Carpocrinus bodei	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	2
Carpocrinus sp.	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	2
Cataractocrinus clementi	3	2	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Cataraquicrinus elongatus	3	1	2	1	2	5	6	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	2	2	3	3	5	1	0	1
Charactocrinus billingsi	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	2	2	3	3	3	1	0	NA
Chenocrinus canadaensis	3	NA	2	1	1	1	5	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Chirocrinus? twenhofeli	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	2	3	3	NA	NA	NA	NA
Cincinnaticrinus pentagonus	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Cincinnaticrinus varibrachialis	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Cleicrinus regius	3	1	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleicrinus sculptus	3	1	1	1	1	5	5	1	NA	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus bromidensis	3	1	NA	NA	NA	NA	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus laevis	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus magnificus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cleiocrinus ornatus	3	1	1	1	1	6	6	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus springeri	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus tessellatus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Clematocrinus ohioensis	3	NA	NA	NA	NA	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Clidochirus americanus	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Clidochirus anebos	3	1	1	1	1	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Clidochirus serrulatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Clidochirus springeri	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Clidochirus ulrichi	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Clidochirus vaurealensis	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Cnemocrinus fillmorensis	3	1	2	1	2	1	6	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Colpodecrinus quadrifidus	3	1	2	1	2	3	4	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Columbicrinus crassus	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Columbicrinus sulphurensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Compsocrinus miamiensis	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Compsocrinus nodosus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	1	0	3	5	1	0	2
Compsocrinus relictus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Corvucrinus schucherti	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	NA

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Carabocrinus magnificus	2	3	5	1	1	1	4	1	1	8	2	1	1	1	2	2	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Carabocrinus micropunctatus	2	3	5	1	1	1	4	1	1	3	2	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Carabocrinus oogyi	2	3	5	1	1	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus radiatus	2	3	5	1	1	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus slocomi	2	3	5	1	1	1	4	1	1	2	3	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus stellifer	2	3	5	1	1	1	4	1	1	4	1	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Carabocrinus treadwelli	2	3	5	1	1	1	1	1	1	4	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Carabocrinus valis	2	3	5	1	1	1	2	1	1	4	2	1	1	1	2	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Carbocrinus radiatus	2	3	4	1	2	1	3	1	1	8	2	1	6	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Carpocrinus bodei	2	1	0	0	0	0	2	1	1	3	2	2	1	1	2	1	1	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Carpocrinus sp.	2	1	0	0	0	0	2	1	1	3	1	3	1	1	2	1	1	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Cataractocrinus clementi	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	4	1	1	1	1	2	1	1	0	1
Cataraquicrinus elongatus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Charactocrinus billingsi	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	2	2	4	1
Chenocrinus canadaensis	2	1	0	0	0	0	1	1	1	2	2	3	6	1	NA	2	1	1	2	20	1	1	NA	1	1	0	0	0	1
Chirocrinus? twenhofeli	NA	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	1	1
Cincinnaticrinus pentagonus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Cincinnaticrinus varibrachialis	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Cleicrinus regius	2	2	5	1	1	2	1	1	1	7	1	1	5	1	2	1	1	1	2	40	2	1	2	1	2	1	1	0	1
Cleicrinus sculptus	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus bromidensis	2	3	5	1	1	1	1	1	1	7	1	1	6	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus laevis	0	2	5	1	1	1	0	1	1	7	3	1	1	1	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus magnificus	2	2	5	1	1	1	1	1	1	7	3	1	NA	2	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus ornatus	0	2	5	1	1	1	1	1	1	7	3	1	6	1	2	1	1	1	2	80	1	1	3	1	NA	NA	NA	NA	NA
Cleiocrinus springeri	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus tessellatus	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Clematocrinus ohioensis	2	1	0	0	0	0	1	1	1	3	1	1	6	1	1	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Clidochirus americanus	2	3	5	1	1	1	2	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Clidochirus anebos	1	3	3	1	1	2	4	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Clidochirus serrulatus	1	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	2	5	1
Clidochirus springeri	2	3	5	1	1	1	2	1	1	2	2	1	1	1	2	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Clidochirus ulrichi	2	3	5	1	1	1	3	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Clidochirus vaurealensis	2	3	3	1	2	1	3	1	1	2	2	NA	NA	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Cnemocrinus fillmorensis	2	3	5	1	1	1	5	1	1	8	2	2	1	1	2	1	2	2	2	5	1	1	3	1	2	2	1	0	1
Colpodecrinus quadrifidus	2	3	4	1	1	2	1	1	1	8	3	1	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Columbicrinus crassus	2	1	0	0	0	0	1	1	1	1	2	1	5	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Columbicrinus sulphurensis	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Compsocrinus miamiensis	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*1*	*2*	*14*	*1*	*2*	*3*	*1*	*1*	*0*	*0*	*0*	*1*
Compsocrinus nodosus	2	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Compsocrinus relictus	2	1	0	0	0	0	2	1	1	2	2	3	5	1	1	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Corvucrinus schucherti	2	1	0	0	0	0	1	1	1	10	2	2	2	2	2	1	1	1	2	3	1	3	1	1	NA	NA	NA	NA	NA

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Carabocrinus magnificus	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Carabocrinus micropunctatus	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2
Carabocrinus oogyi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	3	NA	1	1
Carabocrinus radiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carabocrinus slocomi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carabocrinus stellifer	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Carabocrinus treadwelli	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
Carabocrinus valis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carbocrinus radiatus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carpocrinus bodei	NA	NA	NA	NA	NA	1	2	3	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Carpocrinus sp.	NA	NA	NA	NA	NA	1	2	3	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Cataractocrinus clementi	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	4	NA	1	1
Cataraquicrinus elongatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	3	NA	1	1
Charactocrinus billingsi	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Chenocrinus canadaensis	1	1	NA	1	1	1	2	NA	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1
Chirocrinus? twenhofeli	1	1	NA	1	1	1	2	1	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cincinnaticrinus pentagonus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1
Cincinnaticrinus varibrachialis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1
Cleicrinus regius	1	1	2	1	1	1	2	20	1	0	1	0	1	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	2	1
Cleicrinus sculptus	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Cleiocrinus bromidensis	NA	NA	NA	NA	NA	NA	2	NA	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1
Cleiocrinus laevis	NA	NA	NA	NA	NA	1	2	6	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1	NA	2	2
Cleiocrinus magnificus	NA	NA	NA	NA	1	1	2	40	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	3	NA	2	1
Cleiocrinus ornatus	NA	NA	NA	1	1	1	2	17	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	2	1
Cleiocrinus springeri	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Cleiocrinus tessellatus	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Clematocrinus ohioensis	1	2	2	1	1	1	2	1	2	3	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	NA	1	1
Clidochirus americanus	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Clidochirus anebos	2	1	2	1	1	1	2	3	1	0	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Clidochirus serrulatus	1	2	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	1	NA	1	1
Clidochirus springeri	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Clidochirus ulrichi	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Clidochirus vaurealensis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cnemocrinus fillmorensis	1	1	1	1	1	1	2	2	2	2	1	0	1	0	0	3	1	1	1	0	0	0	0	2	2	2	0	1	1
Colpodecrinus quadrifidus	1	1	2	1	1	1	2	4	2	2	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	3	1	1
Columbicrinus crassus	1	2	3	1	1	1	1	0	1	0	2	1	1	0	0	4	1	1	2	1	1	1	1	1	1	2	2	1	1
Columbicrinus sulphurensis	1	2	2	1	1	1	2	2	1	0	2	1	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1
Compsocrinus miamiensis	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*6*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*3*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*
Compsocrinus nodosus	1	1	2	1	1	1	2	3	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Compsocrinus relictus	1	2	1	1	1	1	2	4	2	1	2	1	1	0	0	4	1	1	1	0	0	0	0	2	1	2	NA	1	1
Corvucrinus schucherti	NA	NA	NA	NA	NA	1	1	0	1	0	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1

Species	88	89	90	91	92
Carabocrinus magnificus	1	1	1	NA	1
Carabocrinus micropunctatus	*1*	1	1	NA	1
Carabocrinus oogyi	1	1	1	0	1
Carabocrinus radiatus	1	1	1	NA	1
Carabocrinus slocomi	1	1	2	NA	1
Carabocrinus stellifer	*1*	1	1	NA	1
Carabocrinus treadwelli	*1*	1	1	0	1
Carabocrinus valis	1	1	1	0	1
Carbocrinus radiatus	*1*	1	1	0	1
Carpocrinus bodei	*1*	1	1	NA	1
Carpocrinus sp.	*1*	1	1	NA	1
Cataractocrinus clementi	*1*	1	1	1	1
Cataraquicrinus elongatus	1	1	1	1	1
Charactocrinus billingsi	1	1	1	NA	1
Chenocrinus canadaensis	1	1	1	NA	1
Chirocrinus? twenhofeli	1	1	1	NA	1
Cincinnaticrinus pentagonus	1	1	1	NA	1
Cincinnaticrinus varibrachialis	1	1	1	NA	1
Cleicrinus regius	*1*	1	1	NA	1
Cleicrinus sculptus	*1*	1	1	NA	1
Cleiocrinus bromidensis	*1*	1	1	NA	1
Cleiocrinus laevis	1	1	1	NA	1
Cleiocrinus magnificus	1	1	1	NA	1
Cleiocrinus ornatus	*1*	1	1	NA	1
Cleiocrinus springeri	*1*	1	1	NA	1
Cleiocrinus tessellatus	*1*	1	1	NA	1
Clematocrinus ohioensis	1	1	1	0	1
Clidochirus americanus	*1*	1	1	0	1
Clidochirus anebos	1	1	1	NA	1
Clidochirus serrulatus	1	1	1	0	1
Clidochirus springeri	*1*	1	1	0	1
Clidochirus ulrichi	*1*	1	1	0	1
Clidochirus vaurealensis	1	1	1	NA	1
Cnemocrinus fillmorensis	*2*	1	1	0	1
Colpodecrinus quadrifidus	1	1	2	NA	1
Columbicrinus crassus	*1*	1	1	1	1
Columbicrinus sulphurensis	1	1	1	1	1
Compsocrinus miamiensis	*1*	1	*1*	*NA*	1
Compsocrinus nodosus	1	1	1	NA	1
Compsocrinus relictus	*1*	1	1	0	1
Corvucrinus schucherti	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Cotylacrinus sandra	3	2	2	1	1	1	6	1	NA	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Cremacrinus sp.	3	1	1	1	1	1	1	1	?	1	0	0	1	0	2	3	1	1	1	0	1	0	1	0	3	5	1	0	2
Cremacrinus arctus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	1	0	3	3	1	0	2
Cremacrinus articulosus v1	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	2	3	4	1	0	2
Cremacrinus articulosus v2	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Cremacrinus crossmani	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	NA	NA	NA	NA	NA
Cremacrinus forrestonensis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	2	1	0	1	2	2	3	3	3	1	0	2
Cremacrinus gerki	3	1	1	1	1	1	2	1	1	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	3	4	1	0	1
Cremacrinus guttenbergensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	4	2	2	1	1	2	2	2	2	4	1	0	1
Cremacrinus latus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	1	1	0	1
Cremacrinus punctatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Cremacrinus ramifer	3	1	1	1	1	1	NA	NA	NA	1	0	0	NA	NA	2	3	1	1	1	0	1	0	1	0	3	3	1	0	2
Crinerocrinus parvicostatus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	6	1	2	2	1	1	1	0	3	5	1	0	1
Culicocrinus? girardeauensis	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Cupulocrinus canaliculatus	3	1	2	1	1	7	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus crossmani	3	1	1	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus cylindricus	3	1	2	1	1	1	3	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cupulocrinus dixiei	3	1	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Cupulocrinus gracilis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Cupulocrinus heterocostalis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1
Cupulocrinus humulis	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Cupulocrinus jewetti	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus jewetti (Decorah)	3	2	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus kentuckyensis	3	NA	NA	NA	NA	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Cupulocrinus latibrachiatus	3	NA	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus levorsoni	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus minimus	3	2	NA	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus molanderi	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus plattevillensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Cupulocrinus plolydactylus	3	1	1	1	1	1	1	2	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus sp A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	NA	NA	NA
Cupulocrinus sp. cf. *Latibrachialus*	3	1	1	1	1	8	1	2	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus sp. cf. *C. gracilis*	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cupulorcrinus angustatus	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Cybelecrinus ladus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cybelecrinus nebros	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Daedalocrinus bellevillnsis	3	1	1	1	2	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Daedalocrinus kirki	3	1	2	1	1	5	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	1
Dendrocrinus abactronodosus	3	1	2	1	2	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus acutidactylus	3	2	1	1	1	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Dendrocrinus alternatus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Cotylacrinus sandra	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	2
Cremacrinus sp.	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	6	1	3	1	1	2	3	2	5	1
Cremacrinus arctus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	2	1	1	2	4	1	3	1	1	2	3	2	1	1
Cremacrinus articulosus v1	2	1	0	0	0	0	1	1	1	10	2	2	1	1	1	1	1	1	2	4	1	3	1	1	2	2	2	1	1
Cremacrinus articulosus v2	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	4	1	3	1	1	2	2	2	1	1
Cremacrinus crossmani	NA	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	4	2	3	2	1	2	2	1	0	1
Cremacrinus forrestonensis	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	4	2	3	1	1	2	3	1	0	1
Cremacrinus gerki	2	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	4	2	3	1	1	2	3	2	2	1
Cremacrinus guttenbergensis	1	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	4	2	3	1	1	2	2	2	1	1
Cremacrinus latus	2	1	0	0	0	0	1	1	1	10	2	2	1	1	1	1	1	1	2	5	1	3	1	1	2	3	2	5	1
Cremacrinus punctatus	2	1	0	0	0	0	1	1	1	10	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	3	2	5	1
Cremacrinus ramifer	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	3	3	1	1	2	2	2	5	1
Crinerocrinus parvicostatus	2	2	5	1	1	1	1	1	1	4	1	1	6	1	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Culicocrinus? girardeauensis	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*1*	*1*	*2*	*10*	*1*	*1*	*3*	*1*	*1*	*0*	*0*	*0*	*1*
Cupulocrinus canaliculatus	2	3	5	1	1	1	2	1	1	2	2	2	2	1	1	1	1	1	2	2	1	1	2	1	2	2	1	0	1
Cupulocrinus crossmani	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Cupulocrinus cylindricus	2	3	5	1	1	1	0	1	1	3	2	2	5	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Cupulocrinus dixiei	2	3	4	1	2	1	3	1	1	8	2	1	6	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Cupulocrinus gracilis	2	3	5	1	1	1	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Cupulocrinus heterocostalis	2	3	5	1	1	1	NA	1	1	3	2	2	6	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Cupulocrinus humulis	2	3	5	1	1	1	3	1	1	2	2	3	1	1	2	1	1	1	2	5	1	1	2	1	2	4	1	0	1
Cupulocrinus jewetti	2	3	5	1	0	1	2	1	1	2	2	2	2	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus jewetti (Decorah)	2	3	5	1	1	1	2	1	1	2	2	2	2	1	2	1	1	2	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus kentuckyensis	2	3	5	1	1	2	3	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus latibrachiatus	2	3	5	1	1	1	6	1	1	3	2	NA	1	1	2	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Cupulocrinus levorsoni	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Cupulocrinus minimus	2	3	5	1	1	1	2	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	2	NA	NA	NA	1
Cupulocrinus molanderi	2	3	5	1	1	1	2	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Cupulocrinus plattevillensis	2	3	5	1	1	1	NA	1	1	2	3	2	6	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus plolydactylus	1	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus sp A	NA	3	NA	NA	NA	NA	2	1	1	2	NA	2	5	1	1	1	1	1	2	10	1	1	1	1	2	3	1	0	1
Cupulocrinus sp. cf. *Latibrachialus*	1	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus sp. cf. *C. gracilis*	1	3	5	1	1	1	0	1	1	2	2	3	5	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Cupulorcrinus angustatus	2	3	5	1	1	1	2	1	1	2	2	2	6	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cybelecrinus ladus	2	3	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	2	2	20	1	1	NA	1	1	0	0	0	1
Cybelecrinus nebros	2	3	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	2	2	20	1	1	NA	1	1	0	0	0	1
Daedalocrinus bellevillnsis	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	2	2	1
Daedalocrinus kirki	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	2	2	1
Dendrocrinus abactronodosus	2	3	5	1	1	1	3	1	1	2	3	1	1	1	1	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Dendrocrinus acutidactylus	2	3	5	1	1	1	NA	1	1	2	2	1	NA	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Dendrocrinus alternatus	2	3	5	1	1	1	1	1	1	2	2	1	6	1	2	1	1	1	2	5	1	1	3	1	NA	NA	NA	NA	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Cotylacrinus sandra	1	1	2	1	2	1	2	4	2	2	2	1	1	0	0	2	1	1	0	0	0	0	0	2	2	0	NA	1	1
Cremacrinus sp.	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1
Cremacrinus arctus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	2
Cremacrinus articulosus v1	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cremacrinus articulosus v2	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cremacrinus crossmani	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus forrestonensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	NA	1	1	1	2	NA	1	2
Cremacrinus gerki	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	NA	NA	NA	NA	1	1	2	0	1	2
Cremacrinus guttenbergensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus latus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	2
Cremacrinus punctatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus ramifer	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	2
Crinerocrinus parvicostatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Culicocrinus? girardeauensis	1	1	2	1	1	1	2	8	2	1	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	1	1	1
Cupulocrinus canaliculatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1
Cupulocrinus crossmani	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	1	1	1	3	NA	1	1
Cupulocrinus cylindricus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	2	1	1	1
Cupulocrinus dixiei	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Cupulocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	NA	NA	NA	2	NA	NA	NA	NA	1	1
Cupulocrinus heterocostalis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	1	1	2	0	1	1
Cupulocrinus humulis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	2	1	3	NA	1	1
Cupulocrinus jewetti	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cupulocrinus jewetti (Decorah)	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cupulocrinus kentuckyensis	1	1	1	1	1	1	2	1	2	3	1	0	1	0	0	NA	1	1	2	1	2	1	2	NA	NA	3	NA	1	1
Cupulocrinus latibrachiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	NA	NA	NA	NA	NA	NA	1	1
Cupulocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	4	NA	1	1
Cupulocrinus minimus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1
Cupulocrinus molanderi	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Cupulocrinus plattevillensis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	3	0	1	1
Cupulocrinus plolydactylus	1	1	2	1	1	1	1	0	1	0	1	1	1	0	1	4	1	1	2	1	1	1	1	1	1	3	NA	1	1
Cupulocrinus sp A	1	1	2	1	1	1	2	3	2	2	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Cupulocrinus sp. cf. *Latibrachialus*	1	1	2	1	1	1	1	0	1	0	1	1	1	0	1	4	1	1	2	1	1	1	1	1	1	3	NA	1	1
Cupulocrinus sp. cf. *C. gracilis*	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1
Cupulorcrinus angustatus	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	0	1	1
Cybelecrinus ladus	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cybelecrinus nebros	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	2	NA	1	1	2	2	3	NA	NA	1	1
Daedalocrinus bellevillnsis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	1	0	1	1
Daedalocrinus kirki	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	0	1	1
Dendrocrinus abactronodosus	1	1	3	1	1	1	1	0	1	0	0	0	1	0	0	4	1	1	2	2	2	1	1	1	1	3	NA	1	1
Dendrocrinus acutidactylus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	NA	NA	1	NA	1	1
Dendrocrinus alternatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	NA	1	1	1

Species	88	89	90	91	92
Cotylacrinus sandra	1	1	1	1	1
Cremacrinus sp.	*1*	1	1	0	1
Cremacrinus arctus	*1*	1	1	1	1
Cremacrinus articulosus v1	*1*	1	1	1	1
Cremacrinus articulosus v2	*1*	1	1	1	1
Cremacrinus crossmani	1	1	1	1	1
Cremacrinus forrestonensis	1	1	1	1	1
Cremacrinus gerki	1	1	1	1	1
Cremacrinus guttenbergensis	1	1	1	1	1
Cremacrinus latus	*1*	1	1	NA	1
Cremacrinus punctatus	1	1	1	1	1
Cremacrinus ramifer	*1*	1	1	0	1
Crinerocrinus parvicostatus	1	1	1	NA	1
Culicocrinus? girardeauensis	*1*	1	*1*	*NA*	1
Cupulocrinus canaliculatus	1	1	1	NA	1
Cupulocrinus crossmani	1	1	1	1	1
Cupulocrinus cylindricus	*1*	1	1	1	1
Cupulocrinus dixiei	*1*	1	1	0	1
Cupulocrinus gracilis	1	1	1	1	1
Cupulocrinus heterocostalis	*1*	1	1	NA	1
Cupulocrinus humulis	1	1	1	1	1
Cupulocrinus jewetti	1	1	1	NA	1
Cupulocrinus jewetti (Decorah)	1	1	1	1	1
Cupulocrinus kentuckyensis	1	1	1	1	1
Cupulocrinus latibrachiatus	1	1	1	1	1
Cupulocrinus levorsoni	1	1	1	1	1
Cupulocrinus minimus	1	1	1	NA	1
Cupulocrinus molanderi	*1*	1	1	NA	1
Cupulocrinus plattevillensis	*1*	1	1	0	1
Cupulocrinus plolydactylus	1	1	1	1	1
Cupulocrinus sp A	1	1	1	NA	1
Cupulocrinus sp. cf. *Latibrachialus*	1	1	1	1	1
Cupulocrinus sp. cf. *C. gracilis*	*1*	1	1	1	1
Cupulorcrinus angustatus	*1*	1	1	1	1
Cybelecrinus ladus	1	1	NA	1	1
Cybelecrinus nebros	1	1	NA	1	1
Daedalocrinus bellevillnsis	*1*	1	1	1	1
Daedalocrinus kirki	*1*	1	1	1	1
Dendrocrinus abactronodosus	*1*	1	1	1	1
Dendrocrinus acutidactylus	1	1	1	1	1
Dendrocrinus alternatus	1	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Dendrocrinus cauduceus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus constrictus	3	2	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Dendrocrinus curvijunctus	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus daytonensis	3	2	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Dendrocrinus erraticus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus gracilis	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Dendrocrinus leptos	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Dendrocrinus minutus	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	2	1	1	0	3	5	1	0	1
Dendrocrinus n. sp. aff. *navigiolum*	3	1	2	1	1	1	NA	1	NA	2	1	1	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus navigiolum	3	2	1	1	1	5	NA	1	NA	1	0	0	1	0	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Dendrocrinus parvus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus posticus	3	1	1	1	1	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus sp. Indet	3	1	NA	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Dendrocrinus ursae	3	1	2	1	2	5	NA	1	NA	2	2	2	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus villosus	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Dendrocrius aphelos	3	1	2	1	2	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Deocrinus asperatus	3	NA	NA	NA	NA	5	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diablocrinus sp.	3	1	2	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Diabolocrinus arbucklensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus constrictus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus n. sp.	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus n. sp.	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus oklahomensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus perplexus	3	1	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus poolevillensis	3	1	2	1	1	1	NA	1	2	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus vesperalus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diaphorocrinus pleniramulus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	3	1	0	2
Difficilicrinus coneyi	3	NA	NA	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Dimerocrinites elegans	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Dimerocrinites hopkintonensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinites sculptus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinites sp.	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinities sculptus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Doliocrinus monilicaulis	3	1	2	1	1	1	5	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Doliocrinus pustulatus	3	1	2	1	1	1	5	1	NA	1	0	0	NA	NA	2	5	5	1	1	0	1	1	2	2	3	5	1	0	1
Drymocrinus manitoulinensis	3	2	2	1	1	1	5	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Dynamocrinus robustus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Dystactocrinus constrictus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Ectenocrinus geniculatus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Ectenocrinus simplex	3	2	2	1	1	1	5	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Ectenocrinus sp.	3	2	1	1	1	1	1	1	1	1	0	0	2	3	2	3	5	1	2	3	1	1	2	3	3	5	1	0	2

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Dendrocrinus cauduceus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Dendrocrinus constrictus	2	3	5	1	1	1	4	1	1	2	3	2	1	1	1	1	1	1	2	5	1	NA	2	NA	NA	NA	NA	NA	NA
Dendrocrinus curvijunctus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Dendrocrinus daytonensis	2	3	5	1	1	2	2	1	1	2	3	2	1	1	1	1	1	1	2	5	1	NA	2	NA	NA	NA	NA	NA	NA
Dendrocrinus erraticus	2	3	5	1	1	2	3	1	1	8	2	1	1	1	2	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Dendrocrinus gracilis	2	3	5	1	1	2	1	1	1	2	1	1	5	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Dendrocrinus leptos	2	3	5	1	0	NA	3	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1
Dendrocrinus minutus	2	3	5	1	1	1	NA	1	1	2	2	2	NA	NA	1	1	1	1	2	5	1	1	NA	1	2	3	1	0	1
Dendrocrinus n. sp. aff. *navigiolum*	2	3	5	1	1	1	2	1	1	2	3	2	1	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Dendrocrinus navigiolum	2	3	5	1	1	2	NA	1	1	2	3	2	NA	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Dendrocrinus parvus	2	3	5	1	1	1	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Dendrocrinus posticus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Dendrocrinus sp. Indet	2	3	5	1	1	2	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Dendrocrinus ursae	2	3	5	1	1	1	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	NA	2	1	NA	NA	NA	NA	NA
Dendrocrinus villosus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	NA	2	1	NA	NA	NA	NA	NA
Dendrocrius aphelos	2	3	5	1	1	2	4	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Deocrinus asperatus	2	2	5	1	1	1	1	1	1	3	2	3	6	2	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Diablocrinus sp.	2	2	5	1	1	1	1	1	1	3	2	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	1	0	1
Diabolocrinus arbucklensis	1	2	5	1	1	1	2	1	1	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2
Diabolocrinus constrictus	1	2	5	1	1	1	2	1	1	3	1	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	1
Diabolocrinus n. sp.	2	2	5	1	1	1	1	1	1	4	1	2	5	1	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Diabolocrinus n. sp.	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Diabolocrinus oklahomensis	1	2	5	1	1	1	2	1	1	3	1	3	1	2	2	1	1	2	2	0	1	1	3	1	1	0	0	0	1
Diabolocrinus perplexus	2	2	5	1	1	1	1	1	1	6	1	2	5	2	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Diabolocrinus poolevillensis	1	2	5	1	1	1	2	1	1	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2
Diabolocrinus vesperalus	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Diaphorocrinus pleniramulus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	4	2	5	1
Difficilicrinus coneyi	2	1	0	0	0	0	1	1	1	1	2	2	2	1	1	1	1	1	2	5	1	NA	1	NA	NA	NA	NA	NA	NA
Dimerocrinites elegans	2	2	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	NA	2	10	1	1	NA	1	1	0	0	0	1
Dimerocrinites hopkintonensis	2	3	5	1	1	1	2	1	1	8	2	1	1	1	2	1	2	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinites sculptus	2	3	5	1	1	2	2	1	1	9	3	1	1	1	2	1	1	2	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinites sp.	2	3	5	1	1	2	2	1	1	8	2	1	5	1	2	1	2	2	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinities sculptus	2	2	5	1	1	1	2	1	1	8	2	2	5	2	2	1	1	2	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Doliocrinus monilicaulis	2	1	0	0	0	0	1	1	1	1	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Doliocrinus pustulatus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	2	1	1	0	0	0	1
Drymocrinus manitoulinensis	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	10	1	1	1	1	2	2	2	2	1
Dynamocrinus robustus	2	1	0	0	0	0	1	1	1	3	2	1	5	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	2
Dystactocrinus constrictus	2	1	0	0	0	0	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	2	2	4	1
Ectenocrinus geniculatus	2	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Ectenocrinus simplex	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	10	1	1	1	1	2	2	2	2	1
Ectenocrinus sp.	2	1	0	0	0	0	2	1	1	8	2	1	1	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Dendrocrinus cauduceus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	1	NA	1	1	1	1	NA	NA	1	1
Dendrocrinus constrictus	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	0	1	2
Dendrocrinus curvijunctus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	3	NA	1	1
Dendrocrinus daytonensis	NA	NA	NA	NA	1	1	1	0	1	0	1	0	1	0	0	NA	NA	1	1	0	0	0	0	1	1	0	NA	1	1
Dendrocrinus erraticus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	2	1	1	1	2	1	1	3	NA	1	1
Dendrocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	NA	NA	3	1	1	1
Dendrocrinus leptos	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	NA	NA	2	1	NA	NA	NA	NA	1	1
Dendrocrinus minutus	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dendrocrinus n. sp. aff. *navigiolum*	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Dendrocrinus navigiolum	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	3	NA	1	1
Dendrocrinus parvus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	NA	1	1
Dendrocrinus posticus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	1	1	1	1	3	NA	1	1
Dendrocrinus sp. Indet	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Dendrocrinus ursae	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dendrocrinus villosus	NA	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Dendrocrius aphelos	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	4	NA	1	1
Deocrinus asperatus	NA	NA	NA	NA	NA	NA	2	5	2	2	NA	NA	1	0	0	NA	NA	1	2	2	NA	1	1	2	2	2	NA	1	2
Diablocrinus sp.	1	2	2	1	1	1	2	2	1	0	2	1	1	0	0	3	1	1	1	1	1	1	1	1	1	2	NA	1	1
Diabolocrinus arbucklensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus constrictus	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus n. sp.	NA	NA	NA	NA	2	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	1	2	1	2	1	1	1
Diabolocrinus n. sp.	NA	NA	2	1	1	1	2	4	2	1	NA	NA	1	1	1	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Diabolocrinus oklahomensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus perplexus	NA	NA	NA	NA	2	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	1	2	1	2	1	1	1
Diabolocrinus poolevillensis	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus vesperalus	1	1	2	1	1	1	2	4	2	2	2	1	1	1	1	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Diaphorocrinus pleniramulus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Difficilicrinus coneyi	NA	NA	NA	NA	1	1	1	0	1	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	1	NA	NA	1	1
Dimerocrinites elegans	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dimerocrinites hopkintonensis	NA	NA	NA	1	NA	1	2	2	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinites sculptus	NA	NA	NA	1	NA	1	2	5	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinites sp.	NA	NA	NA	1	NA	1	2	NA	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinities sculptus	NA	NA	NA	NA	NA	1	2	5	2	2	1	0	1	0	0	0	NA	NA	1	1	0	0	0	0	2	2	2	NA	1
Doliocrinus monilicaulis	1	1	2	1	1	1	2	1	2	1	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	4	NA	1	1
Doliocrinus pustulatus	0	2	2	1	1	1	2	1	1	0	2	1	1	0	0	NA	1	1	2	1	1	1	1	1	1	0	NA	1	2
Drymocrinus manitoulinensis	1	2	3	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1
Dynamocrinus robustus	1	1	1	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Dystactocrinus constrictus	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	4	1	1
Ectenocrinus geniculatus	1	2	2	1	1	1	1	0	1	0	1	0	1	0	0	4	2	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Ectenocrinus simplex	1	1	3	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1
Ectenocrinus sp.	NA	NA	NA	NA	NA	1	2	1	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	1	1	NA	0	1	1

Species	88	89	90	91	92
Dendrocrinus cauduceus	1	1	1	1	1
Dendrocrinus constrictus	*1*	1	1	NA	1
Dendrocrinus curvijunctus	1	1	1	1	1
Dendrocrinus daytonensis	*1*	1	1	0	1
Dendrocrinus erraticus	1	1	1	1	1
Dendrocrinus gracilis	1	1	1	0	1
Dendrocrinus leptos	1	1	1	1	1
Dendrocrinus minutus	1	1	1	NA	1
Dendrocrinus n. sp. aff. *navigiolum*	1	1	1	NA	1
Dendrocrinus navigiolum	1	1	1	NA	1
Dendrocrinus parvus	*1*	1	1	1	1
Dendrocrinus posticus	1	1	1	1	1
Dendrocrinus sp. Indet	1	1	1	1	1
Dendrocrinus ursae	*1*	1	1	1	1
Dendrocrinus villosus	1	1	1	NA	1
Dendrocrius aphelos	*1*	1	1	1	1
Deocrinus asperatus	1	1	1	1	1
Diablocrinus sp.	*1*	1	1	1	1
Diabolocrinus arbucklensis	1	1	1	1	1
Diabolocrinus constrictus	1	1	1	1	1
Diabolocrinus n. sp.	*1*	1	1	1	1
Diabolocrinus n. sp.	*1*	1	1	1	1
Diabolocrinus oklahomensis	1	1	1	1	1
Diabolocrinus perplexus	*1*	1	1	1	1
Diabolocrinus poolevillensis	1	1	1	1	1
Diabolocrinus vesperalus	*1*	1	1	1	1
Diaphorocrinus pleniramulus	*1*	1	1	1	1
Difficilicrinus coneyi	*1*	1	1	0	1
Dimerocrinites elegans	1	1	1	NA	1
Dimerocrinites hopkintonensis	*1*	1	1	0	1
Dimerocrinites sculptus	*1*	1	1	0	1
Dimerocrinites sp.	*1*	1	1	0	1
Dimerocrinities sculptus	1	1	1	0	1
Doliocrinus monilicaulis	*1*	1	1	1	1
Doliocrinus pustulatus	1	1	1	1	1
Drymocrinus manitoulinensis	1	1	1	1	1
Dynamocrinus robustus	*1*	1	1	NA	1
Dystactocrinus constrictus	*1*	1	1	0	1
Ectenocrinus geniculatus	*1*	1	1	NA	1
Ectenocrinus simplex	1	1	1	1	1
Ectenocrinus sp.	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Eknomocrinus wahwahnsis	*3*	*1*	*1*	*1*	*2*	*1*	*5*	*1*	*1*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*2*	*1*	*1*	*2*	*1*	*0*	*3*	*5*	*2*	*2*	*1*
Elpasocrinus radiatus	3	2	2	1	2	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	2	1	0	3	5	2	1	2
Eomyelodactylus forester	3	2	2	2	2	2	1	1	2	2	2	3	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus plumosus	3	1	2	2	1	1	NA	1	NA	2	2	1	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus richardsoni	3	2	2	2	2	1	2	1	2	2	2	3	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eomyelodactylus rotundus	3	2	1	2	2	2	5	1	1	NA	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus sp.	3	2	2	2	2	2	2	1	2	2	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus sparteus	3	2	2	2	2	2	2	1	2	2	2	3	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus springeri	3	2	2	2	2	1	2	1	2	2	2	NA	NA	NA	2	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomylodactylus uniformis	3	1	1	2	2	2	5	1	1	2	1	1	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eoparisocrinus crossmani	3	1	2	1	2	1	NA	1	NA	1	0	0	2	3	2	3	5	2	2	1	1	1	1	0	3	5	1	0	1
Eoparisocrinus grandei	3	1	1	1	1	5	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Eoparisocrinus siluricus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Eopatelliocrinus latibrachiatus	3	1	2	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eopatelliocrinus ornatus	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	2	5	1	0	1
Eopatelliocrinus scyphogracilis	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eopinnacrinus pinnulatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	2	5	1	0	1
Eucalptocrinities archaios	3	NA	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Eucalyptocrinities depressus	3	1	1	1	1	1	NA	1	2	1	0	0	2	2	2	3	5	1	1	0	1	1	1	0	2	5	1	0	1
Eucalyptocrinities proboscidialis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Eucalyptocrinities sp. cf. *E. ornates*	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Euptychocrinus fimbriatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Euptychocrinus skopaios	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Euspirocrinus ? sp.	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Euspirocrinus gagoni	3	1	2	1	1	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Euspirocrinus heliktos	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Euspirocrinus wolcottense	3	2	2	1	2	1	1	2	NA	1	0	0	2	3	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Eustenocrinidae Indeterminante	3	NA	2	1	2	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	4	3	NA	NA	NA	NA
Eustenocrinus springeri	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Fibrocrinus phragmos	3	NA	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	2
Forest ?	3	NA	NA	NA	2	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	NA	3	5	1	0	1
Forest 13 cladid	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Forest 18	3	1	1	1	2	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Forest 2	3	1	2	1	2	6	NA	1	NA	1	0	0	2	3	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 3	3	1	2	1	2	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 4 cleicrinid	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Forest 5 Cam	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 6	3	1	1	1	2	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 7	3	1	1	1	2	6	NA	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Forest 9 Disparid	3	1	2	1	1	1	NA	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Eknomocrinus wahwahnsis	*2*	*1*	*0*	*0*	*0*	*0*	*2*	*1*	1	*3*	*2*	*3*	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*5*	*1*	*1*	*3*	*1*	*2*	*1*	*1*	*0*	*1*
Elpasocrinus radiatus	2	3	5	1	2	2	4	1	1	2	3	2	1	1	1	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Eomyelodactylus forester	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus plumosus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	2	1	0	0	0	0	1	1	1	NA	2	NA	NA	1	1	1	1	1	2	10	1	1	NA	1	2	2	1	0	1
Eomyelodactylus rotundus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus springeri	NA	1	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	2	NA	1	1	NA	1	2	2	1	0	1
Eomylodactylus uniformis	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eoparisocrinus crossmani	2	3	5	1	1	1	1	1	1	2	2	1	5	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Eoparisocrinus grandei	2	3	5	1	1	2	3	1	1	8	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	5	2	2	1
Eoparisocrinus siluricus	2	3	5	1	1	2	NA	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Eopatelliocrinus latibrachiatus	2	1	0	0	0	0	1	1	1	3	2	2	5	1	2	1	1	1	2	10	1	1	3	1	1	0	0	0	1
Eopatelliocrinus ornatus	1	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	2	2	10	1	1	3	1	1	0	1	0	1
Eopatelliocrinus scyphogracilis	2	1	0	0	0	0	1	1	1	2	2	2	5	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Eopinnacrinus pinnulatus	2	3	5	1	1	1	3	1	1	3	1	1	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Eucalptocrinities archaios	2	1	0	0	0	0	1	1	1	2	2	1	6	2	2	1	1	1	2	20	1	1	2	1	1	0	0	0	2
Eucalyptocrinities depressus	1	1	0	0	0	0	1	1	1	2	2	1	6	2	2	1	1	1	2	20	1	1	1	1	1	0	0	0	2
Eucalyptocrinities proboscidialis	2	1	0	0	0	0	1	1	1	2	3	1	6	2	2	1	1	1	2	NA	1	NA	2	NA	NA	NA	NA	NA	NA
Eucalyptocrinities sp. cf. *E. ornates*	2	1	0	0	0	0	1	1	1	8	2	1	6	2	2	1	1	1	2	NA	1	NA	2	NA	NA	NA	NA	NA	NA
Euptychocrinus fimbriatus	2	3	5	1	1	1	2	1	1	3	2	3	1	1	2	1	2	1	2	10	1	1	3	1	1	0	0	0	1
Euptychocrinus skopaios	2	3	5	1	1	1	1	1	1	3	2	3	2	1	2	1	2	1	2	10	1	1	3	1	1	0	0	0	1
Euspirocrinus ? sp.	NA	3	5	NA	NA	NA	NA	1	1	NA	NA	NA	NA	1	NA	1	1	1	2	10	1	1	NA	1	2	2	1	0	1
Euspirocrinus gagoni	2	3	5	1	1	NA	4	1	1	3	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	3	2	2	1
Euspirocrinus heliktos	2	3	5	1	1	1	3	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	2	2	2	2	1
Euspirocrinus wolcottense	2	3	5	1	1	1	5	1	1	3	2	1	2	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Eustenocrinidae Indeterminante	2	1	0	0	0	0	1	1	1	1	2	2	7	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Eustenocrinus springeri	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Fibrocrinus phragmos	2	1	0	0	0	0	2	1	1	3	2	NA	NA	1	2	1	1	1	2	20	1	1	NA	1	1	0	0	0	2
Forest ?	2	1	0	0	0	0	1	1	1	9	2	2	1	1	1	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Forest 13 cladid	2	3	5	1	1	1	NA	1	1	2	2	3	5	1	1	1	2	2	2	5	1	2	3	1	2	2	1	0	1
Forest 15	1	1	0	0	0	0	1	1	1	2	2	2	6	1	NA	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Forest 18	2	1	0	0	0	0	1	1	1	3	1	2	6	1	1	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Forest 2	2	3	5	1	1	2	NA	1	1	2	3	3	NA	1	1	1	2	2	2	10	1	1	2	1	2	3	2	2	1
Forest 3	2	1	0	0	0	0	NA	1	1	2	2	3	NA	1	1	1	1	2	2	10	1	1	3	1	2	3	2	2	1
Forest 4 cleicrinid	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	20	1	1	1	1	2	2	2	5	1
Forest 5 Cam	2	NA	NA	NA	NA	NA	NA	1	1	3	1	1	NA	NA	2	1	1	2	2	10	1	1	2	1	2	2	NA	NA	1
Forest 6	1	1	0	0	0	0	1	1	1	3	2	2	NA	1	1	1	1	2	2	10	1	1	2	1	2	3	1	0	1
Forest 7	2	1	0	0	0	0	1	1	1	9	3	3	NA	1	2	1	2	2	2	20	1	1	3	1	2	3	2	2	1
Forest 9 Disparid	2	1	0	0	0	0	1	1	1	2	2	3	6	1	1	1	1	1	2	5	1	1	2	1	2	3	2	4	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Eknomocrinus wahwahnsis	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*3*	*2*	*2*	*1*	*0*	*1*	*0*	*0*	*NA*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*2*	*1*	*4*	*0*	*1*	*1*
Elpasocrinus radiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	2	NA	1	3	NA	1	1
Eomyelodactylus forester	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus plumosus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eomyelodactylus rotundus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus springeri	1	1	NA	1	1	1	NA	NA	NA	1	0	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eomylodactylus uniformis	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eoparisocrinus crossmani	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	2	2	1	1	1	1	1	NA	1	1
Eoparisocrinus grandei	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	2	NA	1	1
Eoparisocrinus siluricus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	NA	NA	1	1
Eopatelliocrinus latibrachiatus	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Eopatelliocrinus ornatus	1	2	1	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Eopatelliocrinus scyphogracilis	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Eopinnacrinus pinnulatus	1	2	2	1	1	1	1	0	1	1	2	1	1	0	0	4	1	1	2	1	NA	1	1	1	1	1	NA	1	1
Eucalptocrinities archaios	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	2	1	1	2	2	NA	NA	NA	1	1	NA	NA	1	1
Eucalyptocrinities depressus	1	1	2	1	1	1	2	8	2	2	2	1	1	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Eucalyptocrinities proboscidialis	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Eucalyptocrinities sp. cf. *E. ornates*	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Euptychocrinus fimbriatus	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	2	1	1	1	1	1	1	2	NA	1	2
Euptychocrinus skopaios	1	1	2	1	1	1	2	6	2	1	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Euspirocrinus ? sp.	1	1	2	1	1	1	NA	NA	NA	NA	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	3	NA	1	1
Euspirocrinus gagoni	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Euspirocrinus heliktos	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	2	2	1	1	2	1	1	2	1	1	1
Euspirocrinus wolcottense	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	1	1	2	1	1	1	1	1	1	2	NA	1	1
Eustenocrinidae Indeterminante	NA	NA	NA	NA	1	1	2	1	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eustenocrinus springeri	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	4	4	1	1
Fibrocrinus phragmos	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	NA	NA	1	1
Forest ?	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	1	1
Forest 13 cladid	1	1	2	3	1	1	2	2	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	2	NA	1	1
Forest 15	1	1	2	1	1	1	2	2	2	2	1	0	1	0	0	3	1	NA	NA	NA	NA	NA	NA	NA	NA	3	NA	1	1
Forest 18	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	2	2	1	2	1	1	0	NA	1	1
Forest 2	1	1	2	1	1	1	2	7	2	1	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	4	NA	1	1
Forest 3	2	1	2	1	1	1	2	5	2	2	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Forest 4 cleicrinid	1	1	2	2	1	1	2	9	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	NA	NA	3	0	1	2
Forest 5 Cam	1	1	2	1	1	1	2	1	2	3	1	0	1	0	0	3	1	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Forest 6	1	1	2	1	1	1	2	3	2	2	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Forest 7	1	1	2	1	1	1	2	7	2	2	1	0	1	0	0	NA	1	1	0	0	0	0	0	2	3	4	NA	1	1
Forest 9 Disparid	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1

Species	88	89	90	91	92
Eknomocrinus wahwahnsis	*2*	1	1	*0*	1
Elpasocrinus radiatus	1	1	1	1	1
Eomyelodactylus forester	NA	NA	NA	NA	NA
Eomyelodactylus plumosus	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	1	1	1	NA	1
Eomyelodactylus rotundus	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	NA	NA	NA	NA
Eomyelodactylus springeri	1	1	1	NA	1
Eomylodactylus uniformis	NA	NA	NA	NA	NA
Eoparisocrinus crossmani	1	1	1	1	1
Eoparisocrinus grandei	1	1	1	1	1
Eoparisocrinus siluricus	*1*	1	1	NA	1
Eopatelliocrinus latibrachiatus	*1*	1	1	NA	1
Eopatelliocrinus ornatus	1	1	1	NA	1
Eopatelliocrinus scyphogracilis	*1*	1	1	NA	1
Eopinnacrinus pinnulatus	1	1	1	1	1
Eucalptocrinities archaios	1	1	1	1	2
Eucalyptocrinities depressus	1	1	1	NA	1
Eucalyptocrinities proboscidialis	1	1	1	NA	2
Eucalyptocrinities sp. cf. *E. ornates*	1	1	1	NA	2
Euptychocrinus fimbriatus	*1*	1	1	1	1
Euptychocrinus skopaios	1	1	1	NA	1
Euspirocrinus ? sp.	1	1	1	NA	1
Euspirocrinus gagoni	1	1	1	NA	1
Euspirocrinus heliktos	*1*	1	1	1	1
Euspirocrinus wolcottense	*1*	1	1	1	1
Eustenocrinidae Indeterminante	1	1	1	NA	1
Eustenocrinus springeri	*1*	1	1	0	1
Fibrocrinus phragmos	1	1	1	0	1
Forest ?	1	1	1	NA	1
Forest 13 cladid	1	1	1	1	1
Forest 15	1	1	1	NA	1
Forest 18	1	1	1	1	1
Forest 2	1	1	1	NA	1
Forest 3	1	1	1	NA	1
Forest 4 cleicrinid	1	1	1	1	1
Forest 5 Cam	1	1	1	NA	1
Forest 6	1	1	1	NA	1
Forest 7	1	1	1	0	1
Forest 9 Disparid	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Fragucrinus bothros	3	1	2	1	2	1	5	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	2	1	0	3	5	1	0	1
Gaurocrinus fimbriatus	3	1	2	1	1	6	5	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Gaurocrinus nealli	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Geraocrinus sculptus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Geraocrinus sculptus (Benbolt)	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Glaucocorinus falconeri	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	NA	NA	3	5	NA	NA	NA
Glenocrinus globularis	3	1	1	1	2	5	5	1	1	1	0	0	NA	NA	1	3	5	1	2	3	1	1	1	0	3	3	2	3	1
Glyptocrinus circumcarinatus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus decadactylus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus fornshelli	*3*	*1*	*2*	*1*	*1*	*5*	*1*	*1*	*2*	*1*	*0*	*0*	*2*	*6*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Glyptocrinus ramulosus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus tridactylus	3	NA	NA	NA	NA	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Gnorimocrinus? problematicus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	2
Grenprisa springeri	3	1	1	1	2	5	5	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Grenprisia billingsi	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Grypocrinus? genuinus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	3	1	1	0	1	2	2	1	3	NA	NA	NA	NA
Gustabilicrinus sp. Cf. *G. latomium*	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Gustabilocrinus latomium	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Gustabilocrinus plektanikaulos	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Habrotecrinus ibexensis	3	1	1	1	2	6	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Haptocrinus buttsi	3	2	2	1	2	1	5	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Haptocrinus calvatus	3	2	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	2	5	1	0	1
Homocrinus diminutus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Hormocrinus quebecensis	3	NA	1	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Hybocrinus bilateralis	3	2	2	1	2	1	NA	1	1	1	0	0	2	3	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus conicus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus crinerensis	3	NA	NA	1	1	1	6	NA	1	1	0	0	NA	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus nitidus	2	0	0	0	0	0	0	0	0	1	0	0	2	2	2	3	5	1	1	0	1	2	1	1	3	5	1	0	1
Hybocrinus perperamnominatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocrinus punctatocritatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocrinus punctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocrinus sp A	3	2	1	1	NA	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	NA	1	0	3	5	1	0	1
Hybocystis eldonensis	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocystis problematicus	3	1	1	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Ibanocrinus petalos	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Ibexocrinus lepton	3	1	1	1	2	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	1
Illemocrinus amphiatus	3	2	2	1	2	1	NA	1	NA	1	0	0	2	3	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Inyocrinus strimplei	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	5	3	5	1	0	1
Iocrinus similis	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	NA	3	NA	NA	NA	NA
Iocrinus subcrassus	3	1	2	1	1	6	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Iocrinus tretonensis	3	1	2	1	1	6	1	1	NA	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Fragucrinus bothros	NA	3	5	1	1	NA	2	1	1	2	1	NA	NA	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Gaurocrinus fimbriatus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	2	2	10	1	1	NA	1	2	2	NA	NA	1
Gaurocrinus nealli	2	2	5	1	1	1	1	1	1	3	2	3	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1
Geraocrinus sculptus	1	1	0	0	0	0	1	1	1	1	2	2	2	1	1	1	1	1	2	4	1	1	3	1	2	1	1	0	1
Geraocrinus sculptus (Benbolt)	1	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	2	4	2	2	1
Glaucocorinus falconeri	NA	1	0	0	0	0	NA	1	1	3	1	3	6	1	1	1	1	1	2	10	1	1	2	1	2	2	2	3	1
Glenocrinus globularis	2	3	5	2	2	2	NA	1	1	2	2	1	1	1	2	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Glyptocrinus circumcarinatus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	2	2	2	10	1	2	3	1	2	1	1	0	1
Glyptocrinus decadactylus	1	1	0	0	0	0	2	1	1	2	3	3	6	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Glyptocrinus fornshelli	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*9*	*3*	*1*	*5*	*1*	*2*	*1*	*2*	*2*	*2*	*10*	*1*	*1*	*3*	*1*	*1*	*0*	*1*	*0*	*1*
Glyptocrinus ramulosus	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	2	1	2	20	1	1	3	1	2	2	1	0	1
Glyptocrinus tridactylus	1	1	0	0	0	0	NA	1	1	8	2	3	5	1	2	1	2	2	2	15	1	1	2	1	2	2	2	5	1
Gnorimocrinus? problematicus	2	3	3	1	2	2	4	1	1	2	2	2	1	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Grenprisa springeri	2	3	5	1	1	2	2	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Grenprisia billingsi	2	3	5	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	2	NA	1
Grypocrinus? genuinus	NA	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gustabilicrinus sp. Cf. *G. latomium*	2	1	1	NA	NA	NA	NA	1	1	8	2	1	5	1	2	1	2	1	2	20	1	1	2	1	1	0	1	0	1
Gustabilocrinus latomium	2	3	5	1	1	2	2	1	1	2	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1
Gustabilocrinus plektanikaulos	2	3	5	1	1	2	2	1	1	3	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1
Habrotecrinus ibexensis	2	1	0	0	0	0	NA	1	2	8	2	1	1	1	2	1	2	2	2	5	1	1	3	1	2	2	1	0	1
Haptocrinus buttsi	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	3	2	2	1
Haptocrinus calvatus	2	1	0	0	0	0	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	3	2	2	1
Homocrinus diminutus	2	1	0	0	0	0	1	1	1	1	3	2	1	1	1	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Hormocrinus quebecensis	2	3	NA	NA	NA	NA	2	1	1	2	1	1	5	1	NA	1	2	1	2	5	1	1	NA	1	2	2	1	0	1
Hybocrinus bilateralis	2	1	0	0	0	0	2	1	1	8	2	1	2	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus conicus	2	1	0	0	0	0	2	1	1	2	3	2	1	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus crinerensis	2	1	0	0	0	0	2	1	1	2	2	3	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus nitidus	2	1	0	0	0	0	2	1	1	4	2	1	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus perperamnominatus	2	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocrinus punctatocritatus	2	1	0	0	0	0	2	1	1	1	3	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocrinus punctatus	2	1	0	0	0	0	2	1	1	4	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocrinus sp A	2	1	0	0	0	0	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	1	0	0	0	1
Hybocystis eldonensis	2	1	0	0	0	0	2	1	1	8	2	2	2	1	2	1	1	1	2	3	1	1	3	1	1	0	0	0	1
Hybocystis problematicus	2	1	0	0	0	0	2	1	1	8	2	2	2	1	2	1	1	1	2	3	1	1	3	1	1	0	0	0	1
Ibanocrinus petalos	2	1	0	0	0	0	2	1	1	2	2	2	5	1	2	1	2	1	2	20	1	NA	NA	1	NA	NA	NA	NA	NA
Ibexocrinus lepton	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Illemocrinus amphiatus	2	3	5	1	1	1	3	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Inyocrinus strimplei	2	1	0	0	0	0	NA	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Iocrinus similis	NA	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Iocrinus subcrassus	1	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Iocrinus tretonensis	1	1	0	0	0	0	1	1	1	2	2	2	4	1	2	1	1	2	2	10	1	1	2	1	2	1	1	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Fragucrinus bothros	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	NA	NA	1	2
Gaurocrinus fimbriatus	1	2	NA	1	1	1	2	NA	2	2	1	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	NA	NA	1	1
Gaurocrinus nealli	0	2	1	1	1	1	2	7	2	1	2	1	1	0	0	NA	1	1	2	1	NA	NA	NA	NA	NA	2	2	1	1
Geraocrinus sculptus	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	1
Geraocrinus sculptus (Benbolt)	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Glaucocorinus falconeri	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	1	1	NA	1	1
Glenocrinus globularis	1	1	1	1	1	1	2	3	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	2	1	3	0	1	1
Glyptocrinus circumcarinatus	1	1	2	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	NA	1	1	1	1
Glyptocrinus decadactylus	1	2	2	1	1	1	2	6	2	1	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	1	1	1
Glyptocrinus fornshelli	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*5*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*
Glyptocrinus ramulosus	1	2	2	1	1	1	2	8	2	2	2	1	1	0	0	0	1	1	1	0	0	0	0	2	1	2	NA	1	1
Glyptocrinus tridactylus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Gnorimocrinus? problematicus	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Grenprisa springeri	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	3	1	1	1
Grenprisia billingsi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	3	NA	1	1
Grypocrinus? genuinus	NA	NA	NA	NA	NA	NA	2	1	1	0	NA	NA	1	0	0	NA	NA	1	2	NA	NA	NA	NA	1	1	NA	NA	1	2
Gustabilicrinus sp. Cf. *G. latomium*	1	1	1	1	1	1	2	7	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	1	2	NA	1	1
Gustabilocrinus latomium	1	2	2	1	1	1	1	7	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Gustabilocrinus plektanikaulos	1	2	2	1	1	1	1	7	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Habrotecrinus ibexensis	1	1	1	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	3	0	1	1
Haptocrinus buttsi	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	NA	2	1	2	NA	NA	3	NA	1	1
Haptocrinus calvatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	3	NA	1	1
Homocrinus diminutus	1	1	4	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	0	NA	1	1
Hormocrinus quebecensis	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Hybocrinus bilateralis	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus conicus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus crinerensis	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	0	1	2
Hybocrinus nitidus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus perperamnominatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocrinus punctatocritatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocrinus punctatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocrinus sp A	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	NA	1	1	2	NA	NA	NA	2	NA	NA	NA	NA	1	1
Hybocystis eldonensis	1	1	1	1	1	1	1	0	1	0	1	0	2	3	2	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocystis problematicus	1	1	2	1	1	1	1	0	1	0	1	0	2	5	2	1	1	1	1	0	0	0	0	1	1	0	0	1	1
Ibanocrinus petalos	NA	NA	NA	NA	NA	1	2	3	2	1	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Ibexocrinus lepton	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Illemocrinus amphiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	1	1	2	1	2	NA	1	1
Inyocrinus strimplei	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	NA	NA	1	1
Iocrinus similis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	2	1	3	NA	1	1
Iocrinus subcrassus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	1	1	3	3	1	1
Iocrinus tretonensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	2	NA	1	1

Species	88	89	90	91	92
Fragucrinus bothros	1	1	1	1	1
Gaurocrinus fimbriatus	1	1	1	0	1
Gaurocrinus nealli	1	1	1	1	1
Geraocrinus sculptus	1	1	1	1	1
Geraocrinus sculptus (Benbolt)	*1*	1	1	1	1
Glaucocorinus falconeri	*1*	1	1	NA	1
Glenocrinus globularis	2	1	1	0	1
Glyptocrinus circumcarinatus	*1*	NA	1	NA	1
Glyptocrinus decadactylus	1	1	1	0	1
Glyptocrinus fornshelli	*1*	1	*1*	*1*	1
Glyptocrinus ramulosus	1	1	1	0	1
Glyptocrinus tridactylus	1	1	1	NA	1
Gnorimocrinus? problematicus	*1*	1	1	NA	1
Grenprisa springeri	1	1	1	1	1
Grenprisia billingsi	1	1	1	1	1
Grypocrinus? genuinus	1	1	1	1	1
Gustabilicrinus sp. Cf. *G. latomium*	*1*	1	1	NA	1
Gustabilocrinus latomium	*1*	1	1	NA	1
Gustabilocrinus plektanikaulos	*1*	1	1	NA	1
Habrotecrinus ibexensis	*2*	1	1	0	1
Haptocrinus buttsi	1	1	1	1	1
Haptocrinus calvatus	*1*	1	1	1	1
Homocrinus diminutus	*1*	1	1	NA	1
Hormocrinus quebecensis	1	1	1	NA	1
Hybocrinus bilateralis	*1*	1	1	0	1
Hybocrinus conicus	*1*	1	1	0	1
Hybocrinus crinerensis	*1*	1	1	0	1
Hybocrinus nitidus	*1*	1	1	0	1
Hybocrinus perperamnominatus	1	1	1	0	1
Hybocrinus punctatocritatus	1	1	1	0	1
Hybocrinus punctatus	1	1	1	0	1
Hybocrinus sp A	1	1	1	1	1
Hybocystis eldonensis	*1*	1	1	0	1
Hybocystis problematicus	*1*	1	1	0	1
Ibanocrinus petalos	1	1	1	NA	1
Ibexocrinus lepton	1	1	1	1	1
Illemocrinus amphiatus	1	1	1	1	1
Inyocrinus strimplei	1	1	1	NA	1
Iocrinus similis	1	1	1	1	1
Iocrinus subcrassus	1	1	1	1	1
Iocrinus tretonensis	*1*	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Isotomocrinus apheles	3	1	2	1	2	5	5	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Isotomocrinus minutus	3	2	2	1	2	1	5	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Isotomocrinus n. sp.	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	2	2	5	1	0	1
Isotomocrinus tenuis	3	1	2	1	1	5	1	1	2	1	0	0	2	2	2	3	5	1	1	0	1	0	1	0	3	5	1	0	1
Isotomocrinus typus	3	1	2	1	1	5	1	1	2	1	0	0	2	2	2	3	5	1	1	0	1	0	1	0	3	5	1	0	1
Jovacrinus jugum	3	NA	2	1	1	1	6	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Jovacrinus spinosus	3	NA	2	1	1	1	6	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Kanabinocrinus thyaros	3	1	1	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Kastorcrinus chatteroni	3	2	1	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Krinocrinus inflatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Kryphosocrinus tetreaulti	3	2	2	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Kylixocrinus latus	3	1	2	1	1	1	6	1	2	2	2	2	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Kyreocrinus constellatus	3	1	1	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Ladacrinus asynaptos	3	NA	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ladacrinus sp?	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	NA	1	1	0	3	5	1	0	1
Lampterocrinus tennesseensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	2
Laurucrinus sandtopensis	3	1	2	1	1	5	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Levicyathocrinites sablensis	3	NA	2	1	1	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	2	1	1	0	3	5	1	0	1
Luxocrinus simplex	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Macrostylocrinus B D	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus C	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus compressus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus E F	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus jordanensis	3	NA	2	1	1	1	NA	1	NA	2	NA	1	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Macrostylocrinus pristinus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Macrostylocrinus vermiculates	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus wyomingensis	3	1	1	1	1	1	NA	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	2
Manticrinus exaitos	3	1	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Marsupiocrinus primaevus	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Merocrinus britonensis	3	1	1	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Merocrinus corroboratus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Merocrinus curtus	3	1	1	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Merocrinus impressus	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Merocrinus typus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Myeldactylus sp.	3	1	1	2	1	2	3	1	3	NA	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Myelodactylus convolutus	3	1	1	2	1	2	1	1	2	2	2	1	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Myelodactylus linae	3	2	1	2	2	2	2	1	NA	2	2	1	2	2	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Myosocrinus chicottensis	3	NA	NA	NA	NA	1	1	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	2	1	1
Nexocrinus delicatulus	3	1	2	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Ohiocrinus sp.	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Ohiocrinus brauni	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Isotomocrinus apheles	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Isotomocrinus minutus	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Isotomocrinus n. sp.	2	1	0	0	0	0	2	1	1	2	2	2	5	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Isotomocrinus tenuis	2	1	0	0	0	0	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Isotomocrinus typus	2	1	0	0	0	0	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Jovacrinus jugum	2	1	0	0	0	0	1	1	1	2	2	NA	NA	1	1	1	2	2	2	10	1	1	NA	1	1	0	0	0	1
Jovacrinus spinosus	2	1	0	0	0	0	1	1	1	2	2	NA	NA	1	1	3	2	1	2	10	1	1	NA	1	1	0	0	0	2
Kanabinocrinus thyaros	2	3	5	1	1	2	1	1	1	2	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Kastorcrinus chatteroni	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	2	1
Krinocrinus inflatus	1	1	0	0	0	0	1	1	1	8	3	1	5	1	2	1	1	NA	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Kryphosocrinus tetreaulti	2	3	3	1	2	1	3	2	1	8	2	1	1	1	2	1	1	1	2	10	1	1	1	1	2	2	1	0	1
Kylixocrinus latus	1	1	0	0	0	0	1	1	1	3	2	2	1	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	1
Kyreocrinus constellatus	2	2	5	1	1	1	2	1	1	3	2	1	1	2	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ladacrinus asynaptos	2	3	3	1	1	1	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Ladacrinus sp?	2	2	NA	NA	NA	NA	NA	1	1	3	1	1	NA	1	NA	NA	NA	NA	2	5	1	1	NA	1	2	2	1	0	1
Lampterocrinus tennesseensis	2	3	5	1	1	1	NA	1	1	9	3	2	5	1	NA	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Laurucrinus sandtopensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	2	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Levicyathocrinites sablensis	2	3	5	1	1	1	NA	1	1	2	2	NA	NA	1	1	1	1	1	2	5	1	NA	NA	1	NA	NA	NA	NA	1
Luxocrinus simplex	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Macrostylocrinus B D	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus C	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus compressus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus E F	1	1	0	0	0	0	1	1	1	9	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus jordanensis	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	1
Macrostylocrinus pristinus	2	1	0	0	0	0	1	1	1	3	2	3	6	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	1
Macrostylocrinus vermiculates	1	1	0	0	0	0	1	1	1	9	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus wyomingensis	2	1	0	0	0	0	1	1	1	2	2	2	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Manticrinus exaitos	2	1	0	0	0	0	1	1	1	3	2	1	5	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Marsupiocrinus primaevus	1	1	0	0	0	0	1	1	1	3	1	2	6	1	2	1	1	2	2	10	2	NA	2	1	NA	NA	NA	NA	NA
Merocrinus britonensis	2	3	4	1	0	2	1	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Merocrinus corroboratus	2	3	5	1	1	2	1	1	1	1	1	1	6	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Merocrinus curtus	2	3	5	1	1	2	1	1	1	2	1	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	2	1	1
Merocrinus impressus	2	3	5	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Merocrinus typus	2	3	5	1	1	2	1	1	1	1	1	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Myeldactylus sp.	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Myelodactylus convolutus	NA	1	0	0	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Myelodactylus linae	2	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Myosocrinus chicottensis	2	3	5	1	1	2	3	1	1	3	2	1	1	1	2	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Nexocrinus delicatulus	2	2	5	1	1	1	2	1	1	3	2	1	5	2	2	1	2	1	2	20	1	1	3	1	2	1	1	0	1
Ohiocrinus sp.	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Ohiocrinus brauni	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Isotomocrinus apheles	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Isotomocrinus minutus	1	1	3	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Isotomocrinus n. sp.	1	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Isotomocrinus tenuis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	3	3	1	1
Isotomocrinus typus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	3	3	1	1
Jovacrinus jugum	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Jovacrinus spinosus	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Kanabinocrinus thyaros	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	NA	Na	1	1
Kastorcrinus chatteroni	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	2
Krinocrinus inflatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	2	2	NA	1	1
Kryphosocrinus tetreaulti	1	1	1	1	1	1	2	2	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Kylixocrinus latus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	4	1	1	2	1	NA	1	NA	NA	NA	1	NA	1	1
Kyreocrinus constellatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Ladacrinus asynaptos	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Ladacrinus sp?	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Lampterocrinus tennesseensis	NA	NA	NA	NA	NA	NA	2	3	2	2	NA	NA	1	0	0	NA	NA	1	1	NA	NA	NA	NA	2	2	NA	NA	1	1
Laurucrinus sandtopensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Levicyathocrinites sablensis	1	1	1	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Luxocrinus simplex	NA	NA	NA	NA	NA	1	2	1	2	3	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Macrostylocrinus B D	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	2	2	NA	1	1
Macrostylocrinus C	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus compressus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus E F	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus jordanensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Macrostylocrinus pristinus	1	1	1	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	1	1	2	NA	1	1
Macrostylocrinus vermiculates	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	2
Macrostylocrinus wyomingensis	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Manticrinus exaitos	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	2	1	1	1	1
Marsupiocrinus primaevus	NA	NA	NA	NA	NA	NA	2	1	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	NA	NA	1	1
Merocrinus britonensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Merocrinus corroboratus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Merocrinus curtus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	1	1	1
Merocrinus impressus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Merocrinus typus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Myeldactylus sp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Myelodactylus convolutus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA
Myelodactylus linae	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	NA	NA	1	1
Myosocrinus chicottensis	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Nexocrinus delicatulus	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Ohiocrinus sp.	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1
Ohiocrinus brauni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1

Species	88	89	90	91	92
Isotomocrinus apheles	1	1	1	1	1
Isotomocrinus minutus	1	1	1	1	1
Isotomocrinus n. sp.	1	1	1	NA	1
Isotomocrinus tenuis	*1*	1	1	1	1
Isotomocrinus typus	*1*	1	1	1	1
Jovacrinus jugum	1	1	1	NA	1
Jovacrinus spinosus	1	1	1	NA	1
Kanabinocrinus thyaros	*1*	1	1	NA	1
Kastorcrinus chatteroni	1	1	1	1	1
Krinocrinus inflatus	*1*	1	1	0	1
Kryphosocrinus tetreaulti	*1*	1	1	0	1
Kylixocrinus latus	*1*	1	1	1	1
Kyreocrinus constellatus	1	1	1	NA	1
Ladacrinus asynaptos	1	1	1	NA	1
Ladacrinus sp?	1	1	1	NA	1
Lampterocrinus tennesseensis	*1*	1	1	NA	1
Laurucrinus sandtopensis	1	1	1	NA	1
Levicyathocrinites sablensis	1	1	1	NA	1
Luxocrinus simplex	*1*	1	1	NA	1
Macrostylocrinus B D	*1*	1	1	0	1
Macrostylocrinus C	*1*	1	1	0	1
Macrostylocrinus compressus	*1*	1	1	0	1
Macrostylocrinus E F	*1*	1	1	0	1
Macrostylocrinus jordanensis	*1*	1	1	NA	1
Macrostylocrinus pristinus	*1*	1	1	0	1
Macrostylocrinus vermiculates	*1*	1	1	0	1
Macrostylocrinus wyomingensis	1	1	1	0	1
Manticrinus exaitos	1	1	1	0	1
Marsupiocrinus primaevus	*1*	1	1	0	1
Merocrinus britonensis	1	1	1	1	1
Merocrinus corroboratus	1	1	1	1	1
Merocrinus curtus	1	1	1	1	1
Merocrinus impressus	1	1	1	NA	1
Merocrinus typus	1	1	1	1	1
Myeldactylus sp.	NA	NA	NA	NA	NA
Myelodactylus convolutus	*1*	1	1	NA	1
Myelodactylus linae	*1*	1	1	0	1
Myosocrinus chicottensis	1	1	1	NA	1
Nexocrinus delicatulus	*1*	1	1	NA	1
Ohiocrinus sp.	1	1	1	2	1
Ohiocrinus brauni	1	1	1	2	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Ohiocrinus exilis	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	NA	NA	3	5	NA	NA	NA
Ohiocrinus laxus	3	2	2	1	1	5	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Ohiocrinus levorsoni	3	1	2	1	2	1	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Ottawacrinus typus	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Paiderocrinus asketos	3	NA	2	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Paiderocrinus ochthos	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Palaeocrinus angulatus	3	1	2	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Palaeocrinus avondalensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Palaeocrinus hudsoni	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	2	1	1
Palaeocrinus planobasalis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Palaeocrinus pulchellus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Palaeocrinus rhombiferus	3	1	1	1	1	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Palaeocrinus sp.	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Palaeocrinus sp. cf. *P. planobasalis*	3	NA	NA	1	1	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	2
Parachaeocrinus decoratus	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	2
Paracremacrinus laticardinalis	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	2	1	0	1	2	2	1	3	4	1	0	2
Paradiabolocrinus irregularis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Paradiabolocrinus sinuorugosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Paradiabolocrinus stellatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Parapisocrinus quinquelobus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Pararchaeocrinus convexus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Pararchaeocrinus convexus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	2	1	0	3	5	1	0	1
Pararchaeocrinus rugulosus	3	NA	NA	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Pariocrinus heterodactylus	3	2	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Parisocrinus mulletenensis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Patelliocrinus planus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	3	1	0	1
Peltacrinus sculptatus	3	1	2	1	2	7	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	2	5	1	0	1
Penicillicrinus parvus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	2
Peniculocrinus miller	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	NA	NA	2	5	1	0	1
Periechocrinid incertae sedis	3	NA	NA	NA	NA	NA	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	5	1	0	1
Periechocrinus A	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Periechocrinus B	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Periglyptocrinus billingsi	*3*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Periglyptocrinus mercerensis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Periglyptocrinus spinuliferus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	2	5	1	0	1
Petalocrinus mirabilis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Phrygilocrinus batheri	3	NA	NA	NA	NA	1	1	NA	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pisocrinus campana	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	5	1	0	2
Pisocrinus gemmiformis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	2	1	0	1	2	2	1	3	5	1	0	2
Plicodendrocrinus casei	3	1	2	1	1	6	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Plicodendrocrinus epinettensis	3	2	2	1	1	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Ohiocrinus exilis	NA	1	0	0	0	0	NA	1	1	NA	2	2	NA	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Ohiocrinus laxus	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Ohiocrinus levorsoni	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Ottawacrinus typus	2	3	5	1	1	1	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Paiderocrinus asketos	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Paiderocrinus ochthos	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	NA	NA	NA	NA	NA
Palaeocrinus angulatus	2	3	5	1	1	1	3	1	1	3	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	1	1
Palaeocrinus avondalensis	2	3	5	1	1	2	3	1	1	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA
Palaeocrinus hudsoni	2	3	5	1	1	2	3	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Palaeocrinus planobasalis	2	3	5	1	1	2	3	1	1	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA
Palaeocrinus pulchellus	2	3	5	1	1	1	NA	1	1	2	2	3	NA	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Palaeocrinus rhombiferus	2	3	5	1	1	2	NA	1	1	3	2	2	NA	1	2	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Palaeocrinus sp.	2	3	5	1	1	1	1	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	2	2	2	4	1
Palaeocrinus sp. cf. *P. planobasalis*	2	3	5	1	1	1	3	1	1	3	1	1	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Parachaeocrinus decoratus	1	2	5	1	1	1	3	1	1	3	1	1	1	1	2	1	2	2	2	10	1	1	3	NA	NA	NA	NA	NA	NA
Paracremacrinus laticardinalis	1	1	0	0	0	0	1	1	1	0	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	2	2	5	1
Paradiabolocrinus irregularis	2	2	5	1	1	1	NA	1	1	3	1	1	1	2	2	1	2	2	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Paradiabolocrinus sinuorugosus	2	2	5	1	1	1	NA	1	1	3	1	1	1	2	2	1	1	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Paradiabolocrinus stellatus	2	2	5	1	1	1	1	1	1	3	1	1	1	2	2	1	2	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Parapisocrinus quinquelobus	2	1	0	0	0	0	1	1	1	3	2	3	6	2	2	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Pararchaeocrinus convexus	2	2	5	1	1	1	NA	1	1	3	2	1	1	2	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Pararchaeocrinus convexus	2	2	5	1	1	1	1	1	1	3	1	2	2	2	2	1	1	1	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Pararchaeocrinus rugulosus	2	2	5	1	1	1	NA	1	1	3	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	2	2	1	0	1
Pariocrinus heterodactylus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Parisocrinus mulletenensis	2	3	5	1	1	2	4	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Patelliocrinus planus	2	1	0	0	0	0	NA	1	1	2	2	1	NA	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	2
Peltacrinus sculptatus	2	1	0	0	0	0	0	1	1	3	2	1	2	1	1	1	1	2	2	5	1	1	1	1	2	2	2	2	1
Penicillicrinus parvus	2	1	0	0	0	0	2	1	1	2	2	2	1	1	1	1	1	1	2	10	1	1	1	1	2	2	1	0	1
Peniculocrinus miller	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Periechocrinid incertae sedis	1	1	0	0	0	0	2	1	1	3	1	1	NA	1	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Periechocrinus A	1	1	0	0	0	0	2	1	1	4	2	1	5	1	2	1	2	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Periechocrinus B	1	1	0	0	0	0	2	1	1	8	3	1	5	1	2	1	2	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Periglyptocrinus billingsi	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*8*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*2*	*2*	*20*	*1*	*1*	*2*	*1*	*1*	*0*	*0*	*0*	*1*
Periglyptocrinus mercerensis	2	1	0	0	0	0	1	1	1	8	2	2	5	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	1
Periglyptocrinus spinuliferus	2	1	0	0	0	0	1	1	1	2	2	3	1	1	2	1	2	2	2	10	1	1	2	1	1	0	0	0	2
Petalocrinus mirabilis	NA	3	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	5	1	1	NA	1	1	0	0	0	1
Phrygilocrinus batheri	2	1	0	0	0	0	1	1	1	2	2	2	5	1	2	1	1	1	2	20	1	1	NA	NA	NA	NA	NA	NA	NA
Pisocrinus campana	2	1	0	0	0	0	1	1	1	1	2	1	1	1	2	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Pisocrinus gemmiformis	2	1	0	0	0	0	1	1	1	4	2	1	1	1	2	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Plicodendrocrinus casei	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Plicodendrocrinus epinettensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Ohiocrinus exilis	1	2	2	1	1	1	2	3	1	0	2	1	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Ohiocrinus laxus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1
Ohiocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	NA	2	1	2	1	1	3	0	1	1
Ottawacrinus typus	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	3	0	1	1
Paiderocrinus asketos	1	1	2	1	1	1	2	4	2	1	2	1	1	0	0	NA	1	1	1	1	1	NA	NA	NA	NA	1	NA	1	1
Paiderocrinus ochthos	NA	NA	NA	NA	NA	1	2	4	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	NA	NA	NA	NA	1	NA	1	1
Palaeocrinus angulatus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Palaeocrinus avondalensis	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	2	NA	1	1
Palaeocrinus hudsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	2	1	0	0	0	0	2	2	3	NA	1	1
Palaeocrinus planobasalis	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1
Palaeocrinus pulchellus	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Palaeocrinus rhombiferus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	NA	2	1	1	NA	NA	2	NA	1	1
Palaeocrinus sp.	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	1	1	1	NA	1	1
Palaeocrinus sp. cf. *P. planobasalis*	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	0	NA	1	1
Parachaeocrinus decoratus	NA	NA	NA	1	1	1	2	6	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	1	2	0	1	1
Paracremacrinus laticardinalis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	2	1	2	1	NA	1	1	1	1	2	NA	1	1
Paradiabolocrinus irregularis	1	NA	NA	NA	1	1	2	7	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	2
Paradiabolocrinus sinuorugosus	1	NA	NA	NA	1	1	2	7	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	1
Paradiabolocrinus stellatus	NA	NA	NA	NA	NA	1	2	3	2	1	NA	NA	1	0	0	NA	NA	1	2	2	1	1	2	2	1	2	NA	1	*2*
Parapisocrinus quinquelobus	1	1	4	1	1	1	1	0	1	0	1	1	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Pararchaeocrinus convexus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Pararchaeocrinus convexus	NA	NA	NA	NA	1	1	2	3	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Pararchaeocrinus rugulosus	1	1	2	1	1	1	2	5	2	1	2	1	1	0	0	1	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Pariocrinus heterodactylus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Parisocrinus mulletenensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	2	NA	1	1
Patelliocrinus planus	1	0	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Peltacrinus sculptatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	3	0	1	1
Penicillicrinus parvus	1	1	3	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Peniculocrinus miller	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	4	NA	1	1
Periechocrinid incertae sedis	NA	NA	NA	NA	NA	1	2	NA	2	NA	NA	NA	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Periechocrinus A	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Periechocrinus B	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Periglyptocrinus billingsi	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*5*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*2*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*NA*	*1*	*1*
Periglyptocrinus mercerensis	1	1	2	1	1	1	2	1	2	1	2	1	1	0	0	NA	1	1	2	1	1	1	2	2	NA	2	NA	1	1
Periglyptocrinus spinuliferus	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	NA	1	2
Petalocrinus mirabilis	1	1	0	2	2	1	NA	NA	NA	NA	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	1	NA
Phrygilocrinus batheri	NA	NA	NA	NA	NA	1	2	5	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	0	1	1
Pisocrinus campana	1	1	4	1	1	1	1	0	1	0	2	20	1	0	0	4	1	1	1	0	0	0	0	1	1	0	NA	1	1
Pisocrinus gemmiformis	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	NA	1	1
Plicodendrocrinus casei	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	3	1	1
Plicodendrocrinus epinettensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	NA	NA	NA	NA	1	1

Species	88	89	90	91	92
Ohiocrinus exilis	1	1	1	2	1
Ohiocrinus laxus	1	1	1	2	1
Ohiocrinus levorsoni	1	1	1	2	1
Ottawacrinus typus	*1*	1	1	1	1
Paiderocrinus asketos	1	1	1	NA	1
Paiderocrinus ochthos	1	1	1	NA	1
Palaeocrinus angulatus	1	1	1	NA	1
Palaeocrinus avondalensis	*1*	1	1	0	1
Palaeocrinus hudsoni	1	1	1	0	1
Palaeocrinus planobasalis	*1*	1	1	0	1
Palaeocrinus pulchellus	1	1	1	NA	1
Palaeocrinus rhombiferus	1	1	1	1	1
Palaeocrinus sp.	1	1	1	NA	1
Palaeocrinus sp. cf. *P. planobasalis*	*1*	1	1	NA	1
Parachaeocrinus decoratus	*1*	1	1	NA	1
Paracremacrinus laticardinalis	1	1	1	1	1
Paradiabolocrinus irregularis	1	1	1	1	1
Paradiabolocrinus sinuorugosus	1	1	1	1	1
Paradiabolocrinus stellatus	1	1	1	1	1
Parapisocrinus quinquelobus	1	1	1	1	1
Pararchaeocrinus convexus	2	1	1	NA	1
Pararchaeocrinus convexus	1	1	1	NA	1
Pararchaeocrinus rugulosus	1	1	1	NA	1
Pariocrinus heterodactylus	*1*	1	1	1	1
Parisocrinus mulletenensis	1	1	1	1	1
Patelliocrinus planus	1	1	1	NA	1
Peltacrinus sculptatus	1	1	1	1	1
Penicillicrinus parvus	1	1	1	NA	1
Peniculocrinus miller	1	1	1	NA	1
Periechocrinid incertae sedis	1	1	1	NA	1
Periechocrinus A	*1*	1	1	0	1
Periechocrinus B	*1*	1	1	0	1
Periglyptocrinus billingsi	*1*	1	1	NA	1
Periglyptocrinus mercerensis	1	1	1	1	1
Periglyptocrinus spinuliferus	1	1	1	0	1
Petalocrinus mirabilis	1	1	1	NA	1
Phrygilocrinus batheri	*1*	1	1	NA	1
Pisocrinus campana	*1*	1	1	0	1
Pisocrinus gemmiformis	*1*	1	1	NA	1
Plicodendrocrinus casei	1	1	1	1	1
Plicodendrocrinus epinettensis	1	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Plicodendrocrinus observationensis	3	2	2	1	1	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Plicodendrocrinus proboscidiatus	3	2	1	1	1	6	1	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Pogonipocrinus antiquus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Porocrinus bromidensis	3	2	1	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus conicus	3	1	2	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus elegans	1	3	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus fayettensis	3	2	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus kentuckiensis	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus lebanonensis	3	2	1	1	1	1	5	1	1	1	0	0	1	0	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Porocrinus pentagonius	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus petersenae	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus plattinensis	3	2	1	1	1	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus pyramidatus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus shawi	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus sp. cf. *P.smithi*	3	2	2	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Praecupulocrinus conjugans	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Pregazacrinus hemisphericus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Premanicrinus debius	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Proanisocrinus oswegoensis	3	1	2	1	1	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Proexenocrinus inyonensis	3	NA	NA	NA	NA	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Protaxocrinus anellus	3	2	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Protaxocrinus cataractensis	3	2	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Protaxocrinus elegans	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Protaxocrinus girardeau	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Protaxocrinus girvanensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Protaxocrinus laevis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Protaxocrinus nodocaudis	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Protaxocrinus paraios	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Protaxocrinus sideros	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Ptychocrinus adamsensis	3	1	2	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ptychocrinus inedinensis	3	2	1	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ptychocrinus insperatus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Ptychocrinus parvus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Ptychocrinus pentagonus	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ptychocrinus splendens	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Pychnocrinus dyeri	3	1	2	1	1	1	5	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pychnocrinus dyeri	3	1	2	1	1	1	5	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus altilis	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus gerki	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus multibrachialis	3	NA	NA	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus sardesoni	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Plicodendrocrinus observationensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1
Plicodendrocrinus proboscidiatus	2	3	5	1	1	1	NA	1	1	2	2	2	5	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Pogonipocrinus antiquus	2	1	0	0	0	0	NA	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Porocrinus bromidensis	2	3	5	1	1	2	3	1	1	4	2	1	1	0	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus conicus	2	3	5	1	1	1	1	1	1	4	2	1	5	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus elegans	2	3	5	1	1	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Porocrinus fayettensis	2	3	5	1	1	1	2	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus kentuckiensis	2	3	5	1	1	1	1	1	1	4	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus lebanonensis	2	3	5	1	1	1	2	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus pentagonius	2	3	5	1	1	1	3	1	1	4	2	2	5	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus petersenae	2	3	5	1	1	1	3	1	1	1	3	2	1	1	1	1	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Porocrinus plattinensis	2	3	5	1	1	2	3	1	1	4	2	1	1	1	2	1	1	2	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Porocrinus pyramidatus	2	3	5	1	1	1	3	1	1	4	2	1	1	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus shawi	2	3	5	1	1	1	3	1	1	4	2	2	1	1	1	1	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Porocrinus sp. cf. *P.smithi*	2	3	5	1	1	2	NA	1	1	8	2	1	1	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Praecupulocrinus conjugans	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Pregazacrinus hemisphericus	2	2	5	1	1	1	2	1	1	3	2	3	1	5	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Premanicrinus debius	2	3	3	1	2	2	3	1	1	8	2	1	1	1	1	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Proanisocrinus oswegoensis	2	3	3	1	2	1	3	1	1	2	2	1	1	1	2	1	1	1	2	10	1	1	1	1	2	2	1	0	1
Proexenocrinus inyonensis	2	3	5	1	1	1	2	1	1	3	2	1	1	1	2	1	1	1	2	10	1	1	2	1	2	3	1	0	1
Protaxocrinus anellus	2	3	3	1	2	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Protaxocrinus cataractensis	2	3	3	1	2	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Protaxocrinus elegans	2	3	5	1	0	1	NA	1	1	2	2	NA	NA	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Protaxocrinus girardeau	2	3	5	1	1	1	2	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Protaxocrinus girvanensis	3	5	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA	1	NA	1	2	1	2	5	1	NA	2	1	2	3	1	0	1
Protaxocrinus laevis	2	3	5	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Protaxocrinus nodocaudis	2	3	3	1	2	2	3	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Protaxocrinus paraios	2	3	3	1	2	1	3	1	1	2	2	NA	1	1	NA	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Protaxocrinus sideros	2	3	3	1	2	1	3	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Ptychocrinus adamsensis	2	3	5	1	1	1	2	1	1	3	2	3	5	1	2	1	2	1	2	20	1	1	3	1	NA	NA	NA	NA	2
Ptychocrinus inedinensis	2	2	5	1	1	1	2	1	1	8	2	3	5	1	2	1	2	2	2	20	1	1	3	1	2	1	1	0	1
Ptychocrinus insperatus	2	3	5	1	1	1	NA	1	1	2	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	NA	NA	NA	NA	1
Ptychocrinus parvus	2	2	5	1	1	1	1	1	1	8	3	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Ptychocrinus pentagonus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	2	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Ptychocrinus splendens	2	3	5	1	1	1	2	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	1
Pychnocrinus dyeri	2	1	0	0	0	0	1	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	2	1	2	1	1	0	1
Pychnocrinus dyeri	2	1	0	0	0	0	1	1	1	8	2	3	5	1	1	1	2	2	2	10	1	1	2	1	2	1	1	0	1
Pycnocrinus altilis	2	1	0	0	0	0	1	1	1	2	2	1	6	1	2	1	1	2	2	10	1	1	3	1	2	1	1	0	1
Pycnocrinus gerki	2	1	0	0	0	0	1	1	1	3	2	3	5	2	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1
Pycnocrinus multibrachialis	1	1	0	0	0	0	NA	1	1	2	3	3	6	1	2	2	2	2	2	10	1	1	3	1	2	2	1	0	1
Pycnocrinus sardesoni	1	1	0	0	0	0	1	1	1	8	2	3	2	1	2	2	2	2	2	20	1	1	3	1	1	0	0	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Plicodendrocrinus observationensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	NA	NA	NA	NA	1	1
Plicodendrocrinus proboscidiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	NA	1	1
Pogonipocrinus antiquus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	1
Porocrinus bromidensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	2	1	0	0	0	0	1	2	0	2	1	1
Porocrinus conicus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus elegans	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Porocrinus fayettensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	1	1	1
Porocrinus kentuckiensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus lebanonensis	0	0	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	1	1	1
Porocrinus pentagonius	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus petersenae	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Porocrinus plattinensis	NA	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Porocrinus pyramidatus	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus shawi	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Porocrinus sp. cf. *P.smithi*	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	1	NA	1	1
Praecupulocrinus conjugans	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	1	1	1	1	1	3	NA	1	1
Pregazacrinus hemisphericus	NA	NA	NA	NA	NA	NA	2	3	2	2	NA	NA	1	0	0	NA	NA	1	2	1	1	NA	NA	NA	1	2	NA	1	1
Premanicrinus debius	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Proanisocrinus oswegoensis	1	1	1	1	1	1	2	2	2	1	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Proexenocrinus inyonensis	1	1	3	1	1	1	2	3	2	1	2	1	1	0	0	4	1	1	2	1	1	1	1	NA	1	2	NA	1	1
Protaxocrinus anellus	1	1	2	1	1	1	1	0	2	1	1	0	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1
Protaxocrinus cataractensis	1	1	2	1	1	1	2	1	2	1	1	0	1	0	0	3	1	1	2	1	2	1	1	1	1	2	NA	1	1
Protaxocrinus elegans	1	1	1	1	1	1	2	1	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Protaxocrinus girardeau	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	2	NA	1	1
Protaxocrinus girvanensis	2	1	1	1	1	1	NA	NA	NA	NA	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Protaxocrinus laevis	1	1	2	1	1	1	2	1	2	2	1	0	1	0	0	3	1	1	2	1	1	1	1	NA	NA	2	NA	1	1
Protaxocrinus nodocaudis	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Protaxocrinus paraios	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Protaxocrinus sideros	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Ptychocrinus adamsensis	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Ptychocrinus inedinensis	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	1	1	1
Ptychocrinus insperatus	1	2	2	1	1	1	2	6	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Ptychocrinus parvus	1	1	3	1	1	1	2	6	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Ptychocrinus pentagonus	NA	NA	NA	NA	1	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Ptychocrinus splendens	1	2	2	1	1	1	2	5	2	2	2	1	1	0	0	2	1	1	2	2	1	1	2	2	1	2	NA	1	1
Pychnocrinus dyeri	1	2	2	1	1	1	2	10	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	2	1	1	1	1	1
Pychnocrinus dyeri	1	2	2	1	1	1	2	10	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	2	1	1	1	1	1
Pycnocrinus altilis	1	2	2	1	1	1	2	7	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	1	1	1
Pycnocrinus gerki	1	2	2	1	1	1	2	5	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	NA	1	1
Pycnocrinus multibrachialis	1	1	1	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	NA	1	1	1	1	1
Pycnocrinus sardesoni	1	2	1	1	1	1	2	10	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	NA	1	1

Species	88	89	90	91	92
Plicodendrocrinus observationensis	1	1	1	1	1
Plicodendrocrinus proboscidiatus	*1*	1	1	1	1
Pogonipocrinus antiquus	*1*	1	1	1	1
Porocrinus bromidensis	1	1	2	0	1
Porocrinus conicus	*1*	1	1	0	1
Porocrinus elegans	*1*	1	2	1	1
Porocrinus fayettensis	1	1	2	0	1
Porocrinus kentuckiensis	*1*	1	1	0	1
Porocrinus lebanonensis	*1*	1	1	0	1
Porocrinus pentagonius	1	1	1	0	1
Porocrinus petersenae	*1*	1	2	0	1
Porocrinus plattinensis	1	1	2	0	1
Porocrinus pyramidatus	*1*	1	2	1	1
Porocrinus shawi	1	1	1	0	1
Porocrinus sp. cf. *P.smithi*	*1*	1	1	0	1
Praecupulocrinus conjugans	1	1	1	1	1
Pregazacrinus hemisphericus	*1*	1	1	1	1
Premanicrinus debius	1	1	1	NA	1
Proanisocrinus oswegoensis	1	1	1	NA	1
Proexenocrinus inyonensis	1	1	1	1	1
Protaxocrinus anellus	*1*	1	1	1	1
Protaxocrinus cataractensis	*1*	1	1	1	1
Protaxocrinus elegans	*1*	1	1	NA	1
Protaxocrinus girardeau	*1*	1	1	1	1
Protaxocrinus girvanensis	1	1	1	NA	1
Protaxocrinus laevis	1	1	1	1	1
Protaxocrinus nodocaudis	*1*	1	1	0	1
Protaxocrinus paraios	1	1	1	NA	1
Protaxocrinus sideros	1	1	1	NA	1
Ptychocrinus adamsensis	1	1	1	NA	1
Ptychocrinus inedinensis	1	1	1	0	1
Ptychocrinus insperatus	*1*	1	1	NA	1
Ptychocrinus parvus	1	1	1	NA	1
Ptychocrinus pentagonus	*1*	1	1	NA	1
Ptychocrinus splendens	*1*	1	1	1	1
Pychnocrinus dyeri	1	1	1	0	1
Pychnocrinus dyeri	1	1	1	0	1
Pycnocrinus altilis	1	1	1	0	1
Pycnocrinus gerki	1	1	1	1	1
Pycnocrinus multibrachialis	*1*	1	1	0	1
Pycnocrinus sardesoni	1	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Pycnocrinus shafferi	3	2	2	1	1	1	NA	1	NA	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Quinquecaudex cincinnatiensis	3	1	1	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Quinquecaudex glabellus	3	1	2	1	2	6	6	1	2	1	0	0	2	2	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Quinquecaudex species A	3	2	1	1	2	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Quinquecaudex springeri	3	2	1	1	1	5	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Quintuplexacrinus oswegoensis	3	2	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Reteocrinus alveolatus	3	1	1	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus depressus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus elongatus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus fenestratus	3	2	1	1	1	1	NA	1	1	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	1	1
Reteocrinus magnificus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus mahlburgi	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus polki	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus rocktonnsis	3	2	2	1	1	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus spinosus	3	1	2	1	1	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus stellaris	3	1	2	1	1	1	6	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus variabilicaulis	3	1	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reterocrinus sp.	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Rhachicrinus wrighti	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus buckleyi	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus sculptus	3	1	1	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus simplex	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Rhaphanocrinus subnodosus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rheocrinus aduncus	3	2	2	1	1	1	6	1	2	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Rhodocrinitid sp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Ristnacrinus altobasalis	3	1	2	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Salinocrinus conus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Scapanocrinus muricatus	3	1	2	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Schizocrinus nodosus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Schizocrinus striatus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Silfonocrinus siluricus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Simplocrinus persculptus	3	NA	NA	NA	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Siphonocrinus nobilis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1
Stereoaster squamosus	3	2	2	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Stibarocrinus centervillensis	3	1	1	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	4	2	1	0	1	2	2	3	3	4	1	0	1
Stipatocrinus hulveri	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	4	1	0	2
Sygcaulocrinus typus	3	2	1	1	1	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Tenuicrinus longibasalis	3	1	2	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Thaerocrinus crenalus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	3	1	0	2
Thaleproktocrinus davidsoni	3	NA	NA	NA	NA	NA	6	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Thomasocrinus cylindrisa	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Pycnocrinus shafferi	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	2	2	10	1	1	2	1	2	1	1	0	1
Quinquecaudex cincinnatiensis	2	3	5	1	1	1	2	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Quinquecaudex glabellus	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Quinquecaudex species A	2	3	5	1	1	2	0	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Quinquecaudex springeri	2	3	5	1	2	2	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Quintuplexacrinus oswegoensis	2	3	5	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Reteocrinus alveolatus	2	3	5	1	1	1	1	1	1	3	2	3	5	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Reteocrinus depressus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	1	2	5	1	1	2	1	2	3	1	0	1
Reteocrinus elongatus	2	3	5	1	1	2	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Reteocrinus fenestratus	2	3	5	1	1	2	1	1	1	1	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	NA	NA	1
Reteocrinus magnificus	2	3	5	1	1	1	0	1	1	3	2	3	6	1	2	1	2	2	2	10	1	1	2	1	2	2	1	0	1
Reteocrinus mahlburgi	2	3	5	1	1	1	1	1	1	3	2	2	5	1	2	1	2	2	2	5	1	1	3	1	2	3	1	0	1
Reteocrinus polki	2	3	5	1	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Reteocrinus rocktonnsis	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Reteocrinus spinosus	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Reteocrinus stellaris	2	3	5	1	1	2	1	1	1	3	2	3	6	1	1	1	2	2	2	5	1	1	3	1	2	3	1	0	1
Reteocrinus variabilicaulis	2	3	5	1	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Reterocrinus sp.	2	3	5	2	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Rhachicrinus wrighti	2	2	5	1	1	1	2	1	1	3	1	2	5	2	2	1	2	2	2	20	1	NA	3	1	NA	NA	NA	NA	NA
Rhaphanocrinus buckleyi	2	2	5	1	1	1	1	1	1	8	2	3	6	2	2	1	2	2	2	10	1	1	2	1	1	0	0	0	1
Rhaphanocrinus sculptus	2	3	5	1	1	1	NA	1	1	8	2	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Rhaphanocrinus simplex	2	2	5	1	1	1	1	1	1	8	3	3	1	2	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Rhaphanocrinus subnodosus	2	2	5	1	1	1	NA	1	1	3	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Rheocrinus aduncus	2	2	5	1	1	1	1	1	1	3	2	1	5	2	2	1	1	1	2	20	1	1	2	1	1	0	0	0	2
Rhodocrinitid sp.	2	3	5	1	1	1	1	1	1	3	2	2	1	1	2	1	1	1	2	10	2	NA	NA	NA	NA	NA	NA	NA	NA
Ristnacrinus altobasalis	2	1	0	0	0	0	NA	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Salinocrinus conus	2	3	3	1	2	1	3	1	1	3	2	NA	1	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Scapanocrinus muricatus	2	3	3	1	2	1	3	1	1	3	2	3	1	1	2	1	1	1	2	20	1	2	2	1	2	3	2	4	1
Schizocrinus nodosus	2	1	0	0	0	0	1	1	1	3	2	1	6	1	2	1	1	1	2	10	1	1	3	1	2	1	1	0	1
Schizocrinus striatus	2	1	0	0	0	0	1	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Silfonocrinus siluricus	2	2	5	1	1	1	2	1	1	3	2	2	5	2	2	1	2	1	2	20	1	2	2	1	2	2	2	4	2
Simplococrinus persculptus	2	2	5	1	1	1	1	2	1	3	2	1	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	2
Siphonocrinus nobilis	2	3	5	NA	1	2	NA	1	1	9	3	3	1	1	2	1	1	2	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Stereoaster squamosus	2	2	5	1	1	1	2	1	1	3	1	1	6	2	2	1	1	2	2	20	1	NA	2	1	NA	NA	NA	NA	NA
Stibarocrinus centervillensis	1	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	4	1
Stipatocrinus hulveri	1	1	0	0	0	0	1	1	1	2	3	3	5	1	NA	1	1	1	2	10	1	1	3	1	1	0	0	0	1
Sygcaulocrinus typus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Tenuicrinus longibasalis	2	1	0	0	0	0	1	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	NA
Thaerocrinus crenalus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	5	1
Thaleproktocrinus davidsoni	2	1	0	0	0	0	2	1	1	4	2	1	1	1	2	1	1	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Thomasocrinus cylindrisa	1	1	0	0	0	0	1	1	1	8	3	2	6	2	NA	1	1	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Pycnocrinus shafferi	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Quinquecaudex cincinnatiensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	1	1	3	0	1	1
Quinquecaudex glabellus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Quinquecaudex species A	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	1	1	1	1	1	4	0	1	1
Quinquecaudex springeri	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	1	NA	1	1
Quintuplexacrinus oswegoensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	3	1	1	1
Reteocrinus alveolatus	1	1	2	1	1	1	2	3	2	1	1	0	1	0	0	3	1	1	1	1	0	0	0	NA	NA	NA	3	1	1
Reteocrinus depressus	1	1	1	1	1	1	2	1	2	1	1	0	1	0	0	NA	1	1	2	1	NA	NA	NA	NA	NA	2	NA	1	1
Reteocrinus elongatus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	NA	NA	3	NA	1	1
Reteocrinus fenestratus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	3	0	1	2
Reteocrinus magnificus	1	1	1	1	1	1	2	4	2	1	2	1	1	0	0	4	1	1	1	0	0	0	0	2	1	1	2	1	2
Reteocrinus mahlburgi	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	2	3	3	NA	1	2
Reteocrinus polki	1	1	3	1	1	1	2	8	2	1	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	2
Reteocrinus rocktonnsis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	NA	NA	3	0	1	2
Reteocrinus spinosus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	2	1	3	0	1	2
Reteocrinus stellaris	1	1	2	1	1	1	1	0	2	1	1	0	1	0	0	NA	1	1	2	1	2	1	2	NA	NA	2	0	1	1
Reteocrinus variabilicaulis	1	1	3	1	1	1	2	8	2	1	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	2
Reterocrinus sp.	1	1	3	1	1	1	2	8	2	1	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	1
Rhachicrinus wrighti	NA	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Rhaphanocrinus buckleyi	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Rhaphanocrinus sculptus	1	2	1	1	1	1	2	7	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Rhaphanocrinus simplex	1	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Rhaphanocrinus subnodosus	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Rheocrinus aduncus	1	2	2	1	1	1	2	10	2	1	2	1	1	0	0	3	1	1	1	0	0	0	0	2	2	2	5	2	1
Rhodocrinitid sp.	NA	NA	NA	NA	NA	1	2	1	3	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Ristnacrinus altobasalis	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Salinocrinus conus	NA	NA	NA	NA	1	1	2	NA	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Scapanocrinus muricatus	1	1	1	1	1	1	2	7	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Schizocrinus nodosus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	NA	NA	3	1	1	1
Schizocrinus striatus	1	1	2	1	1	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Silfonocrinus siluricus	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Simplococrinus persculptus	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	NA	2	NA	1	1
Siphonocrinus nobilis	NA	NA	NA	NA	NA	1	2	NA	2	NA	NA	NA	1	0	0	NA	NA	1	2	2	2	1	2	2	3	NA	NA	1	1
Stereoaster squamosus	NA	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Stibarocrinus centervillensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Stipatocrinus hulveri	1	1	1	1	1	1	2	10	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Sygcaulocrinus typus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Tenuicrinus longibasalis	NA	NA	NA	NA	1	1	2	1	1	0	NA	NA	1	0	0	NA	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Thaerocrinus crenalus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	2	NA	1	1
Thaleproktocrinus davidsoni	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Thomasocrinus cylindrisa	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	1	2	NA	1	1

Species	88	89	90	91	92
Pycnocrinus shafferi	1	1	1	0	1
Quinquecaudex cincinnatiensis	1	1	1	1	1
Quinquecaudex glabellus	1	1	1	1	1
Quinquecaudex species A	*1*	1	1	1	1
Quinquecaudex springeri	*1*	1	1	1	1
Quintuplexacrinus oswegoensis	1	1	1	1	1
Reteocrinus alveolatus	1	1	1	NA	1
Reteocrinus depressus	1	1	1	NA	1
Reteocrinus elongatus	1	1	1	1	1
Reteocrinus fenestratus	*1*	1	1	1	1
Reteocrinus magnificus	*1*	1	1	0	1
Reteocrinus mahlburgi	1	1	1	0	1
Reteocrinus polki	*1*	1	1	NA	1
Reteocrinus rocktonnsis	1	1	1	1	1
Reteocrinus spinosus	1	1	1	1	1
Reteocrinus stellaris	1	1	1	1	1
Reteocrinus variabilicaulis	*1*	1	1	NA	1
Reterocrinus sp.	*1*	1	1	NA	1
Rhachicrinus wrighti	1	1	1	NA	1
Rhaphanocrinus buckleyi	1	1	1	NA	1
Rhaphanocrinus sculptus	*1*	1	1	0	1
Rhaphanocrinus simplex	1	1	1	NA	1
Rhaphanocrinus subnodosus	1	1	1	NA	1
Rheocrinus aduncus	1	1	1	0	1
Rhodocrinitid sp.	*1*	1	1	NA	1
Ristnacrinus altobasalis	*1*	1	1	0	1
Salinocrinus conus	1	1	1	NA	1
Scapanocrinus muricatus	*1*	1	1	0	1
Schizocrinus nodosus	1	1	1	0	1
Schizocrinus striatus	1	1	1	NA	1
Silfonocrinus siluricus	1	1	1	NA	1
Simplococrinus persculptus	1	1	1	NA	1
Siphonocrinus nobilis	1	1	1	1	1
Stereoaster squamosus	1	1	1	NA	1
Stibarocrinus centervillensis	1	1	1	1	1
Stipatocrinus hulveri	1	1	1	1	1
Sygcaulocrinus typus	1	1	1	NA	1
Tenuicrinus longibasalis	1	1	1	1	1
Thaerocrinus crenalus	*1*	1	1	1	1
Thaleproktocrinus davidsoni	*1*	1	1	0	1
Thomasocrinus cylindrisa	*1*	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Tirocrinus trochos	3	1	2	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	NA	NA	NA	NA
Titanocrinus sumralli	3	1	1	1	2	1	5	1	1	1	0	0	NA	NA	1	3	5	1	2	3	1	1	1	0	3	NA	2	3	1
Tormosocrinus furberi	3	1	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Tornatilicrinus longicaudis	3	1	1	1	1	5	5	1	2	1	0	0	NA	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Triboloporus cryptoplicatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Triboloporus xystrotus	3	NA	NA	NA	NA	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Trichinocrinus terranovicus	3	1	2	1	1	5	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Tripatocrinus pustulatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Trypherocrinus brassfieldensis	3	2	1	1	1	2	1	1	NA	1	0	0	2	4	2	3	5	1	2	1	1	2	2	3	3	3	1	0	2
Tryssocrinus endotomous	3	2	2	1	1	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Turbocrinus punctum	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Typanocrinus strombos	3	NA	NA	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
undescribed big disparid I	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	NA	NA	3	5	1	0	1
Undescribed cladid 1	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
undescribed cladid I1	3	1	1	1	2	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	1	1	1	1	0	3	5	1	0	1
undescribed cladid I1	3	NA	NA	NA	2	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	1	1	1	1	0	3	5	1	0	1
undescribed cladid I2	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Undescribed hybocrinid zone g	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Undescribed hybocrinid zone I	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Undescribed Iocrinid	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	NA	NA	3	5	1	0	1
Undescribed iocrinid zone b	3	1	1	1	2	1	5	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Undescribed iocrinid zone I	3	1	1	1	2	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Ursucrinus stellatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Wilsonicrinus culmeninuosus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Xenocrinus baeri	3	1	1	1	1	4	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	4	1	0	1
Xenocrinus penicillus	3	1	1	1	1	4	5	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Xenocrinus rubus	3	2	2	1	1	3	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Xysmacrinus greenensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Zirocrinus litos	3	NA	2	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Tirocrinus trochos	1	1	0	0	0	0	2	1	1	3	1	1	5	2	2	1	2	1	3	20	1	1	2	1	1	0	0	0	1
Titanocrinus sumralli	2	3	5	2	2	1	NA	1	1	9	3	1	1	1	2	1	2	2	2	5	1	1	3	1	2	1	1	0	1
Tormosocrinus furberi	2	2	5	1	1	1	2	1	1	3	2	2	2	2	1	1	1	1	2	10	1	1	3	1	1	0	0	0	2
Tornatilicrinus longicaudis	2	1	0	0	0	0	1	1	1	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	2	2	1
Triboloporus cryptoplicatus	2	3	5	1	1	1	3	1	1	4	2	1	1	1	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Triboloporus xystrotus	2	3	5	1	1	1	3	1	1	5	2	2	1	1	2	1	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Trichinocrinus terranovicus	2	2	5	1	1	1	1	1	1	2	2	3	5	2	2	1	2	1	2	10	1	1	2	1	2	2	2	2	1
Tripatocrinus pustulatus	2	1	0	0	0	0	2	1	1	8	3	1	3	1	2	1	1	1	2	3	1	NA	NA	NA	NA	NA	NA	NA	NA
Trypherocrinus brassfieldensis	2	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	3	2	4	1
Tryssocrinus endotomous	2	1	0	0	0	0	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	2	2	1
Turbocrinus punctum	2	2	5	1	1	1	2	1	1	3	2	1	6	2	2	1	1	1	1	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
Typanocrinus strombos	2	1	0	0	0	0	1	1	1	2	2	2	6	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	2
undescribed big disparid I	2	1	0	0	0	0	NA	1	1	2	2	2	NA	1	1	1	1	1	2	5	1	1	3	1	NA	NA	NA	NA	1
Undescribed cladid 1	2	3	5	1	1	2	2	1	1	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
undescribed cladid I1	2	3	5	1	1	2	3	1	1	2	3	1	1	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
undescribed cladid I1	2	3	5	1	1	2	3	1	1	2	3	1	1	1	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
undescribed cladid I2	2	3	5	1	1	2	NA	1	1	2	2	2	NA	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Undescribed hybocrinid zone g	1	1	0	0	0	0	2	1	1	8	2	2	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Undescribed hybocrinid zone I	2	1	0	0	0	0	2	1	1	8	2	2	5	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Undescribed Iocrinid	2	1	0	0	0	0	NA	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Undescribed iocrinid zone b	1	1	0	0	0	0	2	1	1	3	2	2	5	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Undescribed iocrinid zone I	2	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Ursucrinus stellatus	2	2	5	1	1	1	2	1	1	3	2	NA	5	2	2	1	2	2	2	20	1	1	NA	1	1	0	0	0	1
Wilsonicrinus culmeninuosus	2	2	5	1	1	1	1	1	1	3	2	1	6	2	2	1	1	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Xenocrinus baeri	1	1	0	0	0	0	2	1	1	4	2	3	5	2	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Xenocrinus penicillus	2	1	0	0	0	0	2	1	1	8	3	3	5	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Xenocrinus rubus	NA	1	0	0	0	0	2	1	1	2	2	3	5	1	2	1	1	1	2	20	1	1	NA	1	1	0	0	0	1
Xysmacrinus greenensis	0	3	5	1	1	2	1	1	1	3	NA	NA	6	2	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zirocrinus litos	2	1	0	0	0	0	1	1	1	2	2	1	6	1	2	1	2	2	2	10	1	1	2	1	1	0	0	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Tirocrinus trochos	1	1	2	1	1	1	2	72	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Titanocrinus sumralli	1	1	2	1	1	1	2	4	2	1	1	0	1	0	0	1	1	1	1	0	0	0	0	2	2	4	0	1	1
Tormosocrinus furberi	1	1	2	1	1	1	2	4	2	3	2	1	1	0	0	3	1	1	2	1	2	1	1	NA	NA	2	NA	1	1
Tornatilicrinus longicaudis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	2	2	1	1	1	1	4	4	1	1
Triboloporus cryptoplicatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Triboloporus xystrotus	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Trichinocrinus terranovicus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	NA	1	2	NA	1	1
Tripatocrinus pustulatus	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Trypherocrinus brassfieldensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	NA	1	1
Tryssocrinus endotomous	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	0	1	1
Turbocrinus punctum	NA	NA	NA	1	NA	1	2	5	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Typanocrinus strombos	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	NA	1	1
undescribed big disparid I	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	0	1	1
Undescribed cladid 1	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1
undescribed cladid I1	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
undescribed cladid I1	NA	NA	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
undescribed cladid I2	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	1	0	NA	1	1
Undescribed hybocrinid zone g	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Undescribed hybocrinid zone I	1	1	1	1	1	1	1	0	1	0	2	1	1	0	0	NA	1	1	1	0	0	0	0	1	1	2	0	1	1
Undescribed Iocrinid	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	4	NA	1	1
Undescribed iocrinid zone b	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	2	1	3	0	1	1
Undescribed iocrinid zone I	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Ursucrinus stellatus	1	2	NA	1	1	1	2	1	2	NA	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Wilsonicrinus culmeninuosus	NA	NA	NA	NA	1	1	2	5	2	3	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Xenocrinus baeri	1	2	2	1	1	1	2	5	2	1	2	1	1	0	0	3	1	1	1	0	0	0	0	2	2	2	NA	1	1
Xenocrinus penicillus	1	2	2	1	1	1	2	10	2	1	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	2	2	6	1	1
Xenocrinus rubus	1	2	NA	1	1	1	2	NA	2	1	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	1	1
Xysmacrinus greenensis	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Zirocrinus litos	1	1	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2

Species	88	89	90	91	92
Tirocrinus trochos	1	1	1	NA	1
Titanocrinus sumralli	2	1	1	0	1
Tormosocrinus furberi	*1*	1	1	1	1
Tornatilicrinus longicaudis	*1*	1	1	1	1
Triboloporus cryptoplicatus	1	1	1	0	1
Triboloporus xystrotus	1	1	2	0	1
Trichinocrinus terranovicus	1	1	1	0	1
Tripatocrinus pustulatus	*1*	1	1	0	1
Trypherocrinus brassfieldensis	1	1	1	1	1
Tryssocrinus endotomous	*1*	1	1	1	1
Turbocrinus punctum	1	1	1	NA	1
Typanocrinus strombos	1	1	1	0	1
undescribed big disparid I	*1*	*1*	1	NA	1
Undescribed cladid 1	*1*	1	1	0	1
undescribed cladid I1	1	1	1	0	1
undescribed cladid I1	1	1	1	0	1
undescribed cladid I2	1	1	1	NA	1
Undescribed hybocrinid zone g	*1*	1	1	0	1
Undescribed hybocrinid zone I	*1*	1	1	0	1
Undescribed Iocrinid	1	1	1	NA	1
Undescribed iocrinid zone b	*1*	1	1	1	1
Undescribed iocrinid zone I	*1*	1	1	1	1
Ursucrinus stellatus	1	1	1	NA	1
Wilsonicrinus culmeninuosus	1	1	1	NA	1
Xenocrinus baeri	1	1	1	0	1
Xenocrinus penicillus	1	1	1	0	1
Xenocrinus rubus	1	1	NA	1	1
Xysmacrinus greenensis	1	1	1	NA	1
Zirocrinus litos	1	1	1	NA	1

APPENDIX 6

Chapter 2; Species PCO loadings

The PCO species loadings for the 479 species analyses for chapter 2. The crinoids were coded using the discreete characters explained in Appendix 1. Gower’s similarity metric was used on the dataset and was analysed using Principal Coordinate Analysis. All analyses were conducted using R.

	Cladids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	Aetocrinus gracilis	-0.01395	0.09630	0.03839	-0.09960	0.03517	-0.01889	-0.01230	-0.01149	0.01154	0.02478
2	*Agostocrinus xenus*	-0.02404	0.07873	-0.02331	0.02249	0.00205	0.01128	-0.01861	-0.00433	-0.00772	0.01710
3	*Agostocrinus xenus* (Benbolt)	0.02415	-0.02806	-0.06571	-0.01839	0.01945	0.03374	0.00827	-0.01980	0.01890	0.00415
4	*Archaetaxocrinus burfordi*	-0.05055	0.05417	0.04315	0.00881	-0.04061	-0.02419	-0.06048	-0.02835	-0.03607	0.02655
5	*Archaetaxocrinus lanei*	-0.00929	-0.02550	0.05664	-0.05357	-0.03847	-0.03839	-0.04884	0.04715	-0.00814	-0.00017
6	*Brechmocrinus eos*	-0.01430	0.09589	0.03395	-0.00260	-0.00295	0.00258	-0.01629	-0.02565	-0.02615	0.00425
7	*Carabocrinus sp.* (Lebanon)	-0.02648	-0.00427	-0.04941	-0.01799	0.00059	-0.03956	0.02504	0.01080	0.01712	-0.01264
8	*Carabocrinus sp.* (Kimmswick)	-0.04275	0.05808	-0.02844	0.01022	0.00052	-0.01156	0.02415	-0.01805	-0.00410	-0.03327
9	*Carabocrinus boltoni*	-0.03597	0.07005	-0.09584	-0.05809	-0.00854	-0.06147	0.01396	-0.03220	0.00419	-0.00003
10	*Carabocrinus* cf. *treadwelli*	-0.05309	0.02026	-0.08215	-0.00776	0.02089	0.01541	-0.00263	-0.02892	0.01688	-0.00329
11	*Carabocrinus conoideus*	-0.07409	0.02939	-0.09240	-0.01826	0.01025	-0.01301	0.04395	-0.00291	-0.02037	-0.02541
12	*Carabocrinus dicyclicus*	-0.04641	0.04750	-0.05905	-0.04088	-0.00981	-0.03197	0.02989	-0.01174	0.03961	-0.00283
13	*Carabocrinus huronensis*	-0.04635	0.04129	-0.07321	-0.01113	-0.00028	-0.02410	0.01949	0.00037	-0.00580	-0.02231
14	*Carabocrinus magnificus*	-0.08333	0.07081	-0.04270	-0.04431	-0.03972	-0.00995	0.02956	-0.04736	0.03786	-0.05680
15	*Carabocrinus micropunctatus*	-0.05494	0.07486	-0.03851	-0.04486	-0.04319	-0.00784	0.05882	-0.03903	0.02447	-0.00457
16	*Carabocrinus oogyi*	-0.04318	0.03838	-0.05499	-0.03598	0.01154	-0.02758	0.01986	0.00626	-0.00633	-0.01822
17	*Carabocrinus radiatus*	-0.05109	0.04242	-0.04841	-0.04210	0.00975	-0.03493	0.02437	-0.00704	0.03200	0.00128
18	*Carabocrinus slocomi*	-0.05731	0.05035	-0.05611	-0.05223	0.02197	-0.03779	0.02494	-0.00822	0.02504	0.00169
19	*Carabocrinus stellifer*	-0.06622	0.06815	-0.03456	-0.02994	-0.02420	-0.01400	0.01970	-0.05921	0.02676	-0.02949
20	*Carabocrinus treadwelli*	-0.05284	0.01999	-0.08346	-0.00831	0.01845	0.01519	-0.00147	-0.02845	0.01765	-0.00418
21	*Carabocrinus valis*	-0.04774	0.04977	-0.06500	-0.02631	-0.01685	-0.02100	-0.02402	0.01321	0.02719	0.00414
22	*Carbocrinus radiatus*	-0.05643	0.03583	-0.06360	-0.03677	-0.01358	-0.06273	-0.00458	-0.01162	0.04850	0.00548
23	*Chenocrinus canadaensis*	0.02428	-0.05977	0.02276	0.03873	0.04480	0.02026	-0.01690	0.00720	0.01165	-0.00553
24	*Clematocrinus ohioensis*	0.02113	-0.09561	-0.02193	0.02777	0.04435	0.02124	-0.05603	0.01057	0.00776	0.01587
25	*Colpodecrinus quadrifidus*	-0.06269	-0.00206	0.00352	-0.00555	0.01484	-0.02811	0.01652	0.02231	-0.05318	-0.06583
26	*Cupulocrinus canaliculatus*	-0.02075	0.07320	-0.00550	0.00943	0.02114	-0.00206	-0.01213	0.02449	0.00089	0.00501

27 *Cupulocrinus crossmani*	-0.01489	0.09615	0.02043	0.00380	0.00261	0.00697	-0.00595	-0.01070	-0.01517	0.01952
28 *Cupulocrinus cylindricus*	-0.01191	0.05228	0.03038	0.00838	0.02014	0.00832	0.02027	0.03365	0.02972	-0.03331
29 *Cupulocrinus dixiei*	-0.06139	0.03612	-0.06510	-0.04465	-0.00903	-0.06620	-0.00648	-0.00472	0.04690	-0.01398
30 *Cupulocrinus gracilis*	-0.01520	0.08528	0.01719	0.00278	0.01019	0.00311	0.00545	0.00067	-0.01154	0.02079
31 *Cupulocrinus heterocostalis*	-0.02424	0.06538	-0.01720	0.00465	0.00172	-0.01392	-0.04475	-0.00613	0.02590	0.01702
32 *Cupulocrinus humulis*	-0.01954	0.07891	0.02716	0.00040	-0.02701	0.00763	0.01827	-0.00348	-0.00621	-0.00634
33 *Cupulocrinus jewetti*	0.00074	0.07209	0.00679	0.00426	-0.00115	0.00195	-0.01085	0.00259	0.00058	0.01254
34 Cupulocrinus jewetti (Decorah)	-0.03657	0.04479	0.02374	0.00923	-0.01031	-0.01375	0.02327	-0.00739	-0.00796	-0.01534
35 *Cupulocrinus kentuckyensis*	-0.05994	0.04280	0.06688	0.01523	-0.04409	0.00361	-0.01790	0.00434	-0.02766	-0.00871
36 *Cupulocrinus latibrachiatus*	-0.02901	0.06698	0.00127	0.00345	-0.00731	0.01064	0.01533	0.00187	-0.00365	-0.00033
37 *Cupulocrinus levorsoni*	-0.02362	0.06796	0.01535	0.00938	-0.01678	0.00207	-0.00177	-0.00878	0.02351	-0.00530
38 *Cupulocrinus minimus*	0.00915	0.09127	-0.01384	-0.00928	0.01409	0.01396	-0.00139	0.01409	-0.01161	0.02166
39 *Cupulocrinus molanderi*	-0.01991	0.05622	-0.00419	-0.00083	0.03452	0.01869	-0.00861	0.02862	0.03498	0.00707
40 *Cupulocrinus plattevillensis*	-0.02799	0.04092	-0.06270	-0.00273	-0.00716	-0.01096	-0.03720	0.02994	0.00934	0.00799
41 *Cupulocrinus plolydactylus*	0.00126	0.09579	0.00001	0.01675	-0.02348	0.02732	0.02096	0.01108	0.01853	0.00515
42 *Cupulocrinus sp. A*	-0.00984	-0.01119	0.05330	-0.05256	0.00021	-0.03023	-0.05366	0.02259	-0.00160	0.02342
43 *Cupulocrinus* sp. Cf. *Latibrachialus*	-0.00471	0.10515	-0.00453	0.03671	-0.02761	0.02645	0.01114	0.02328	0.02059	-0.01108
44 *Cupulocrinus* species cf. *C. gracilis*	-0.01246	0.05038	0.01474	0.02062	0.00416	-0.00105	-0.00011	0.01694	0.01183	-0.01756
45 *Cupulorcrinus angustatus*	-0.01293	0.07498	-0.00484	0.01716	-0.03550	0.01530	-0.00313	0.00270	0.00929	0.00854
46 *Dendrocrinus abactronodosus*	-0.02275	0.09895	0.04262	-0.00924	-0.00433	0.00026	-0.01956	-0.00499	-0.02608	-0.02133
47 *Dendrocrinus acutidactylus*	-0.02167	0.08999	0.04481	0.01321	-0.00104	0.00207	-0.03234	0.00084	0.01017	-0.02379
48 *Dendrocrinus alternatus*	-0.02433	0.01903	-0.04305	-0.01533	0.04711	0.00522	0.00149	0.06329	0.03610	-0.02436
49 *Dendrocrinus cauduceus*	-0.00026	0.07607	-0.01879	0.00218	-0.01201	0.03327	0.02181	0.00200	0.01317	0.00871
50 *Dendrocrinus constrictus*	-0.00589	0.10336	-0.03776	-0.01501	-0.02552	0.04771	0.00127	0.00663	-0.03211	0.04602
51 *Dendrocrinus curvijunctus*	0.00208	0.09689	0.01413	0.00672	0.01596	0.01783	0.00787	0.00309	-0.00195	0.01663

52 *Dendrocrinus daytonensis*	-0.01759	0.06920	-0.07266	-0.04579	0.01950	0.03053	-0.02329	0.03389	-0.01006	0.02082
53 *Dendrocrinus erraticus*	-0.02722	0.08732	0.00833	0.00929	-0.03449	0.01562	0.00036	-0.00602	-0.00083	-0.02482
54 *Dendrocrinus gracilis*	-0.04493	0.04861	-0.01693	-0.02333	0.04285	-0.01841	-0.03205	0.04335	0.03012	0.02688
55 *Dendrocrinus leptos*	0.00409	0.08562	0.02128	-0.01775	-0.00338	-0.00430	-0.00664	0.00016	-0.03417	-0.00984
56 *Dendrocrinus minutus*	-0.01896	0.07489	-0.00277	-0.01249	0.03890	0.00234	-0.01523	0.01450	-0.00315	0.00521
57 *Dendrocrinus* n. sp. aff. *navigiolum*	-0.00106	0.05938	-0.00064	-0.07448	0.01320	0.02690	0.03053	0.01357	-0.01540	0.01850
58 *Dendrocrinus navigiolum*	-0.02580	0.07452	-0.01073	0.00046	0.02074	-0.00715	-0.04309	0.02128	-0.01613	-0.00554
59 *Dendrocrinus parvus*	-0.01152	0.08778	0.04100	-0.00766	0.01507	0.00903	0.00559	0.00227	-0.00579	0.00412
60 *Dendrocrinus posticus*	-0.00773	0.09870	0.01325	0.01908	-0.02861	0.01573	0.01633	-0.00911	0.00651	-0.00722
61 *Dendrocrinus sp.* Indet	-0.01237	0.11077	0.02518	0.00156	0.00475	0.01114	0.00512	0.01216	-0.00201	0.00138
62 *Dendrocrinus ursae*	-0.01395	0.06661	0.03731	-0.10545	0.02933	0.04453	-0.02446	0.01323	-0.04079	-0.00700
63 *Dendrocrinus villosus*	-0.02129	0.07238	-0.00484	0.00590	0.02552	0.03751	0.00341	0.03726	0.00266	0.00227
64 *Dendrocrius aphelos*	-0.02875	0.07610	0.05569	-0.01108	0.00986	-0.00142	-0.01564	-0.00874	-0.03017	-0.00123
65 *Elpasocrinus radiatus*	-0.03239	0.12407	0.03416	-0.06828	0.03789	-0.04023	0.03300	-0.04583	-0.00956	-0.01271
66 *Eopinnacrinus pinnulatus*	-0.03054	0.08638	0.02029	0.03506	0.03251	0.02958	0.01556	0.00693	0.01271	0.02779
67 *Euspirocrinus ? Sp*	-0.01329	0.03054	-0.00582	0.01802	-0.02281	-0.01679	-0.01810	0.02785	0.03109	-0.00783
68 *Euspirocrinus gagoni*	0.00184	0.07584	0.01189	-0.07701	0.01129	0.00010	0.01219	0.02163	-0.02511	0.01344
69 *Euspirocrinus heliktos*	-0.02383	0.07228	0.03617	-0.01583	-0.02231	0.03148	0.04415	0.04775	0.02120	-0.02109
70 *Euspirocrinus wolcottense*	-0.02542	0.06779	0.01337	-0.01469	-0.01739	0.01956	0.00970	0.01826	-0.00072	-0.03347
71 Forest 13 cladid	-0.04697	0.04286	0.05886	0.01998	0.03399	-0.04080	0.02777	-0.00711	-0.01321	-0.00084
72 *Fragucrinus bothros*	0.01012	0.10401	0.07073	-0.06735	0.01255	0.00762	0.01833	-0.02174	-0.01154	0.04480
73 *Grenprisa springeri*	-0.02309	0.09752	0.03502	0.01970	-0.01278	-0.01454	-0.04991	-0.02129	-0.01453	-0.01069
74 *Grenprisia billingsi*	0.00921	0.11316	0.03768	-0.01377	-0.00149	0.00666	0.00199	-0.00717	-0.03206	0.00369
75 *Illemocrinus amphiatus*	-0.03816	0.06521	0.01711	-0.03062	-0.00075	-0.01157	0.04328	-0.03133	-0.01889	-0.04022
76 *Kanabinocrinus thyaros*	-0.00758	0.06794	-0.00808	-0.00380	0.04718	0.00328	-0.03387	0.04381	0.01044	-0.01040
77 *Laurucrinus sandtopensis*	-0.01111	0.07249	0.01310	-0.06283	0.04068	0.01208	-0.00360	0.01239	-0.01679	0.01419
78 *Levicyathocrinites sablensis*	-0.00998	0.05816	0.01592	-0.06402	0.05206	0.02800	-0.00528	0.01446	-0.01064	0.00696
79 *Merocrinus britonensis*	0.03163	0.07472	0.01046	0.01854	0.03811	0.01081	-0.01280	0.00816	0.02292	-0.00337
80 *Merocrinus corroboratus*	-0.02918	0.09024	0.04232	0.00429	0.00488	-0.00676	-0.02719	-0.01769	0.03153	0.01521
81 *Merocrinus curtus*	-0.02382	0.09019	0.05676	-0.00663	-0.00044	-0.00193	-0.01290	0.02767	0.04826	-0.00386
82 *Merocrinus impressus*	0.02145	0.08843	-0.01448	0.00063	0.04545	0.02137	0.00385	0.03546	0.00593	0.00042

83	*Merocrinus typus*	-0.00070	0.08576	0.03605	0.01807	0.02140	-0.01184	-0.03807	-0.00109	0.01827	-0.00718
84	*Myosocrinus chicottensis*	-0.04191	0.07312	-0.01012	-0.14512	-0.01777	0.05152	-0.00633	-0.01469	0.02848	-0.01456
85	*Ottawacrinus typus*	-0.00873	0.05684	0.02053	0.03951	0.00630	-0.00544	-0.04360	0.00607	-0.00805	0.00470
86	*Palaeocrinus angulatus*	-0.04585	0.05830	-0.01548	-0.01375	0.00107	-0.00877	0.03652	0.00803	0.01321	-0.03404
87	*Palaeocrinus avondalensis*	-0.04608	0.04068	-0.06315	-0.01857	0.01742	-0.00978	0.03921	0.00228	-0.01257	0.00042
88	*Palaeocrinus hudsoni*	-0.05748	0.05008	-0.05969	-0.08194	-0.01623	-0.07178	0.01792	-0.01052	-0.00557	-0.02116
89	*Palaeocrinus planobasalis*	-0.04658	0.04127	-0.06571	-0.02152	0.01949	-0.00696	0.03966	-0.00111	-0.01206	0.00003
90	*Palaeocrinus pulchellus*	-0.04233	0.03553	-0.00692	0.00104	0.02417	-0.02075	0.03227	0.00175	0.00531	-0.02516
91	*Palaeocrinus rhombiferus*	-0.02935	0.06914	0.01082	0.01793	-0.01903	-0.00328	-0.00209	0.00224	0.01139	-0.01848
92	*Palaeocrinus sp.*	-0.04067	0.04237	-0.02493	-0.00035	-0.01386	-0.01845	0.02078	-0.00324	0.01555	-0.03012
93	*Palaeocrinus* sp. cf. *P. planobasalis*	-0.04723	0.07297	-0.04886	-0.02495	0.00095	0.04766	0.05120	-0.01846	0.02097	-0.04300
94	*Petalocrinus mirabilis*	-0.04086	0.01361	-0.03126	0.02002	-0.01016	0.02416	-0.01438	-0.04480	0.02647	-0.00955
95	*Plicodendrocrinus casei*	-0.01005	0.11048	0.03960	-0.00130	0.04439	-0.00462	0.05660	-0.00014	0.00794	-0.02420
96	*Plicodendrocrinus epinettensis*	-0.01201	0.10957	0.04311	-0.00677	-0.00790	0.00428	-0.00755	0.00905	-0.02212	-0.02362
97	*Plicodendrocrinus observationensis*	-0.01163	0.11044	0.04343	-0.00829	-0.00897	0.00429	-0.00863	0.00951	-0.02170	-0.02504
98	*Plicodendrocrinus proboscidiatus*	-0.01687	0.08609	0.03709	0.01515	0.01354	-0.00532	-0.02163	0.01465	0.01746	-0.02180
99	*Porocrinus bromidensis*	-0.07305	0.03987	-0.08589	-0.08399	0.04936	0.01095	0.02512	-0.03910	0.03559	-0.00859
100	*Porocrinus conicus*	-0.04455	0.03209	-0.06339	-0.01573	0.06148	0.01051	-0.00852	-0.02174	0.00914	0.00649
101	*Porocrinus elegans*	-0.06626	0.05895	-0.09183	-0.00589	0.01864	0.01825	0.04000	0.00950	0.00529	-0.03703
102	*Porocrinus fayettensis*	-0.05327	0.02564	-0.07331	-0.03882	0.04419	0.03028	0.03803	-0.00564	0.01934	-0.01859
103	*Porocrinus kentuckiensis*	-0.05152	0.02087	-0.08192	-0.00688	0.01905	0.01403	-0.00124	-0.02738	0.01812	-0.00395
104	*Porocrinus lebanonensis*	-0.04596	0.01340	-0.08748	-0.00293	0.02806	0.01077	-0.01823	-0.03459	-0.00103	-0.02772
105	*Porocrinus pentagonius*	-0.04869	0.03542	-0.06167	-0.03894	0.05392	-0.01780	-0.01997	-0.04382	0.04333	0.01386
106	*Porocrinus petersenae*	-0.05484	0.06345	-0.08073	-0.06919	0.04271	-0.02708	-0.00931	-0.02662	0.01215	0.01211
107	*Porocrinus plattinensis*	-0.05912	0.04541	-0.08727	-0.03228	0.01244	0.00245	0.02085	-0.01017	-0.01214	-0.02488
108	*Porocrinus pyramidatus*	-0.04544	0.04896	-0.06171	-0.01773	0.05874	0.01977	0.00940	-0.05130	-0.00357	0.01493
109	*Porocrinus shawi*	-0.04797	0.05687	-0.07807	-0.02217	0.03577	-0.00650	-0.00331	-0.00936	-0.02142	-0.01670
110	*Porocrinus* sp. Cf.	-0.04945	0.02626	-0.06544	-0.03990	0.03426	0.01951	0.03498	-0.00461	0.00987	-0.02195

	P.smithi										
111	*Praecupulocrinus conjugans*	-0.02029	0.08626	0.03158	-0.01185	0.01866	0.01247	0.00190	0.00067	-0.00589	0.01129
112	*Premanicrinus debius*	-0.02554	0.09889	-0.03251	-0.04135	0.00208	0.04197	-0.03290	-0.01350	-0.03240	-0.02165
113	*Quinquecaudex cincinnatiensis*	-0.02255	0.09410	0.02805	0.03040	-0.00548	0.00715	-0.03681	-0.01521	0.01001	-0.00259
114	*Quinquecaudex glabellus*	-0.01404	0.10544	0.04329	-0.00263	0.01198	-0.00142	-0.00237	0.01492	-0.02210	-0.01110
115	*Quinquecaudex species A*	-0.00221	0.09158	0.01903	0.01799	0.01842	-0.01351	-0.06124	0.00347	-0.02653	-0.03587
116	*Quinquecaudex springeri*	-0.01267	0.11043	0.02876	-0.00366	0.00448	0.01784	-0.00483	-0.00039	-0.00799	-0.00043
117	*Quintuplexacrinus oswegoensis*	-0.01735	0.08630	0.03402	-0.00731	0.02472	0.00504	0.00807	0.02432	-0.00526	0.00290
118	*Salinocrinus conus*	-0.02085	0.03336	0.02763	-0.07774	0.02146	0.03865	-0.03244	0.00089	-0.04968	0.01119
119	*Triboloporus cryptoplicatus*	-0.03725	0.04742	-0.08175	-0.01270	-0.01364	0.02575	-0.00251	0.02077	-0.00206	-0.00303
120	*Triboloporus xystrotus*	-0.05250	0.03494	-0.08637	-0.04617	0.01001	0.00426	0.03448	-0.01029	-0.01948	-0.02489
121	Undescribed cladid 1	0.01805	0.07994	-0.06855	0.00040	0.04143	-0.01952	-0.05738	0.03352	-0.00822	0.02887
122	undescribed cladid I1	-0.03304	0.03123	-0.07487	-0.03685	0.02444	0.03512	-0.02005	0.00014	-0.00974	-0.01404
123	undescribed cladid I1	-0.03477	0.04709	-0.08187	-0.03358	0.00556	0.01772	-0.02977	0.02295	-0.02641	-0.03550
124	undescribed cladid I2	-0.02148	0.04687	-0.03573	0.00472	0.01826	0.02878	-0.02232	-0.01953	-0.01253	-0.03121

	Disparids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Acolocrinus arbucklensis*	0.10200	-0.02458	-0.16836	-0.06665	-0.03732	0.12064	-0.03613	-0.07498	0.01203	-0.01159
2	*Acolocrinus crinerensis*	0.12074	-0.02299	-0.19009	-0.07500	-0.06129	0.11995	0.00848	-0.07919	0.01163	0.02580
3	*Acolocrinus hydraulicus*	0.09465	-0.03750	-0.14667	-0.04242	-0.03251	0.12408	0.01020	-0.04425	0.01248	0.00057
4	*Anomalocrinus antiquus*	0.07287	-0.01003	-0.06730	-0.00250	-0.00349	-0.04819	-0.02655	-0.00110	-0.00251	-0.01286
5	*Anomalocrinus incurvus*	0.09092	0.02401	0.01803	0.00526	-0.02357	0.00238	0.03923	0.01872	0.00593	-0.03934
6	*Apodasmocrinus daubei*	0.08110	0.01403	0.04310	0.06063	0.01199	0.04374	-0.03244	-0.06131	-0.02933	-0.00934
7	*Apodasmocrinus punctatus*	0.10823	0.00670	-0.05508	-0.00510	0.04389	-0.02490	-0.02642	0.00482	0.02407	0.03718
8	*Apodasmocrinus* sp. cf. *A. daubei*	0.08249	0.01173	0.04265	0.05213	0.01488	0.04448	-0.02379	-0.06466	-0.02669	0.00193
9	*Atopocrinus priscus*	0.07872	-0.00622	0.01280	0.02344	0.02629	0.03454	-0.00909	-0.03212	-0.02218	0.00982
10	*Calceocrinus alleni*	0.14290	0.02309	-0.03091	0.01463	-0.04335	0.01655	0.00871	-0.01891	0.05311	-0.04186
11	*Calceocrinus barrandii*	0.12430	0.03456	0.03400	0.04416	-0.05559	-0.01407	0.01216	0.02580	-0.01874	0.02858

12 *Calceocrinus constrictus*	0.12416	0.05621	0.01730	0.02484	-0.02044	-0.01199	0.00592	0.00869	-0.00543	0.00265
13 *Calceocrinus gamachicus*	0.11267	0.02619	-0.04786	0.02439	-0.05305	-0.01252	0.01194	0.03430	0.00144	-0.02687
14 *Calceocrinus gossmani*	0.11063	0.05970	0.02057	0.02538	-0.04354	0.00725	0.07184	-0.00692	0.02725	0.03838
15 *Calceocrinus incertus*	0.10018	0.04777	-0.02595	0.00927	-0.05744	-0.00787	0.04366	0.01219	-0.00127	0.01383
16 *Calceocrinus levorsoni*	0.11778	0.06065	-0.01218	0.01610	-0.09765	-0.00143	0.05774	0.00612	0.01681	0.03123
17 *Calceocrinus longifrons*	0.12130	0.06360	0.00033	0.00848	-0.07623	0.00024	0.07205	-0.00845	0.00512	0.04214
18 *Calceocrinus multibifurcatus*	0.10899	0.05360	-0.03021	0.02636	-0.06611	0.00186	0.06537	0.01747	0.00494	0.04086
19 *Calceocrinus pusulosus*	0.12805	0.05881	0.01569	0.02018	-0.02724	-0.01041	0.00553	0.01070	-0.00614	-0.00423
20 *Calceocrinus sp?*	0.10886	0.02350	-0.03783	-0.00941	-0.03448	-0.03132	-0.00271	0.00450	0.02301	-0.02833
21 *Calceocrinus tridactylus*	0.11534	0.03807	-0.00426	0.02077	-0.06619	-0.00989	0.03995	0.02415	0.00123	-0.00140
22 *Caleidocrinus gerki*	0.05707	0.01565	0.04921	0.01085	0.02633	-0.01669	-0.00743	-0.01138	0.01612	-0.01487
23 *Cataractocrinus clementi*	0.10091	0.04232	0.04504	0.02083	0.03789	-0.01300	-0.01717	-0.01829	0.01539	0.00782
24 *Cataraquicrinus elongatus*	0.10298	0.05488	0.03580	0.01694	0.01597	-0.01094	-0.00889	-0.02164	-0.01900	0.00127
25 *Charactocrinus billingsi*	0.14145	0.01199	-0.01994	-0.04551	-0.04061	-0.01305	0.01493	0.04340	-0.02622	-0.03988
26 *Cincinnaticrinus pentagonus*	0.09966	0.04060	0.00136	-0.00325	0.04375	-0.00097	-0.00058	0.02868	0.00678	-0.01195
27 *Cincinnaticrinus varibrachialis*	0.09926	0.03742	0.00117	-0.00936	0.04474	0.00038	0.00723	0.02270	0.00766	-0.00169
28 *Columbicrinus crassus*	0.08460	0.00809	0.03771	0.01911	0.05819	0.05204	0.00933	-0.00705	0.04200	-0.01093
29 *Columbicrinus sulphurensis*	0.07194	-0.00453	0.03362	0.04213	0.02922	0.04451	0.00008	-0.02982	-0.00687	0.02160
30 *Corvucrinus schucherti*	0.15352	-0.00160	-0.02963	-0.03992	-0.02754	0.04253	0.01467	0.01055	-0.01335	-0.05115
31 *Cremacrinus arctus*	0.09688	0.03447	0.02094	0.02627	-0.05878	-0.00616	0.03999	0.02188	0.01204	-0.01182
32 *Cremacrinus articulosus v1*	0.11833	0.05283	0.00234	0.01689	-0.01293	-0.00711	0.01235	0.01868	-0.00469	0.00260
33 *Cremacrinus articulosus v2*	0.12150	0.05169	0.00296	0.01927	-0.01136	-0.00899	0.00986	0.02001	0.00079	0.00335
34 *Cremacrinus crossmani*	0.13088	0.08414	0.01501	0.01101	-0.04598	-0.03947	0.02211	-0.01858	0.04015	0.06424
35 *Cremacrinus forrestonensis*	0.13088	0.04394	-0.01391	0.03258	-0.04106	-0.01364	0.04847	0.01230	0.01320	0.02772
36 *Cremacrinus gerki*	0.10963	0.05518	-0.02808	0.01145	-0.08334	-0.00997	0.04495	-0.00158	0.00002	0.03385
37 *Cremacrinus guttenbergensis*	0.12449	0.07795	0.01951	0.03720	-0.00463	-0.00880	0.07158	0.03742	0.02777	0.05977
38 *Cremacrinus latus*	0.14187	0.05868	-0.03030	0.02546	-0.03377	-0.03466	0.00611	0.04303	-0.02537	0.00546

39 *Cremacrinus punctatus*	0.12196	0.03964	0.00463	0.01262	-0.05408	-0.00254	0.05738	0.03206	-0.00566	-0.00149
40 *Cremacrinus ramifer*	0.08920	0.00461	-0.09345	0.02815	-0.05064	-0.04293	0.01483	0.07133	0.01376	0.00604
41 *Cremacrinus sp.*	0.07334	0.00784	-0.08726	0.01397	-0.03631	-0.02854	-0.00121	0.06743	-0.00143	-0.01803
42 *Daedalocrinus bellevillnsis*	0.10660	0.06446	0.01773	0.02313	-0.01216	-0.01373	-0.02893	-0.02786	-0.03587	-0.00890
43 *Daedalocrinus kirki*	0.10415	0.06005	0.01743	0.02372	-0.00048	-0.00384	-0.00256	0.00306	-0.01952	0.00102
44 *Diaphorocrinus pleniramulus*	0.11765	0.03503	0.00339	0.01842	-0.05676	-0.00386	0.05258	0.03763	-0.00003	-0.00682
45 *Difficilicrinus coneyi*	0.09821	-0.00493	-0.05959	-0.00434	0.03723	-0.00361	-0.03954	0.01293	-0.02090	-0.00528
46 *Doliocrinus monilicaulis*	0.06238	-0.00290	0.04975	0.05170	0.01290	-0.01249	-0.03031	0.00253	0.00035	0.01883
47 *Doliocrinus pustulatus*	0.08232	0.00464	0.02748	0.06351	0.03966	0.05857	0.01864	-0.03849	-0.00402	0.04526
48 *Drymocrinus manitoulinensis*	0.08366	0.00582	0.05982	0.02658	0.00995	-0.00716	-0.00651	0.03199	0.00845	-0.00271
49 *Dystactocrinus constrictus*	0.07621	-0.01339	-0.02070	-0.00065	0.03371	-0.02396	-0.01840	0.06381	0.01195	0.00803
50 *Ectenocrinus geniculatus*	0.09442	0.02289	-0.00976	0.01927	0.03642	-0.01141	-0.02390	-0.00395	0.02044	0.01475
51 *Ectenocrinus simplex*	0.08422	0.00968	0.05744	0.02470	0.00958	-0.01253	-0.00878	0.02978	0.00750	-0.00136
52 *Ectenocrinus sp.*	0.06285	-0.02066	-0.00294	0.02785	-0.05576	0.04029	-0.02276	-0.01868	-0.02181	0.04322
53 *Eomyelodactylus forester*	0.16391	-0.17796	0.15378	-0.28066	0.05194	0.02724	0.03892	0.03984	-0.01627	-0.02578
54 *Eomyelodactylus plumosus*	0.12815	-0.13638	0.08838	-0.14973	0.02630	0.02335	0.05294	-0.02382	0.02970	0.08818
55 *Eomyelodactylus richardsoni*	0.09175	-0.00167	0.03177	-0.07648	0.05421	-0.02455	-0.02362	0.02816	-0.01870	-0.01959
56 *Eomyelodactylus rotundus*	0.09821	-0.08080	-0.01826	-0.06950	-0.12731	-0.04804	-0.08126	-0.14298	-0.08916	-0.00295
57 *Eomyelodactylus sp.*	0.11628	-0.13097	0.08010	-0.14736	0.00114	0.00884	0.04157	0.01001	-0.00589	-0.05062
58 *Eomyelodactylus sparteus*	0.16216	-0.18026	0.16042	-0.27854	0.04759	0.01467	0.03212	0.02448	-0.03106	-0.01438
59 *Eomyelodactylus springeri*	0.08483	-0.05337	0.05550	-0.06574	0.01633	-0.08169	0.01191	0.02088	0.01163	0.00291
60 *Eomylodactylus uniformis*	0.12654	-0.10949	0.01308	-0.12586	-0.11773	-0.04945	-0.08647	-0.14668	-0.10087	0.04668
61 *Eustenocrinidae Indeterminante*	0.09307	-0.03653	0.03034	-0.02871	0.04073	-0.01337	-0.06098	-0.00661	0.01020	-0.00376
62 *Eustenocrinus springeri*	0.09366	0.01276	-0.04582	-0.00456	0.06481	-0.02828	-0.02753	0.02852	0.02951	0.02142
63 Forest ?	0.09859	0.01710	-0.03031	-0.00918	0.03807	0.02002	0.00150	-0.04335	-0.01447	-0.01155

64 Forest 15	0.03987	-0.05201	0.04705	-0.01627	0.01446	-0.03452	-0.03531	0.01781	-0.01772	-0.00861
65 Forest 18	0.06824	0.02058	0.03972	0.01714	0.04067	0.02801	-0.04185	-0.07473	0.02401	-0.04283
66 Forest 9 Disparid	0.06533	0.00927	0.01167	0.00178	0.01862	-0.03454	-0.01784	0.02417	0.00614	-0.01612
67 *Geraocrinus sculptus*	0.07501	0.01026	0.05592	0.03320	0.02323	0.00519	0.00488	-0.01607	0.00120	0.01170
68 *Geraocrinus sculptus* (Benbolt)	0.08376	0.02897	0.01036	0.00534	-0.01055	-0.00060	0.02406	0.00275	0.00459	-0.01773
69 *Glaucocorinus falconeri*	0.10446	0.00808	0.02367	-0.05313	0.01870	-0.05553	-0.04345	0.01081	0.03136	-0.01386
70 *Grypocrinus? Genuinus*	0.16319	-0.03856	0.00825	-0.01098	-0.08054	0.02894	0.02983	0.00063	0.02941	-0.00782
71 *Haptocrinus buttsi*	0.06228	0.00319	0.07559	0.01603	-0.00373	-0.03542	-0.04068	0.00935	-0.01786	-0.02494
72 *Haptocrinus calvatus*	0.10295	0.05047	0.04187	0.02926	0.02208	-0.03061	-0.02241	0.00515	-0.00608	-0.01713
73 *Homocrinus diminutus*	0.08351	-0.00237	-0.00553	0.01417	0.04279	0.03413	-0.01586	-0.01850	-0.00570	0.01523
74 *Ibexocrinus lepton*	0.10324	0.05076	0.01429	0.00688	0.01250	-0.01431	-0.00514	-0.01612	-0.01617	0.01432
75 *Inyocrinus strimplei*	0.10486	0.04761	-0.02026	0.00830	0.03078	-0.01390	-0.00586	-0.00960	-0.00664	0.02731
76 *Iocrinus similis*	0.08088	0.03175	0.03060	0.02278	0.02478	-0.04151	-0.02371	-0.00908	0.04431	0.00046
77 *Iocrinus subcrassus*	0.08059	0.04650	0.05291	0.01583	0.04710	-0.02603	0.04308	-0.01652	0.01522	-0.04395
78 *Iocrinus tretonensis*	0.04617	0.01024	0.03060	0.02031	0.01543	-0.02507	0.03127	-0.01649	0.02852	-0.05702
79 *Isotomocrinus apheles*	0.08107	0.02518	0.05216	0.02547	0.00429	-0.01163	-0.02209	-0.01203	-0.02678	0.00049
80 *Isotomocrinus minutus*	0.08021	0.02314	0.05349	0.01206	0.00790	-0.01591	-0.01490	-0.01122	-0.02920	0.00159
81 *Isotomocrinus n. sp.*	0.08062	0.03407	-0.02655	0.04898	0.02547	0.01288	-0.01849	-0.02498	0.02595	0.03319
82 *Isotomocrinus tenuis*	0.06661	0.03094	0.06001	0.01803	0.04090	-0.00321	-0.01682	0.01193	0.03547	-0.02550
83 *Isotomocrinus typus*	0.06661	0.03094	0.06001	0.01803	0.04090	-0.00321	-0.01682	0.01193	0.03547	-0.02550
84 *Kastorcrinus chatteroni*	0.10009	0.03039	-0.00134	0.00344	0.00478	-0.03680	-0.01307	-0.00003	-0.00938	0.01224
85 *Myeldactylus sp.*	0.08711	-0.07712	-0.01090	-0.04370	-0.08049	0.00686	0.00243	-0.04697	0.03370	0.02370
86 *Myelodactylus convolutus*	0.15632	-0.13883	0.04844	-0.06913	-0.02164	0.02622	0.06011	0.02314	0.11104	0.03310
87 *Myelodactylus linae*	0.06874	-0.03976	-0.00382	-0.06692	0.04164	-0.04364	-0.06632	0.02753	-0.02096	0.01483
88 *Ohiocrinus brauni*	0.10631	0.05824	0.06205	0.00825	0.03084	0.00893	0.00435	0.00867	0.01155	-0.02109
89 *Ohiocrinus exilis*	0.06869	-0.02643	0.06936	-0.01658	0.00669	0.03437	-0.02780	-0.03292	0.03011	0.02018
90 *Ohiocrinus laxus*	0.10519	0.05726	0.06170	0.00866	0.03059	0.00990	0.00628	0.01090	0.00791	-0.02189
91 *Ohiocrinus levorsoni*	0.08901	0.05034	0.03357	0.02200	0.01754	-0.01030	-0.01635	-0.04478	-0.03131	0.00619
92 *Ohiocrinus sp.*	0.10631	0.05824	0.06205	0.00825	0.03084	0.00893	0.00435	0.00867	0.01155	-0.02109
93 *Paracremacrinus laticardinalis*	0.12104	0.04139	0.00057	0.02186	-0.05070	-0.00328	0.02504	0.01832	-0.00099	-0.01778
94 *Parapisocrinus quinquelobus*	0.05256	-0.02371	-0.05527	-0.00358	0.03608	0.02203	-0.02019	-0.02250	0.03038	-0.00860
95 *Pariocrinus*	0.06834	0.03687	0.03976	0.00946	0.01906	-0.01125	-0.00823	-0.01108	-0.00658	-0.00262

	heterodactylus										
96	*Peltacrinus sculptatus*	0.08940	0.06251	0.01100	0.04454	0.02191	-0.04978	0.00879	-0.02523	-0.02112	-0.04922
97	*Penicillicrinus parvus*	0.09063	0.01858	-0.00410	0.02492	0.01054	-0.01287	-0.01083	0.00659	-0.01775	0.03669
98	*Peniculocrinus miller*	0.06723	0.01132	0.00207	0.05541	0.03081	-0.03058	-0.04316	0.00940	0.01227	0.02099
99	*Pisocrinus campana*	0.08199	-0.01797	-0.08288	-0.00084	0.01988	0.04221	0.00227	-0.01649	0.01590	0.00797
100	*Pisocrinus gemmiformis*	0.11873	0.01848	-0.04428	0.00935	-0.01388	0.03943	0.01894	-0.00669	0.00256	-0.04075
101	*Pogonipocrinus antiquus*	0.06505	0.03048	0.03958	0.02013	0.01487	-0.01365	-0.02587	-0.01888	0.02221	-0.00235
102	*Ristnacrinus altobasalis*	0.08941	-0.00388	-0.05761	-0.01131	0.09355	0.02366	-0.01963	0.01154	0.03545	0.01805
103	*Stibarocrinus centervillensis*	0.12976	0.04941	-0.01193	0.04119	-0.06878	-0.01583	0.04886	0.02491	0.01173	0.00203
104	*Sygcaulocrinus typus*	0.08926	0.03624	-0.01373	0.00935	0.02422	-0.01718	-0.01331	-0.00827	-0.00897	0.02047
105	*Tenuicrinus longibasalis*	0.09122	0.01066	0.03314	0.02388	0.01200	0.02319	-0.02162	-0.00589	-0.03000	-0.01371
106	*Thaerocrinus crenalus*	0.11282	0.03572	0.01678	0.01337	-0.04758	0.00082	0.03268	0.03275	-0.00103	-0.03996
107	*Tornatilicrinus longicaudis*	0.10569	0.05092	0.04552	0.02941	0.01380	-0.01167	-0.03525	-0.00107	0.01802	-0.01439
108	*Trypherocrinus brassfieldensis*	0.11352	0.06190	0.01180	0.00213	-0.04747	-0.00020	0.01604	0.02278	-0.00135	0.00418
109	*Tryssocrinus endotomous*	0.10255	0.05471	0.03467	0.04029	0.00425	-0.02145	-0.03809	-0.01412	-0.00202	-0.00326
110	undescribed big disparid I	0.07277	0.02697	-0.02615	0.00964	0.01996	-0.00954	-0.02430	-0.02456	-0.01587	-0.00639
111	Undescribed Iocrinid	0.05972	0.03202	-0.00084	0.00003	0.01735	-0.01163	-0.00766	-0.00001	0.00170	0.00939
112	Undescribed iocrinid zone b	0.06874	0.02299	0.01056	0.02769	-0.02387	-0.05949	0.01904	-0.05672	-0.01053	-0.04994
113	Undescribed iocrinid zone I	0.07313	0.03257	-0.00652	0.01479	0.00033	-0.03452	0.03987	-0.04303	-0.01027	-0.03339

	Diplobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Adelplicrinus fortuitus*	0.02693	-0.02068	0.03071	0.03053	-0.03445	-0.00831	-0.02108	-0.02913	-0.03865	-0.01673
2	*Allozygocrinus dubuquensis*	-0.10164	0.01327	-0.01078	-0.02221	-0.06468	0.01118	-0.05385	0.00534	0.01868	-0.02591
3	*Allozygocrinus exallos*	-0.08766	-0.03209	0.06264	-0.08521	0.01779	0.00347	-0.10925	0.02084	0.01226	-0.02990
4	*Anthracocrinus primitivus*	-0.05198	-0.02168	0.03630	0.02038	0.03127	0.05357	-0.00118	0.02349	0.03122	-0.02797
5	*Apoarchaeocrinus anticostiensis*	-0.08001	-0.04186	0.00608	-0.00380	0.00694	0.05152	-0.02995	-0.00717	-0.00571	-0.01867

6	*Archaeocrinus buckhornensis*	-0.10673	-0.04190	0.00851	0.02426	-0.05140	0.02735	-0.01505	0.02734	-0.01088	-0.00225
7	*Archaeocrinus conicus*	-0.08800	-0.02277	0.00130	0.01680	-0.06007	0.03998	-0.03357	0.02985	0.00266	-0.02017
8	*Archaeocrinus desideratus*	-0.06588	0.00998	0.05258	0.01956	-0.04853	0.01937	0.00289	0.01920	0.00463	0.00912
9	*Archaeocrinus lacunosus*	-0.10797	-0.01932	0.01075	0.04478	-0.00738	-0.02626	0.05134	0.00056	-0.02062	0.03482
10	*Archaeocrinus microbasalis*	-0.07131	-0.00584	0.03074	0.00466	0.00333	0.02265	0.02588	0.05220	0.00688	0.00247
11	*Archaeocrinus ottawaensis*	-0.12089	-0.08509	-0.02875	-0.07971	0.04189	0.01279	-0.00210	-0.02466	-0.01730	0.00525
12	*Archaeocrinus peculiaris*	-0.06804	0.00916	0.04115	0.02690	-0.08747	0.04629	0.01630	0.01580	-0.02881	0.02505
13	*Archaeocrinus peculiaris* (Benbolt)	-0.05879	0.00251	-0.00584	0.01894	-0.01690	0.02660	-0.01132	0.00053	-0.02101	-0.00995
14	*Archaeocrinus snyderi*	-0.04944	-0.02930	-0.01686	-0.00475	0.02159	0.01150	0.01282	0.07317	-0.00513	-0.00873
15	*Archaeocrinus subovalis*	-0.07620	-0.02668	0.03096	0.01195	0.00945	-0.00023	0.01648	0.04063	0.00480	0.01770
16	*Atactocrinus wilmingtonensis*	-0.09936	-0.01847	0.00537	0.02826	-0.02022	0.01741	-0.00095	-0.00637	0.01718	-0.02907
17	*Balacrinus sp.*	-0.11130	-0.05330	-0.02023	-0.00241	0.00293	-0.04350	0.04545	0.03537	-0.01891	0.01391
18	*Becsciecrinus adonis*	-0.06511	-0.01934	0.01696	0.01590	0.00453	-0.00074	0.00226	0.02123	-0.00623	0.01924
19	*Bromidocrinus nodosus*	-0.08497	-0.01015	0.04539	0.02338	-0.00523	0.02271	0.03172	-0.01652	-0.00402	-0.02231
20	*Bucucrinus saccus*	-0.08234	-0.02935	0.02319	0.02210	0.02321	0.05239	-0.03677	-0.00247	0.01166	0.01158
21	*Cleicrinus regius*	-0.08092	0.02814	0.01615	-0.03324	-0.04911	-0.03047	-0.05508	-0.01634	0.07828	0.00855
22	*Cleicrinus sculptus*	-0.01818	-0.09269	0.00858	0.00825	-0.07929	-0.06077	-0.01976	-0.08357	0.11429	-0.02587
23	*Cleiocrinus bromidensis*	-0.12406	-0.02605	0.03205	-0.03465	-0.05009	0.01154	-0.04505	0.02796	0.08784	-0.00688
24	*Cleiocrinus laevis*	-0.17688	-0.06399	0.03897	-0.06717	-0.12917	0.01659	0.02485	0.03931	0.03659	0.07139
25	*Cleiocrinus magnificus*	-0.03770	0.01355	-0.01254	0.01803	-0.02893	0.03175	-0.04636	0.03073	0.00150	-0.07143
26	*Cleiocrinus ornatus*	-0.11247	-0.03069	0.03043	-0.00081	-0.05794	-0.01083	-0.05191	0.01734	0.07934	0.00021
27	*Cleiocrinus springeri*	0.01566	-0.11910	0.05251	-0.06253	-0.09252	-0.01213	-0.07004	-0.03205	0.11734	-0.00189
28	*Cleiocrinus tessellatus*	-0.01029	-0.13776	0.04201	-0.07063	-0.07035	-0.06496	-0.01222	-0.08453	0.11639	-0.04864
29	*Cnemocrinus fillmorensis*	-0.10780	-0.02249	-0.04200	-0.00827	-0.01702	-0.05554	0.01864	-0.01059	-0.08104	0.02329
30	*Cotylacrinus sandra*	-0.09700	-0.06079	-0.01383	-0.00922	0.01158	0.05191	-0.03848	-0.01009	0.01260	0.01181
31	*Crinerocrinus parvicostatus*	-0.10156	-0.05961	0.04168	-0.04389	-0.00590	0.02206	-0.01364	0.02094	-0.01779	-0.00551
32	*Cybelecrinus ladus*	-0.09994	-0.03016	0.00596	0.02731	0.03440	0.02549	0.02368	-0.03492	-0.02097	0.00641
33	*Cybelecrinus nebros*	-0.10099	-0.02955	0.04276	0.02385	0.02808	0.03449	0.03404	-0.04050	-0.01586	-0.00406

34 *Deocrinus asperatus*	-0.07189	-0.03458	0.10184	-0.03223	-0.06385	0.04985	-0.00483	0.02655	-0.01728	0.00526
35 *Diablocrinus sp.*	-0.03091	0.00627	0.01333	0.03580	0.01394	0.03417	-0.01234	0.01516	0.02106	-0.01956
36 *Diabolocrinus arbucklensis*	-0.09986	-0.03705	0.06129	0.01488	0.01614	0.04832	0.06614	-0.03616	-0.00438	-0.00381
37 *Diabolocrinus constrictus*	-0.09606	-0.02690	0.06238	0.01274	0.01924	0.03989	0.06860	-0.04246	0.00766	0.00013
38 *Diabolocrinus n. sp.*	-0.07210	-0.01434	0.06704	0.02110	-0.02231	0.03239	0.00684	0.02034	0.02140	-0.00659
39 *Diabolocrinus n. sp.*	-0.06801	-0.00229	0.07257	0.02881	-0.03395	0.03894	-0.01373	-0.00431	0.01761	0.00635
40 *Diabolocrinus oklahomensis*	-0.08791	-0.02306	0.05844	0.00902	0.01093	0.05080	0.04842	-0.03688	0.01430	-0.01621
41 *Diabolocrinus perplexus*	-0.07309	-0.01321	0.05571	0.02882	-0.04474	0.03274	-0.00131	0.01064	0.02255	-0.00227
42 *Diabolocrinus poolevillensis*	-0.09532	-0.02966	0.06117	0.01293	0.01513	0.04651	0.06732	-0.03889	-0.00029	-0.00349
43 *Diabolocrinus vesperalus*	-0.07770	-0.02344	0.06586	0.03343	-0.01044	0.05957	-0.02031	-0.02932	0.01758	0.01104
44 *Dimerocrinites elegans*	-0.08997	-0.03864	0.01650	0.00955	0.03293	0.03872	0.02090	-0.00033	0.00541	0.01272
45 *Dimerocrinites hopkintonensis*	-0.08591	-0.02617	-0.06383	0.00415	-0.02281	0.01770	-0.00126	0.02945	-0.03207	0.01925
46 *Dimerocrinites sculptus*	-0.09852	-0.01936	-0.07647	-0.01278	-0.02180	0.00362	0.00265	0.01166	-0.03514	-0.02256
47 *Dimerocrinites sp.*	-0.11768	-0.04474	-0.06704	0.00008	-0.00166	-0.02021	0.00476	0.00980	-0.01987	-0.01034
48 *Dimerocrinities sculptus*	-0.09042	-0.06753	-0.02475	-0.09108	-0.02577	0.01304	0.00348	0.01871	-0.03191	-0.03042
49 *Eoparisocrinus crossmani*	-0.03345	0.06806	0.03481	-0.01639	0.00043	-0.01937	0.03587	-0.03037	0.01261	-0.04337
50 *Eoparisocrinus grandei*	-0.01528	0.10619	0.02773	0.00931	-0.04004	-0.00373	-0.01241	0.00480	-0.01622	-0.01289
51 *Eoparisocrinus siluricus*	-0.01757	0.06547	-0.00870	0.00234	0.02864	-0.00317	-0.02558	0.01726	0.01450	0.00749
52 *Euptychocrinus fimbriatus*	-0.06506	-0.00470	0.03159	0.02761	-0.00397	0.04809	0.04977	-0.00858	-0.02350	0.04563
53 *Euptychocrinus skopaios*	-0.07509	-0.01722	0.00260	0.02700	0.00788	0.03010	0.01676	-0.00026	-0.02206	0.02992
54 Forest 2	-0.07571	0.01898	0.04229	0.00802	0.03007	-0.07549	-0.01238	0.03238	-0.07142	-0.02716
55 *Gaurocrinus fimbriatus*	-0.10382	-0.03679	-0.01926	0.00868	0.02556	-0.03662	0.01889	0.04238	-0.00645	0.00487
56 *Gaurocrinus nealli*	-0.08339	-0.01480	0.04920	0.03056	-0.00480	0.00344	0.01422	0.03404	-0.00445	0.00440
57 *Gustabilicrinus* sp. Cf. *G. latomium*	-0.02480	-0.06007	0.01450	0.02228	-0.01454	0.00101	-0.01243	-0.00342	-0.00715	0.00429
58 *Gustabilocrinus latomium*	-0.08444	0.00347	-0.00558	0.01924	0.01163	0.05244	-0.01457	-0.00383	0.01194	-0.00795
59 *Gustabilocrinus plektanikaulos*	-0.08465	0.00253	-0.00682	0.01905	0.00900	0.05252	-0.01313	-0.00387	0.01297	-0.00943
60 *Habrotecrinus ibexensis*	-0.00844	-0.08631	-0.06116	0.03197	0.00272	-0.08424	0.00910	-0.04191	-0.09026	-0.00415

61 *Kyreocrinus constellatus*	-0.09244	-0.01044	-0.00750	0.00555	-0.03692	0.02807	0.01606	-0.00753	-0.00366	-0.02697
62 *Lampterocrinus tennesseensis*	-0.08817	-0.01720	-0.01493	0.02480	-0.01153	-0.01034	-0.02030	0.01587	-0.02514	-0.05062
63 *Luxocrinus simplex*	-0.09030	-0.01821	0.00898	0.01506	-0.02577	0.03075	-0.04646	0.00382	0.01143	-0.02104
64 *Nexocrinus delicatulus*	-0.07675	-0.02752	0.02695	0.00848	0.01082	0.01909	0.02855	0.05753	0.00500	0.01787
65 *Parachaeocrinus decoratus*	-0.10218	-0.02562	-0.00011	0.00842	-0.02307	0.00617	0.04420	-0.02209	-0.02670	0.00767
66 *Paradiabolocrinus irregularis*	-0.10389	-0.00952	0.03178	0.02213	-0.04175	-0.00662	0.06556	-0.03365	-0.02332	0.01425
67 *Paradiabolocrinus sinuorugosus*	-0.07151	0.00887	0.02526	0.01785	-0.03983	0.03038	-0.01071	-0.00590	-0.00626	-0.00555
68 *Paradiabolocrinus stellatus*	-0.09104	-0.00230	0.07301	0.03307	-0.06404	0.03860	0.02929	-0.01875	-0.02001	0.02307
69 *Pararchaeocrinus convexus*	-0.08733	-0.00368	0.00245	0.01330	-0.04354	0.04515	-0.02679	0.00957	-0.03631	-0.01036
70 *Pararchaeocrinus convexus*	-0.06708	-0.00282	0.00948	0.02223	-0.06889	0.03420	0.00930	0.02297	-0.01003	0.02792
71 *Pararchaeocrinus rugulosus*	-0.08112	-0.01495	0.00841	0.02929	0.01294	-0.03230	0.01859	0.00308	-0.02135	-0.01815
72 *Eoparisocrinus mulletenensis*	-0.01569	0.09523	0.02978	0.00598	0.00235	0.00799	-0.00392	-0.01480	-0.00622	0.01430
73 *Pregazacrinus hemisphericus*	-0.05825	0.00615	0.02207	0.02838	-0.05205	0.06038	0.00063	0.01705	-0.04026	-0.01585
74 *Proexenocrinus inyonensis*	-0.04464	0.00701	0.06864	-0.04846	-0.02841	0.01301	0.00761	0.00868	-0.02020	0.01220
75 *Ptychocrinus adamsensis*	-0.06737	-0.01799	0.01162	0.01984	0.01293	0.01427	0.01739	0.03357	-0.00565	0.01247
76 *Ptychocrinus inedinensis*	-0.08910	-0.05491	-0.02693	-0.00830	0.01455	-0.02125	0.04159	0.03930	0.00085	0.00277
77 *Ptychocrinus insperatus*	-0.08217	-0.02018	0.01126	0.03182	0.02183	-0.02113	0.02873	-0.00046	-0.02543	-0.00125
78 *Ptychocrinus parvus*	-0.06970	-0.05486	0.01540	0.02112	0.04240	0.00748	0.04283	0.03098	0.00376	-0.03162
79 *Ptychocrinus pentagonus*	-0.10700	-0.02623	-0.00543	0.03133	0.00645	-0.01698	0.01359	-0.01648	-0.03710	-0.01279
80 *Ptychocrinus splendens*	-0.08584	-0.01823	0.05402	0.02775	-0.00240	-0.01351	0.04918	-0.00881	-0.01107	-0.00728
81 *Reteocrinus alveolatus*	-0.07319	0.01955	0.00501	-0.00457	-0.00613	-0.04521	-0.07110	0.01890	0.03594	0.04358
82 *Reteocrinus depressus*	-0.08138	0.00495	0.04391	-0.00430	-0.01885	-0.03948	-0.00336	0.01342	0.03463	0.04034
83 *Reteocrinus elongatus*	-0.04109	0.09861	0.08357	-0.03592	0.00561	-0.02675	-0.04522	-0.01698	0.06966	0.01144
84 *Reteocrinus fenestratus*	-0.03320	0.11903	0.03899	-0.00448	-0.02448	-0.02849	0.01638	-0.05700	-0.01380	0.01898
85 *Reteocrinus magnificus*	-0.09532	-0.03840	-0.01330	-0.01056	0.02497	-0.02731	0.05610	0.04843	0.00856	0.03957

86	*Reteocrinus mahlburgi*	-0.09308	0.02707	-0.04695	-0.04020	-0.01007	-0.10706	0.02543	-0.00445	0.05386	0.02505
87	*Reteocrinus polki*	-0.10738	0.00281	0.06016	-0.00641	0.00973	-0.08383	0.00388	-0.02078	0.03778	0.07116
88	*Reteocrinus rocktonnsis*	-0.04845	0.07262	0.01920	0.00900	-0.02060	-0.02488	0.02475	-0.02185	0.00675	-0.00851
89	*Reteocrinus spinosus*	-0.05157	0.07014	0.01711	0.01526	-0.02732	-0.02480	0.02433	-0.02489	0.00971	-0.00350
90	*Reteocrinus stellaris*	-0.08787	0.06687	0.07799	0.00734	0.01268	-0.08350	0.00380	-0.06922	0.01630	0.03378
91	*Reteocrinus variabilicaulis*	-0.09963	0.00753	0.06338	-0.01809	0.02409	-0.07557	0.02526	0.01038	0.05837	0.06126
92	*Reterocrinus sp.*	-0.11201	0.00116	0.05916	-0.00689	0.02733	-0.08330	-0.01920	-0.02256	0.03261	0.04149
93	*Rhachicrinus wrighti*	-0.09925	-0.03827	0.01922	0.01071	0.00172	-0.01098	0.03355	-0.00619	0.00234	0.00097
94	*Rhaphanocrinus buckleyi*	-0.09400	-0.05275	0.02076	0.01505	0.02545	0.01584	0.03989	0.00257	0.01256	0.00021
95	*Rhaphanocrinus sculptus*	-0.10608	-0.05656	-0.04592	0.01579	0.01030	0.00889	0.01707	0.00514	0.00901	0.01263
96	*Rhaphanocrinus simplex*	-0.07711	-0.01803	-0.00627	0.02416	-0.03057	0.01912	0.01161	0.02293	-0.04816	-0.00874
97	*Rhaphanocrinus subnodosus*	-0.09452	-0.03521	-0.00259	0.01894	0.01284	0.00954	0.02200	-0.03976	-0.00939	0.01462
98	*Rheocrinus aduncus*	-0.10653	-0.06321	-0.00958	-0.03146	0.00738	0.02903	-0.03936	0.00916	0.05859	0.03344
99	Rhodocrinitid sp.	-0.08150	-0.01582	0.03054	-0.06034	-0.02876	0.05483	-0.01280	0.02233	-0.03612	-0.00599
100	*Silfonocrinus siluricus*	-0.07113	-0.02483	0.02819	0.01277	-0.03338	-0.00176	0.01183	0.04750	-0.01199	0.01373
101	*Simplococrinus persculptus*	-0.12901	-0.06114	0.02724	-0.00792	0.01072	-0.01079	0.00516	-0.05793	0.05010	0.02189
102	*Siphonocrinus nobilis*	-0.09502	-0.01272	0.11872	-0.06366	-0.05440	0.00013	0.02070	-0.03028	-0.03978	-0.08875
103	*Stereoaster squamosus*	-0.08247	-0.02541	0.02298	-0.00281	-0.00146	0.00520	0.01095	0.01051	0.02108	-0.02312
104	*Stipatocrinus hulveri*	0.00640	-0.05721	0.06622	0.03249	-0.00737	0.03942	-0.00648	-0.02335	0.01227	0.01240
105	*Tormosocrinus furberi*	-0.06064	0.00625	0.06595	0.03062	0.00709	0.05055	-0.01709	-0.02669	-0.01387	0.02810
106	*Trichinocrinus terranovicus*	-0.08012	-0.04072	-0.01056	0.01476	-0.01152	-0.01407	-0.00800	0.05354	-0.01629	0.02769
107	*Turbocrinus punctum*	-0.08494	-0.01663	0.00436	0.01444	-0.02971	0.04019	-0.03956	0.00781	0.00407	-0.01087
108	*Ursucrinus stellatus*	-0.09341	-0.03951	0.00789	0.01231	0.02816	0.02122	0.02201	-0.03018	0.00581	0.00637
109	*Wilsonicrinus culmeninuosus*	-0.07772	-0.01443	0.01108	0.02734	-0.02830	0.02332	-0.04240	0.02056	0.00337	-0.02130
110	*Xysmacrinus greenensis*	-0.18926	-0.03683	0.02210	-0.03604	-0.04207	-0.03120	-0.05516	-0.04159	0.06959	-0.05409
111											
112											
113	Flexibles	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
114	*Anisocrinus prinstaensis*	-0.03819	0.00718	0.01436	-0.00366	0.00413	0.00630	-0.01659	0.00561	-0.01451	0.01535
115	*Chirocrinus? twenhofeli*	0.11388	-0.02215	0.00548	-0.03997	-0.05851	-0.03994	-0.01263	0.03056	0.00606	-0.02070

116 *Clidochirus americanus*	-0.03967	0.03490	-0.06698	0.01615	-0.02952	0.00980	-0.02290	0.02259	-0.00841	0.02408
117 *Clidochirus anebos*	-0.02611	0.04978	0.00172	-0.00060	-0.00673	-0.00501	-0.03815	-0.00056	-0.02009	0.02458
118 *Clidochirus serrulatus*	-0.00101	0.06449	-0.04591	-0.03245	0.02213	0.00866	0.01099	0.06500	0.00228	0.01953
119 *Clidochirus springeri*	-0.04283	0.03387	-0.06625	0.01619	-0.02509	0.00789	-0.02245	0.02145	-0.00984	0.02413
120 *Clidochirus ulrichi*	-0.04020	0.03601	-0.06746	0.01492	-0.02927	0.00964	-0.02263	0.02253	-0.00956	0.02424
121 *Clidochirus vaurealensis*	-0.01589	0.07644	-0.01699	-0.00885	0.02047	-0.00526	-0.02532	-0.01443	-0.01504	0.03054
122 *Gnorimocrinus? Problematicus*	0.01516	0.11493	-0.02991	-0.02074	0.00388	0.04761	-0.02286	0.00020	-0.03878	0.00387
123 *Hormocrinus quebecensis*	-0.03010	-0.02577	0.03147	-0.02060	-0.00002	-0.02177	-0.02093	0.00838	-0.02376	0.04370
124 *Kryphosocrinus tetreaulti*	-0.04316	-0.00151	-0.03475	-0.03315	-0.00989	0.00701	-0.00347	0.05226	-0.01399	0.01566
125 *Ladacrinus asynaptos*	-0.03888	0.02473	0.00594	0.00067	0.00501	0.00583	-0.02838	0.01441	-0.02160	0.02006
126 *Ladacrinus sp?*	-0.03290	-0.01373	0.00479	0.02068	-0.00970	-0.02448	-0.02453	-0.01729	-0.00699	0.00907
127 *Proanisocrinus oswegoensis*	-0.03256	0.00597	0.02696	-0.05117	-0.01798	0.01217	0.01835	0.02890	-0.02992	0.04406
128 *Protaxocrinus anellus*	-0.02076	0.06831	0.04556	-0.01438	0.01945	0.01292	0.01019	0.03022	-0.01680	0.01720
129 *Protaxocrinus cataractensis*	-0.03038	0.05313	0.05424	0.01244	0.00087	-0.00029	-0.01774	0.01286	-0.03171	0.01945
130 *Protaxocrinus elegans*	-0.02320	0.02351	-0.01115	0.02130	-0.01589	-0.00389	-0.01658	0.01325	0.01033	0.00183
131 *Protaxocrinus girardeau*	-0.01563	0.07803	0.03316	0.00805	0.00798	0.00832	-0.01428	-0.00100	0.02531	0.00555
132 *Protaxocrinus girvanensis*	-0.01624	0.02718	-0.00616	0.03516	-0.03124	-0.04652	-0.02011	0.02887	0.00373	0.00448
133 *Protaxocrinus laevis*	-0.03841	0.03949	0.03690	0.02591	-0.01703	0.00394	-0.01941	0.01323	-0.02277	0.02560
134 *Protaxocrinus nodocaudis*	-0.01727	0.04434	-0.04038	-0.02602	0.00934	-0.01349	-0.03400	0.03960	-0.04109	0.04460
135 *Protaxocrinus paraios*	-0.00540	0.06316	0.00623	-0.09295	0.01852	0.00851	-0.00212	-0.00255	-0.03997	0.00770
136 *Protaxocrinus sideros*	-0.01405	0.07918	-0.00720	-0.01830	0.03319	0.00152	-0.00534	-0.00811	-0.02504	0.02986
137 *Scapanocrinus muricatus*	-0.04280	-0.00339	-0.03237	-0.02195	-0.03343	-0.00621	-0.00006	0.05876	-0.02951	0.01292

Hybocrinids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Hybocrinus bilateralis*	0.07124	-0.01535	-0.08259	-0.02159	0.01277	0.01515	-0.00132	-0.03284	-0.01133	-0.01607
2 *Hybocrinus conicus*	0.06962	-0.00630	-0.08451	-0.00943	0.02774	0.02345	0.00998	-0.01601	0.00333	0.00784
3 *Hybocrinus crinerensis*	0.07123	-0.00834	-0.09075	0.02931	0.02090	0.00609	0.00220	-0.03443	0.00432	0.04193
4 *Hybocrinus nitidus*	0.02649	-0.00279	-0.12019	0.08822	0.02665	0.02204	-0.02856	0.02444	0.05690	-0.03146
5 *Hybocrinus*	0.07558	0.00097	-0.07792	-0.02773	-0.00576	0.01737	0.04369	-0.00549	0.00065	0.04066

perperamnominatus										
6 *Hybocrinus punctatocritatus*	0.07871	0.00040	-0.08358	-0.03026	-0.00677	0.01718	0.04206	-0.00046	-0.00270	0.03831
7 *Hybocrinus punctatus*	0.07505	-0.00092	-0.08057	-0.02860	-0.01076	0.01757	0.04624	-0.00531	0.00253	0.03751
8 *Hybocrinus sp A*	0.03777	0.00226	0.01916	0.00313	0.00995	0.02707	-0.01717	-0.04377	-0.01104	0.01399
9 *Hybocystis eldonensis*	0.08354	-0.00532	-0.11185	0.00376	0.02334	0.02429	0.01294	-0.02714	-0.00402	0.01921
10 *Hybocystis problematicus*	0.08723	-0.00915	-0.10535	-0.00341	0.03350	0.02274	0.01976	-0.02774	-0.00113	0.02167
11 *Tripatocrinus pustulatus*	0.08316	-0.00905	-0.09974	-0.02833	-0.02497	0.01938	0.00346	0.01301	0.01820	-0.01365
12 Undescribed hybocrinid zone g	0.05610	-0.01199	-0.09126	-0.00448	-0.00317	0.01975	0.00249	-0.03021	0.03215	0.01727
13 Undescribed hybocrinid zone I	0.06255	-0.01325	-0.08271	-0.00111	0.01074	-0.05469	0.02642	-0.02360	0.00038	-0.02173

Monobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Abacocrinus latus*	0.01681	-0.09077	0.04016	-0.00812	-0.01977	0.01548	0.01336	-0.01374	-0.03904	0.02622
2 *Abacocrinus sp A*	0.00105	-0.10118	0.03347	-0.01283	-0.00511	-0.01708	0.04926	-0.04727	-0.04111	-0.00070
3 *Abacocrinus sp B*	0.00044	-0.10257	0.03180	-0.01314	-0.00867	-0.01652	0.05121	-0.04754	-0.03959	-0.00246
4 *Abludoglyptocrinus charltoni*	-0.00836	-0.11026	-0.01709	-0.00666	0.02501	-0.02541	0.00493	0.01715	0.06688	0.02556
5 *Abludoglyptocrinus laticostatus*	-0.00155	-0.10182	0.02095	0.04327	0.03612	-0.00931	0.06147	-0.01721	0.01209	0.00435
6 *Abludoglyptocrinus pustulosus*	-0.00311	-0.09454	0.01163	0.03468	0.03272	-0.00663	0.04744	-0.01475	0.00878	-0.02365
7 *Acacocrinus anebos*	0.01476	-0.05598	0.00150	0.03568	-0.03520	0.02155	-0.01908	0.00139	0.00288	-0.01330
8 *Aclistocrinus articus*	0.01641	-0.05629	-0.02462	0.00227	0.02536	0.03464	-0.02111	0.00355	-0.01861	0.05051
9 *Aclistocrinus capistratus*	0.02920	-0.06693	0.06015	0.04960	0.00736	0.03805	-0.01975	-0.00859	0.00303	-0.02056
10 *Alisocrinus tetrarmatus*	-0.02357	-0.10578	-0.03828	0.02905	0.00781	-0.07336	-0.01816	-0.04808	0.04019	0.03170
11 *Alisocrinus? heterodactylus*	0.01443	-0.06162	0.00215	0.03824	0.00427	0.01489	0.00818	-0.01659	-0.01613	0.01736
12 *Allocrinus* cf. A. *subglobosus*	0.02921	-0.09864	-0.04913	0.03186	-0.01950	0.00107	-0.03843	0.03392	0.00386	-0.01824
13 *Allocrinus ornatus*	0.01399	-0.11561	-0.05421	0.03078	-0.00455	-0.03149	-0.00902	0.00250	0.01139	-0.04301
14 *Alopocrinus parvus*	0.00074	-0.09177	0.00694	0.04222	0.03531	-0.00456	0.02285	-0.03211	0.00176	-0.02113
15 *Archaeocalyptocrinus nodosus*	0.02744	-0.13752	-0.05238	0.02593	-0.02282	-0.00320	-0.04736	0.04695	-0.01127	-0.03063

16 *Archaeocalyptocrinus rowensis*	0.02645	-0.13743	-0.04379	0.02900	0.00013	-0.00037	-0.06042	0.04490	-0.01696	-0.02539
17 *Astakocrinus teren*	-0.00064	-0.06876	0.00266	0.03478	0.00459	0.04700	-0.00517	-0.01095	0.01349	0.00104
18 *Atalocrinus actus*	0.01457	-0.05160	0.02814	0.02394	0.01624	0.03190	-0.02468	-0.00832	0.00269	0.03431
19 *Bikocrinus baios*	0.02364	-0.11417	0.04726	0.00015	0.04901	-0.04355	0.00857	-0.02273	-0.03808	-0.03122
20 *Bolicrinus deflatus*	0.01578	-0.11594	-0.04484	0.04056	-0.00768	-0.01649	-0.00841	0.02963	-0.01411	0.00149
21 *Bolicrinus globosus*	0.01620	-0.11700	-0.04672	0.04009	-0.01046	-0.01687	-0.00680	0.02974	-0.01319	0.00023
22 *Calliocrinus longspinus*	0.05160	-0.07440	0.13772	0.01135	-0.04411	0.01115	-0.01601	-0.01174	0.03305	0.02381
23 *Callistocrinus tesselatus*	-0.06275	-0.05775	0.00754	-0.08850	-0.03874	-0.00551	0.02145	0.08088	-0.04376	0.04139
24 *Canistrocrinus richardsoni*	0.00889	-0.06881	0.03315	0.03320	0.02283	-0.00750	0.02609	0.03985	0.00966	-0.00001
25 *Canistrocrinus typus*	-0.07900	0.02296	0.05582	0.01574	0.02559	0.00073	0.02532	-0.00675	-0.02305	0.01105
26 *Carpocrinus bodei*	0.01119	-0.05833	-0.00971	0.02942	-0.03620	0.00250	0.03674	-0.02423	-0.02896	-0.03084
27 *Carpocrinus sp.*	0.00853	-0.06666	-0.00419	0.03137	-0.03668	-0.00009	0.03919	-0.02734	-0.02576	-0.03076
28 *Compsocrinus miamiensis*	0.00517	-0.08485	0.02141	0.03246	0.02627	0.01970	0.02430	0.02143	0.01051	-0.00331
29 *Compsocrinus nodosus*	0.02307	-0.06509	0.00854	0.03525	0.00824	0.01907	0.03037	-0.00326	-0.02503	0.02280
30 *Compsocrinus relictus*	-0.01277	-0.08502	-0.01626	0.00927	0.06154	-0.01499	0.00990	-0.02633	-0.01028	0.04425
31 *Culicocrinus? girardeauensis*	0.01338	-0.06233	0.01572	0.02294	0.02735	0.02507	0.00961	0.01482	0.02253	-0.01672
32 *Dynamocrinus robustus*	-0.00038	-0.08803	-0.03064	0.00909	0.02744	-0.00041	-0.00247	-0.01949	0.01173	-0.01797
33 *Eopatelliocrinus latibrachiatus*	0.00919	-0.06041	0.00360	0.04733	0.00701	0.02130	-0.01855	-0.00592	0.00435	-0.02134
34 *Eopatelliocrinus ornatus*	-0.03758	-0.08442	0.01970	0.05069	0.02020	-0.00689	0.06847	-0.01704	0.00035	0.01429
35 *Eopatelliocrinus scyphogracilis*	-0.00387	-0.07996	0.00405	0.04315	0.02823	-0.01084	0.02395	-0.03353	-0.00431	-0.01243
36 *Eucalptocrinities archaios*	0.01907	-0.07497	0.02659	0.05710	0.00440	0.05220	-0.03318	-0.02418	0.01421	-0.01623
37 *Eucalyptocrinities depressus*	0.01499	-0.07683	0.00883	0.06666	0.01474	0.03753	-0.02811	0.00222	0.02983	-0.00844
38 *Eucalyptocrinities proboscidialis*	0.01142	-0.10347	0.04984	-0.01735	-0.03179	0.03567	-0.04391	0.01537	-0.00211	-0.00621
39 *Eucalyptocrinities* sp. Cf. *E. ornates*	0.01580	-0.10516	0.04410	-0.01526	-0.05101	0.03068	-0.02632	0.01530	0.00579	-0.01037
40 *Fibrocrinus phragmos*	-0.00749	-0.08880	-0.04220	0.01915	0.00190	0.04064	-0.00835	-0.00261	-0.00073	0.02580
41 Forest 3	0.01955	-0.03693	0.04100	0.00967	-0.00636	-0.06732	0.01465	0.00264	-0.04004	-0.00271

42 Forest 4 cleicrinid	0.06882	0.01321	0.06021	0.04378	-0.03561	-0.02265	-0.03372	0.00284	-0.00871	0.01122
43 Forest 5 Cam	-0.03252	-0.02374	0.01349	0.00490	-0.00394	-0.02670	0.00656	-0.00492	0.00230	-0.02117
44 Forest 6	0.01090	-0.03225	0.02055	0.02271	-0.00081	-0.05196	-0.02431	-0.01396	-0.01801	-0.01482
45 Forest 7	0.00273	-0.09504	-0.03550	0.01522	-0.02247	-0.09883	0.00698	0.02352	-0.04205	-0.04142
46 *Glyptocrinus circumcarinatus*	0.00018	-0.09228	0.01710	0.02579	0.01093	-0.04827	0.04440	-0.00147	-0.00970	-0.02538
47 *Glyptocrinus decadactylus*	-0.00940	-0.11361	-0.02287	0.01472	0.05929	-0.00928	0.03711	0.01075	0.01694	-0.00461
48 *Glyptocrinus fornshelli*	-0.00385	-0.08490	0.02588	0.03902	0.02053	-0.02050	0.04525	0.01006	0.01338	-0.04102
49 *Glyptocrinus ramulosus*	-0.00018	-0.09501	-0.01536	0.01591	0.01713	-0.02281	0.00267	0.02270	-0.00454	0.02195
50 *Glyptocrinus tridactylus*	0.01228	-0.09188	0.02216	0.03303	-0.02112	-0.05879	0.04566	0.02433	-0.01625	-0.04317
51 *Ibanocrinus petalos*	0.01173	-0.06357	0.00863	0.04493	-0.02348	0.00197	0.00208	0.00319	-0.00891	0.00976
52 *Jovacrinus jugum*	0.02128	-0.09693	0.04274	0.00459	0.08612	-0.01563	0.00861	-0.03897	-0.04448	0.01535
53 *Jovacrinus spinosus*	0.03651	-0.10397	0.05665	0.01289	0.07976	0.02297	-0.02636	-0.00972	-0.05179	0.04606
54 *Krinocrinus inflatus*	0.02595	-0.10511	-0.06202	0.02616	-0.02535	-0.01491	-0.02084	0.02732	0.00341	-0.03567
55 *Kylixocrinus latus*	0.03770	-0.08465	0.06671	-0.00312	0.01797	0.05526	0.01432	0.00672	-0.01825	-0.00361
56 Macrostylocrinus B D	0.03945	-0.12935	-0.02481	-0.02339	-0.00786	0.00485	-0.02874	0.04410	-0.02094	-0.00985
57 Macrostylocrinus C	0.04372	-0.12358	-0.02796	-0.02193	-0.00540	0.00793	-0.02700	0.04509	-0.01806	-0.01031
58 *Macrostylocrinus compressus*	0.04831	-0.13605	-0.03972	-0.02504	-0.02165	0.00527	-0.02555	0.05570	-0.02049	-0.01804
59 Macrostylocrinus E F	0.04967	-0.13707	-0.04029	-0.02456	-0.02353	0.00465	-0.02444	0.05726	-0.02088	-0.01820
60 *Macrostylocrinus jordanensis*	0.02687	-0.09517	0.03910	-0.00103	0.02231	0.03427	-0.01790	0.00096	0.00885	-0.00437
61 *Macrostylocrinus pristinus*	0.00413	-0.08379	-0.04173	0.01720	0.02619	-0.00445	-0.00155	-0.01419	0.01549	-0.01038
62 *Macrostylocrinus vermiculates*	0.05775	-0.14729	-0.04233	-0.02136	-0.04427	0.00037	-0.00204	0.06467	-0.02141	0.01408
63 *Macrostylocrinus wyomingensis*	0.02750	-0.10545	-0.01774	-0.02044	0.02218	0.03054	-0.02498	0.01206	-0.00108	0.01805
64 *Manticrinus exaitos*	0.00548	-0.09171	-0.03897	0.03266	0.00902	0.02249	-0.02420	0.01280	0.01599	0.00897
65 *Marsupiocrinus primaevus*	0.01050	-0.11636	-0.05302	0.03528	0.00280	-0.03683	-0.01328	-0.01335	0.00857	-0.02828
66 *Paiderocrinus asketos*	0.02221	-0.08143	0.02978	-0.00508	0.01996	0.03206	-0.02029	-0.01702	0.00999	-0.00486
67 *Paiderocrinus ochthos*	0.03825	-0.07803	0.03539	-0.01172	0.00214	0.01423	-0.03254	0.00411	0.00261	-0.02587
68 *Patelliocrinus planus*	-0.00460	-0.08214	0.00866	0.04443	-0.00818	0.02965	-0.01187	-0.02001	-0.01094	0.00276

69 Periechocrinid incertae sedis	0.01117	-0.05350	0.01150	0.07573	0.02657	-0.01432	-0.03351	-0.06502	-0.00780	-0.01813
70 Periechocrinus A	-0.00298	-0.10203	-0.04788	0.02156	-0.02111	-0.00427	-0.00905	0.01845	-0.00195	0.02142
71 Periechocrinus B	-0.00148	-0.11233	-0.05660	0.01964	-0.03395	-0.00642	-0.00633	0.02672	-0.00505	0.01768
72 *Periglyptocrinus billingsi*	0.00020	-0.09714	0.00531	0.04063	0.01018	-0.01895	0.02102	-0.03523	-0.00921	-0.02395
73 *Periglyptocrinus mercerensis*	0.00878	-0.05637	0.04142	0.04841	-0.01032	-0.04360	0.03524	-0.03102	0.00134	-0.01364
74 *Periglyptocrinus spinuliferus*	-0.00723	-0.11159	-0.04797	0.05557	0.03190	-0.02074	0.04723	-0.02298	-0.03345	0.03117
75 *Phrygilocrinus batheri*	0.03092	-0.06200	0.00025	0.04106	-0.02111	0.01640	-0.03420	-0.00641	-0.01458	-0.02351
76 *Pychnocrinus dyeri*	-0.00792	-0.10259	-0.01764	0.01612	0.02514	-0.04383	0.03770	0.01778	0.00060	-0.00002
77 *Pycnocrinus altilis*	-0.00463	-0.08202	-0.01670	0.00464	0.03905	-0.02472	0.01755	0.02430	0.02402	-0.02129
78 *Pycnocrinus gerki*	0.00275	-0.08248	-0.00144	0.02321	0.01589	-0.02107	0.00556	0.02255	-0.00685	0.02022
79 *Pycnocrinus multibrachialis*	-0.00711	-0.10001	-0.02655	0.01040	0.05216	-0.05204	0.03580	0.02865	0.00702	-0.00515
80 *Pycnocrinus sardesoni*	-0.00918	-0.12250	-0.04083	0.01527	0.03082	-0.01113	0.04752	-0.02072	-0.01228	-0.00307
81 *Pycnocrinus shafferi*	0.01567	-0.06188	-0.00404	0.00873	0.05376	-0.04751	-0.01795	0.00754	-0.00947	0.00228
82 *Schizocrinus nodosus*	0.00533	-0.07434	-0.01437	0.00361	0.02762	-0.00315	-0.00591	0.04446	0.02462	-0.00721
83 *Schizocrinus striatus*	0.03628	-0.03429	0.01807	0.03705	0.01461	-0.00842	-0.04568	0.00438	-0.00021	0.01364
84 *Thaleproktocrinus davidsoni*	0.01932	-0.08215	-0.05712	0.03311	-0.02626	0.00477	-0.01969	0.01671	-0.03235	-0.00855
85 *Thomasocrinus cylindrisa*	0.03581	-0.09288	-0.04646	0.03322	-0.00640	-0.00318	-0.04963	0.03597	-0.00284	-0.01238
86 *Tirocrinus trochos*	-0.01567	-0.09951	0.02110	0.05974	0.01890	0.01192	0.00004	-0.01750	0.05963	0.04626
87 *Typanocrinus strombos*	0.00499	-0.10857	-0.01969	-0.01874	0.03751	-0.00653	-0.00496	-0.02256	-0.00402	-0.00511
88 *Xenocrinus baeri*	-0.01842	-0.09449	-0.04562	0.06029	0.01246	0.01079	-0.00645	0.00047	0.00951	0.04228
89 *Xenocrinus penicillus*	-0.02418	-0.10459	-0.02862	0.01748	-0.00711	0.00884	-0.00067	0.00387	0.00926	0.04119
90 *Xenocrinus rubus*	0.00333	-0.06268	0.01580	0.02639	0.01110	0.04056	-0.00184	-0.01440	0.00769	-0.00408
91 *Zirocrinus litos*	0.00907	-0.10642	0.03251	0.00843	0.03141	-0.01521	0.04191	-0.03463	-0.01083	0.01903

Procrinids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1 *Balbocrinus sp.*	-0.07270	0.01730	-0.08782	0.02433	0.04547	-0.01646	-0.03046	-0.04173	-0.07771	-0.03629
2 *Eknomocrinus wahwahnsis*	0.00049	-0.04905	-0.04466	-0.01267	-0.04108	-0.05780	-0.03722	-0.03163	-0.01831	0.04853
3 *Glenocrinus globularis*	-0.12554	0.03395	-0.06462	0.00815	-0.04616	-0.06194	-0.09329	-0.00290	-0.03241	0.04365
4 *Titanocrinus sumralli*	-0.15543	-0.00595	-0.07670	-0.00559	-0.03778	-0.11138	-0.01412	-0.04347	-0.04218	0.04945

APPENDIX 7

Chapter 2; Courser Stratigraphic Bin Sample Lists

Species included within each stratigraphic bin as defined using the temporal binning scheme of Foote 1999.

Interval		Age of base	Duration (Myr)
Lower Silurian (4)	Llandoverian	443.7	15.5

Species
? Myelodacylus sp.
?Euspirocrinus sp
Abacocrinus latus
Abacocrinus sp. A
Abacocrinus sp. B
Acacocrinus anebos
Aclistocrinus arctus
Aetocrinus gracilus
Allocrinus cf. A. sp. *subglobosus*
Allozygocrinus dubuquensis
Allozygocrinus exallos
Alopocrinus parvus
Apoarchaeocrinus anticostiensis
Archaeocalytpocrinus iowensis
Archaeocalytpocrinus nodosus
Becsciecrinus adonis
Bikocrinus baios
Bolicrinus deflatus
Bolicrinus globosus
Bucucrinus saccus
Calceocrinus incertus
Calceocrinus tridactylus
Calceorinus pustulosus
Calliocrinus longispinus
Callistocrinus tesselatus
Carpocrinus bodei
Cataractocrinus clementi
Chenocrinus canadaensis
Clematocrinus ohioensis
Clidochirus americanus
Clidochirus ulrichi
Clidocrinus spirngeri
Compsocrinus relictus

Corvucrinus schucherti
Cybelecrinus ladas
Cybelecrinus nebros
Dendrocrinus abactronodusus
Dendrocrinus aphelos
Dendrocrinus daytonensis
Dendrocrinus leptos
Dendrocrinus parvus
Dendrocrinus ursae
Diaphorocrinus pleniramulus
Dimerocrinites elegans
Dimerocrinites hopkintonesis
Dimerocrinites scuptus
Dimerocrinites sp.
Dimerocrinities hopkintonesis
Dynamocrinus robustus
Eomyelodactylus ?plumosus
Eomyelodactylus foerstei
Eomyelodactylus richardsoni
Eomyelodactylus rotundatus
Eomyelodactylus sp.
Eomyelodactylus sparteus
Eomyelodactylus springeri
Eomyelodactylus uniformis
Eomylodactylus forestei
Eoparisocrinus siluricus
Eucalyptocrinites depressus
Eucalyptocrinites proboscidalis
Eucalyptocrinus sp. Cf. *E. ornatus*
Euspirocrinus heliktos
Euspirocrinus wolcottense
Eustenocrinidae Indeterminate
Fibrocrinus phragmos
Fragucrinus bothros
Haptocrinus calvatus
Homocrinus diminutus
Hormocrinus quebecensis
Ibanocrinus petalos
Jovacrinus jugum
Jovacrinus spinosus
Kanabinocrinus thyaros
Krinocrinus inflatus
Kryphosocrinus tetreaulti
Kylixocrinus latus
Kyreocrinus constellatus
Ladacrinus synaptos
Ladacrinus? sp.
Laurucrinus sandtopensis
Levicyathocrinites sablensis
Luxocrinus simplex
Macrostylocrinus compressus

Macrostylocrinus jordanensis
Macrostylocrinus sp. A.
Macrostylocrinus sp. C
Macrostylocrinus sp. D
Macrostylocrinus sp. E.
Macrostylocrinus vermiculatus
Manticrinus exaitos
Marsupiocrinus primaevus
Myelodactylus linae
Myososcrinus chicottensis
Nexocrinus delicatulus
Paiderocrinus asketos
Paiderocrinus ochthos
Parapisocrinus quinquelobus
Pariocrinus heterodactylus
Patelliocrinus planus
Perichocrinus sp. B
periehocrinus incertae sedis
Petalocrinus mirabilis
Phrygilocrinus batheri
Pisocrinus gemmiformis
Pregazacrinus hemisphericus
Premanicrinus dubius
Prolixocrinus nodocaudis
Protaxocrinus anellus
Protaxocrinus cararactensis
Protaxocrinus paraios
Protaxocrinus sideros
Ptychocrinus adamsensis
Rhachicrinus wrighti
Salinocrinus conus
Scapanocrinus muricatus
Silfonocrinus siluricus
Siphonocrinus nobilis
Stereoaster squamosus
Stibaraocrinus centervillensis
Stipatocrinus hulveri
Thaerocrinus crenatus
Theleproktocrinus davidsoni
Thomasocrinus cylindrica
Thomasocrinus sp.
Tirocrinus trochos
Tormosocrinus furberi
Trypherocrinus brassfieldensis
Turbocrinus punctum
Typannocrinus strombos
Xysmacrinus greenensis
Zirocrinus litos

Interval	Age of base	Duration

			(Myr)
Upper Ordovician (3)	Upper Caradocian through Ashgill	455.8	12.1
Species			
?Ectenocrinus simplex			
Abludoglyptocrinus charltoni			
Abludoglyptocrinus pustulosus			
Alisocrinus tetrarmatus			
Alisocrinus? heterodactylus			
Anisocrinus prinstaensis			
Anomalocrinus incurvus			
Archaeocrinus desideratus			
Archaeocrinus lacunosus			
Archaeocrinus microbasalis			
Archaeocrinus ottawaensis			
Astakocrinus teren			
Atatocrinus wilmingtonensis			
Calceocrinus alleni			
Calceocrinus barrandii			
Calceocrinus constrictus			
Calceocrinus gamachicus			
Calceocrinus levorsoni			
Calceocrinus multibifurcatus			
Canistrocrinus richardsoni			
Canistrocrinus typus			
Carabocrinus boltoni			
Carabocrinus dicyclicus			
Carabocrinus huronensis			
Carabocrinus magnificus			
Carabocrinus radiatus			
Carabocrinus slocomi			
Carabocrinus sp.			
Carabocrinus treadwelli			
Carabocrinus vancortlandi			
Cataraquicrinus elongatus			
Charactocrinus billingsi			
Chirocrinus twenhohofi			
Cincinnaticrinus pentagonus			
Cincinnaticrinus varibrachialis			
Cleicrinus sculptus			
Cleiocrinus magnificus			
Cleiocrinus regius			
Clidochirus serrulatus			
Clidocrinus anebo			
Compsocrinus miamiensis			
Compsocrinus nodosus			
Cremacrinus articulosus			
Cremacrinus articulosus v1			
Cremacrinus forrestonesis			
Cremacrinus guttenbergensis			

Cremacrinus punctatus
Culicocrinus? girardeauensis
Cupulocrinus canaliculatus
Cupulocrinus cylindricus
Cupulocrinus heterocostalis
Cupulocrinus humilis
Cupulocrinus jewetti
Cupulocrinus jewetti
Cupulocrinus kentuckyiensis
Cupulocrinus latibrachiatus
Cupulocrinus levorsoni
Cupulocrinus minimus
Cupulocrinus plattevillensis
Cupulocrinus plolydactylus
Cupulocrinus sp.
Daedalocrinus bellevillensis
Daedalocrinus kirki
Dendrocrinus aculidactylus
Dendrocrinus alternatus
Dendrocrinus cauduceus
Dendrocrinus constrictus
Dendrocrinus curvijunctus
Dendrocrinus gracilis
Dendrocrinus leptos
Dendrocrinus minutus
Dendrocrinus n. sp. aff. *navigiolum*
Dendrocrinus navigiolum
Dendrocrinus posticus
Dendrocrinus sp.
Dystactocrinus constrictus
Ectencrinus simplex
Ectenocrinus geniculatus
Ectenocrinus sp.
Eomyelocrinus sp.
Eoparisocrinus mulletensis
Eopatelliocrinus latibrachiatus
Eopatelliocrinus ornatus
Eopatelliocrinus scyphogracilis
Euptychocrinus fimbriatus
Euspirocrinus gagnoni
Eustenocrinus springeri
Gaurocrinus fimbriatus
Gaurocrinus nealli
Glaucocrinus falconeri
Glptyocrinus decadactylus
Glyptocrinus circumcarinatus
Glyptocrinus fornshelli
Glyptocrinus ramulosus
Glyptocrinus tridactylus
Gnorimocrinus? problematicus
Grenprisia billingsi

Grenprisia springeri
Hybocrinus conicus
Hybocystis problematicus
Hybocystites eldonensis
Hybocystites problematicus
Illemnocrinus amphiatus
Iocrinid sp.
Iocrinus similis
Iocrinus subcrassus
Iocrinus trentonensis
Isotomocrinus minutus
Isotomocrinus tenuis
Isotomocrinus typus
Macrostylocrinus pristinus
Macrostylocrinus wyomingensis
Merocrinus corroboratus
Merocrinus curtus
Merocrinus typus
Ohiocrinus brauni
Ohiocrinus exilis
Ohiocrinus laxus
Ottawacrinus typus
Palaeocrinus angulatus
Palaeocrinus pulchellus
Palaeocrinus rhombiferus
Paleocrinus sp.
Peniculocrinus milleri
Periglyptocrinus billingsi
Periglyptocrinus priscus
Periglyptocrinus spinuliferus
Plicodendrocrinus casei
Plicodendrocrinus epinettensis
Plicodendrocrinus observationensis
Plicodendrocrinus proboscidiatus
Porocrinus conicus
Porocrinus elegans
Porocrinus fayettensis
Porocrinus kentuckyensis
Porocrinus pentagonius
Porocrinus petersenae
Porocrinus shawi
Porocrinus smithi
Praecupulocrinus conjugans
Proanisocrinus oswegoensis
Protaxocrinus elegans
Protaxocrinus girardeau
Protaxocrinus girvanensis
Protaxocrinus laevis
Protaxocrinus paraios
Ptychocrinus insperatus
Ptychocrinus parvus

Ptychocrinus pentagonus
Ptychocrinus splendens
Pycnocrinus dyeri
Pycnocrinus multibrachialis
Pycnocrinus ramulosus
Pycnocrinus sardesoni
Pycnocrinus shafferi
Quinquecaudex cincinnatiensis
Quinquecaudex springeri
Quintuplexacrinus oswegoensis
Reteocrinus alveolatus
Reteocrinus magnificus
Reteocrinus mahlburgi
Reteocrinus rocktnensis
Reteocrinus spinosus
Reteocrinus stellaris
Rhaphanocrinus buckleyi
Rhaphanocrinus sculptus
Rhaphanocrinus subnodosus
Rheocrinus aduncus
Schizocrinus nodosus
Schizocrinus striatus
Simplococrinus persculptus
Sygcaulocrinus typus
Tenuicrinus longibasalis
Ursacrinus stellatus
Xenocrinus baeri
Xenocrinus penicillus
Xenocrinus rubus

Interval		Age of base	Duration (Myr)
Middle Ordovician (2)	Llanvirnian through lower Caradocian	466.2	10.4
Species			
Abludoglyptocrinus charltoni			
Abludoglyptocrinus laticostatus			
Abludoglyptocrinus pustulosus			
Acolocrinus arbucklensis			
Acolocrinus crinerensis			
Acolocrinus hydraulicus			
Agostocrinus xenus			
Agostocrinus xenus			
Anomalocrinus antiquus			
Anthracocrinus primitivus			
Anulocrinus forrestonensis			
Apodasmocrinus daubei			
Apodasmocrinus punctatus			
Apodasmocrinus sp. cf. *A. daubei*			

Archaeocrinus buckhornensis
Archaeocrinus conicus
Archaeocrinus desideratus
Archaeocrinus lacunosus
Archaeocrinus microbasalis
Archaeocrinus peculiaris
Archaeocrinus snyderi
Archaeocrinus subovalis
Archeocrinus sp.
Balacrinus sp.
Brechmocrinus eos
Bromidocrinus nodosus
Calceocrinus barrandii
Calceocrinus gossmani
Calceocrinus longifrons
Calceocrinus multibifurcatus
Caleidocrinus gerki
Carabocrinus sp.
Carabocrinus radiatus
Carabocrinus cf. *tradwelli*
Carabocrinus conoideus
Carabocrinus dicyclicus
Carabocrinus huronensis
Carabocrinus magnificus
Carabocrinus micropunctatus
Carabocrinus oogyi
Carabocrinus radiatus
Carabocrinus sp.
Carabocrinus stellifer
Carabocrinus treadwelli
Carabocrinus vancortlandi
Cataraquicrinus elongatus
Cincinnaticrinus varibrachialus
Cleicrinus sculptus
Cleiocrinus bromidensis
Cleiocrinus laevis
Cleiocrinus magnificus
Cleiocrinus ornatus
Cleiocrinus regius
Cleiocrinus springeri
Cleiocrinus tessellatus
Colpodecrinus quadrifidus
Columbicrinus crassus
Columbicrinus sulphurensis
Cotylacrinna sandra
Cremacrinus sp.
Cremacrinus arctus
Cremacrinus articulosus
Cremacrinus articulosus v1
Cremacrinus forrestonesis
Cremacrinus gerki

Cremacrinus guttenbergensis
Cremacrinus latus
Cremacrinus punctatus
Cremacrinus ramifer
Crinerocrinus parvicostatus
Cupulocrinus canaliculatus
Cupulocrinus cylindricus
Cupulocrinus gacilis
Cupulocrinus heterocostalis
Cupulocrinus humilis
Cupulocrinus jewetti
Cupulocrinus kentuckyiensis
Cupulocrinus levorsoni
Cupulocrinus molanderi
Cupulocrinus plattevillensis
Cupulocrinus species cf. *C. gracilis*
Daedalocrinus bellevillensis
Daedalocrinus kirki
Dendrocrinus aculidatylus
Dendrocrinus alternatus
Dendrocrinus gracilis
Dendrocrinus villosus
Diablocrinus sp.
Diablocrinus perplexus
Diablocrinus vesperalis
Diabolocrinus arbucklensis
Diabolocrinus constrictus
Diabolocrinus n. sp.
Diabolocrinus oklahomensis
Diabolocrinus perplexus
Diabolocrinus poolevillensis
Diabolocrinus vesperalus
Difficilicrinus coneyi
Doliocrinus monilicaulis
Doliocrinus pustulatus
Ectenocrinus simplex
Eopatelliocrinus ornatus
Eopinnacrinus pinnulatus
Euptychocrinus skapaios
Eustenocrinus springeri
Geraocrinus sculptus
Geraocrinus sculptus
Glaucocrinus falconeri
Glyptocrinus charltoni
Glyptocrinus circumcarinatus
Glyptocrinus pustulosis
Glyptocrinus ramulosus
Glyptocrinus tridactylus
Grenprisia billingsi
Grenprisia springeri
Gustabilocrinus latomium

Gustabilocrinus plektanikaulos
Hybocrinus bilateralis
Hybocrinus conicus
Hybocrinus crinerensis
Hybocrinus nitidus
Hybocrinus perperamnominatus
Hybocrinus punctatocristatus
Hybocrinus punctatus
Hybocystis problematicus
Hybocystites eldonensis
Illemnocrinus amphiatus
Iocrinid
Iocrinus trentonensis
Isotomocrinus minutus
Isotomocrinus n. sp.
Isotomocrinus tenuis
Isotomocrinus typus
Merocrinus britonensis
Merocrinus corroboratus
Merocrinus impressus
Merocrinus typus
Ohiocrinus levorsoni
Ottawacrinus typus
Palaeocrinus angulatus
Palaeocrinus avondalensis
Palaeocrinus hudsoni
Palaeocrinus planobasalis
Palaeocrinus pulchellus
Palaeocrinus rhombiferus
Palaeocrinus sp. cf. *P. planobasalis*
Paleocrinus sp.
Parachaeocrinus convexus
Parachaeocrinus decoratus
Paracremacrinus laticardinalis
Paradiabolocrinus irregularis
Paradiabolocrinus sinuorugosus
Paradiabolocrinus stellatus
Pararchaeocrinus convexus
Peltacrinus sculptatus
Penicillicrinus parvus
Peniculocrinus milleri
Periglyptocrinus billingsi
Periglyptocrinus priscus
Periglyptocrinus spinuliferus
Plicodendrocrinus proboscidiatus
Porocrinus bromidensis
Porocrinus cf. *smithi*
Porocrinus conicus
Porocrinus elegans
Porocrinus kentuckyensis
Porocrinus lebanonensis

Porocrinus pentagonius
Porocrinus petersenae
Porocrinus plattinensis
Porocrinus smithi
Praecupulocrinus conjugans
Protaxocrinus elegans
Protaxocrinus laevis
Pycnocrinus multibrachialis
Pycnocrinus sardesoni
Quinquecaudex glabellus
Quinquecaudex species A
Quinquecaudex springeri
Reteocrinus alveolatus
Reteocrinus depressus
Reteocrinus fenestratus
Reteocrinus mahlburgi
Reteocrinus polki
Reteocrinus rocktnensis
Reteocrinus spinosus
Reteocrinus stellaris
Reteocrinus variabilicaulis
Reterocrinus sp.
Rhaphanocrinus buckleyi
Rhaphanocrinus simplex
Rhaphanocrinus subnodosus
Ristnacrinus altobasalis
Schizocrinus nodosus
Schizocrinus striatus
Tornatilicrinus longicaudis
Triboloporus cryptoplicatus
Triboloporus xystrotus
Trichinocrinus terranovicus
Tripatocrinus pustulatus
Tryssocrinus endotomous
Undescribed cladid 1
Wilsonicrinus culmeninuosus

Interval		Age of base	Duration (Myr)
Lower Ordovician (1)	Tremadocian and Arenigian	488.3	22.1
Species			
Adelpicrinus fortuitus			
Archaetaxocrinus burfordi			
Archaetaxocrinus lanei			
Cnemecrinus fillmorenesis			
Eknomocrinus wahwahensis			
Elpasocrinus radiatu			
Forest ?			
Forest 13 cladid			

Forest 15
Forest 18
Forest 2
Forest 3
Forest 4 cleicrinid
Forest 5 Cam
Forest 6
Forest 7
Forest 9 Disparid
Glenocrinus globularis
Habrotecrinus ibexensis
Ibexocrinus lepton
Inyocrinus strimplei
Pogoniporinus antiquus
Proexenocrinus inyoensis
Titanocrinus sumralli
undescribed big disparid I
undescribed cladid
undescribed cladid I1
undescribed cladid I2
undescribed hybocrinid
undescribed Hybocrinus
undescribed Iocrinid 1b
undescribed iocrinid I

APPENDIX 8

Chapter 2; Finer Stratigraphic Bin Sample Lists

Species included within each stratigraphic bin as defined using the temporal binning scheme of Foote 1999.

Time interval	Bin	Abbreviation	Age of base	Duration
Telychian	19	T	436	7.8

Species
Abacocrinus latus
Abacocrinus sp. A
Abacocrinus sp. B
Aclistocrinus arctus
Aetocrinus gracilus
Allocrinus cf. A. sp. *Subglobosus*
Allozygocrinus dubuquensis
Allozygocrinus exallos
Archaeocalytpocrinus iowensis
Archaeocalytpocrinus nodosus
Bolicrinus deflatus
Bolicrinus globosus
Calliocrinus longispinus
Callistocrinus tesselatus
Carpocrinus bodei
Chenocrinus canadaensis
Corvucrinus schucherti
Cybelecrinus ladas
Cybelecrinus nebros
Dendrocrinus abactronodusus
Dendrocrinus aphelos
Dimerocrinites elegans
Dimerocrinites hopkintonesis
Dimerocrinites scuptus
Dimerocrinites sp.
Dimerocrinities hopkintonesis
Eomyelodactylus forestei
Eomyelodactylus sparteus
Eomylodactylus forestei
Eucalyptocrinites depressus
Eucalyptocrinites proboscidalis
Eucalyptocrinus sp. Cf. E. ornatus
Euspirocrinus wolcottense
Jovacrinus jugum

Jovacrinus spinosus
Krinocrinus inflatus
Kryphosocrinus tetreaulti
Ladacrinus? sp.
Levicyathocrinites sablensis
Luxocrinus simplex
Macrostylocrinus compressus
Macrostylocrinus sp. A.
Macrostylocrinus sp. C
Macrostylocrinus sp. D
Macrostylocrinus sp. E.
Macrostylocrinus vermiculatus
Marsupiocrinus primaevus
Myelodactylus linae
Myososcrinus chicottensis
Parapisocrinus quinquelobus
Perichocrinus sp. B
Petalocrinus mirabilis
Pisocrinus gemmiformis
Pregazacrinus hemisphericus
Premanicrinus dubius
Protaxocrinus anellus
Protaxocrinus sideros
Salinocrinus conus
Scapanocrinus muricatus
Siphonocrinus nobilis
Theleproktocrinus davidsoni
Thomasocrinus cylindrica
Tormosocrinus furberi

Time interval	Bin	Abbreviation	Age of base	Duration
Aeronian	18	A	439	3
Species				
Acacocrinus anebos				
Bikocrinus baios				
Bucucrinus saccus				
Calceocrinus incertus				
Clematocrinus ohioensis				
Clidochirus americanus				
Clidochirus ulrichi				
Clidocrinus spirngeri				
Compsocrinus relictus				
Cybelecrinus ladas				
Dendrocrinus daytonensis				
Dendrocrinus ursae				
Dynamocrinus robustus				
Eomyelodactylus ?plumosus				
Eomyelodactylus foerstei				
Eomyelodactylus richardsoni				
Eomyelodactylus rotundatus				

Eomyelodactylus sparteus
Eomyelodactylus springeri
Eomyelodactylus uniformis
Eoparisocrinus siluricus
Euspirocrinus heliktos
Euspirocrinus sp?
Fibrocrinus phragmos
Fragucrinus bothros
Haptocrinus calvatus
Hormocrinus quebecensis
Ibanocrinus petalos
Kanabinocrinus thyaros
Kyreocrinus constellatus
Ladacrinus synaptos
Laurucrinus sandtopensis
Manticrinus exaitos
Myelodacylus sp.?
Paiderocrinus asketos
Paiderocrinus ochthos
Patelliocrinus planus
periehocrinus incertae sedis
Phrygilocrinus batheri
Prolixocrinus nodocaudis
Protaxocrinus sideros
Ptychocrinus adamsensis
Rhachicrinus wrighti
Silfonocrinus siluricus
Stereoaster squamosus
Stibaraocrinus centervillensis
Stipatocrinus hulveri
Thaerocrinus crenatus
Tirocrinus trochos
Trypherocrinus brassfieldensis
Turbocrinus punctum
Typannocrinus strombos
Xysmacrinus greenensis
Zirocrinus litos

Time interval	Bin	Abbreviation	Age of base	Duration
Rhuddanian	17	R	443.7	4.7

Species

Alopocrinus parvus
Apoarchaeocrinus anticostiensis
Becsciecrinus adonis
Calceocrinus tridactylus
Calceorinus pustulosus
Cataractocrinus clementi
Dendrocrinus leptos
Dendrocrinus parvus
Diaphorocrinus pleniramulus

Eomyelodactylus sp.
Eustenocrinidae Indeterminate
Homocrinus diminutus
Kylixocrinus latus
Macrostylocrinus jordanensis
Nexocrinus delicatulus
Pariocrinus heterodactylus
Protaxocrinus cararactensis
Protaxocrinus paraios

Time interval	Bin	Abbreviation	Age of base	Duration
Hirnantian	16	H	445.6	1.9

Species

Alisocrinus tetrarmatus
Alisocrinus? heterodactylus
Anisocrinus prinstaensis
Astakocrinus teren
Calceocrinus alleni
Calceocrinus gamachicus
Charactocrinus billingsi
Clidochirus serrulatus
Compsocrinus nodosus
Culicocrinus? girardeauensis
Dendrocrinus constrictus
Dendrocrinus curvijunctus
Dendrocrinus leptos
Dendrocrinus leptos
Dendrocrinus n. sp. aff. *navigiolum*
Eopatelliocrinus latibrachiatus
Eopatelliocrinus scyphogracilis
Euptychocrinus fimbriatus
Euspirocrinus gagnoni
Gnorimocrinus? problematicus
Macrostylocrinus pristinus
Plicodendrocrinus casei
Protaxocrinus girardeau
Protaxocrinus paraios
Ptychocrinus insperatus
Ptychocrinus pentagonus
Ptychocrinus splendens
Ursacrinus stellatus
Xenocrinus rubus

Time interval	Bin	Abbreviation	Age of base	Duration
Rawtheyan	15	R	447.4	1.8

Species

Atatocrinus wilmingtonensis
Calceocrinus constrictus
Calceocrinus levorsoni

Canistrocrinus richardsoni
Canistrocrinus typus
Carabocrinus boltoni
Carabocrinus slocomi
Chirocrinus twenhohofi
Cincinnaticrinus pentagonus
Clidocrinus anebo
Compsocrinus miamiensis
Cupulocrinus latibrachiatus
Cupulocrinus minimus
Cupulocrinus plolydactylus
Cupulocrinus sp.
Dendrocrinus caudeus
Dendrocrinus minutus
Dendrocrinus posticus
Dendrocrinus sp.
Ectencrinus simplex
Ectenocrinus sp.
Eomyelocrinus sp.
Gaurocrinus fimbriatus
Gaurocrinus nealli
Glyptocrinus fornshelli
Iocrinus subcrassus
Macrostylocrinus wyomingensis
Ohiocrinus sp.
Plicodendrocrinus casei
Plicodendrocrinus epinettensis
Plicodendrocrinus observationensis
Porocrinus fayettensis
Proanisocrinus oswegoensis
Protaxocrinus girvanensis
Quintuplexacrinus oswegoensis
Reteocrinus magnificus
Rhaphanocrinus sculptus
Sygcaulocrinus typus
Xenocrinus baeri
Xenocrinus penicillus

Time interval	Bin	Abbreviation	Age of base	Duration
Cautleyan	14	C	449	1.6

Species

Atatocrinus wilmingtonensis
Calceocrinus constrictus
Calceocrinus levorsoni
Canistrocrinus richardsoni
Canistrocrinus typus
Carabocrinus slocomi
Cincinnaticrinus pentagonus
Clidocrinus anebo
Compsocrinus miamiensis

Cupulocrinus minimus
Cupulocrinus plolydactylus
Cupulocrinus sp.
Dendrocrinus cauduceus
Dendrocrinus posticus
Dendrocrinus sp.
Ectencrinus simplex
Ectenocrinus sp.
Eoparisocrinus mulletensis
Gaurocrinus nealli
Glyptocrinus fornshelli
Iocrinus subcrassus
Macrostylocrinus wyomingensis
Ohiocrinus sp.
Plicodendrocrinus casei
Porocrinus fayettensis
Proanisocrinus oswegoensis
Protaxocrinus girvanensis
Quintuplexacrinus oswegoensis
Reteocrinus magnificus
Rhaphanocrinus sculptus
Rheocrinus aduncus
Sygcaulocrinus typus
Xenocrinus baeri
Xenocrinus penicillus

Time interval	Bin	Abbreviation	Age of base	Duration
Pusgillian	13	P	451	2

Species

Anomalocrinus incurvus
Calceocrinus leversoni
Carabocrinus slocomi
Cincinnaticrinus pentagonus
Cincinnaticrinus varibrachialis
Cupulocrinus latibrachiatus?
Dendrocrinus constrictus
Dystactocrinus constrictus
Ectenocrinus simplex
Glptyocrinus decadactylus
Iocrinus subcrassus
Ohiocrinus brauni
Ohiocrinus laxus
Porocrinus fayettensis
Ptychocrinus parvus
Pycnocrinus dyeri
Pycnocrinus shafferi
Quinquecaudex cincinnatiensis
Sygcaulocrinus typus

Time interval	Bin	Abbreviation	Age of	Duration

			base	
Onnian- Actonian	12	O	453.6	2.6
Species				
Anomalocrinus incurvus				
Archaeocrinus ottawaensis				
Calceocrinus leversoni				
Carabocrinus slocomi				
Cincinnaticrinus pentagonus				
Cincinnaticrinus varibrachialis				
Cupulocrinus latibrachiatus?				
Dendrocrinus constrictus				
Dendrocrinus navigiolum				
Dystactocrinus constrictus				
Ectenocrinus geniculatus				
Ectenocrinus simplex				
Eopatelliocrinus ornatus				
Glptyocrinus decadactylus				
Glyptocrinus ramulosus				
Iocrinus similis				
Iocrinus subcrassus				
Merocrinus curtus				
Ohiocrinus brauni				
Ohiocrinus exilis				
Ohiocrinus laxus				
Porocrinus fayettensis				
Porocrinus shawi				
Ptychocrinus parvus				
Pycnocrinus dyeri				
Pycnocrinus ramulosus				
Pycnocrinus shafferi				
Quinquecaudex cincinnatiensis				
Simplococrinus persculptus				
Sygcaulocrinus typus				
Tenuicrinus longibasalis				

Time interval	Bin	Abbreviation	Age of base	Duration
Marshbrookian	11	M	455.8	2.2
Species				
Abludoglyptocrinus charltoni				
Abludoglyptocrinus pustulosus				
Archaeocrinus desideratus				
Archaeocrinus lacunosus				
Archaeocrinus microbasalis				
Calceocrinus barrandii				
Calceocrinus multibifurcatus				
Carabocrinus radiatus				
Carabocrinus dicyclicus				
Carabocrinus huronensis				
Carabocrinus magnificus				
Carabocrinus radiatus				

Carabocrinus sp.
Carabocrinus treadwelli
Carabocrinus vancortlandi
Cataraquicrinus elongatus
Cincinnaticrinus varibrachialis
Cleicrinus sculptus
Cleiocrinus magnificus
Cleiocrinus regius
Cremacrinus articulosus
Cremacrinus articulosus v1
Cremacrinus forrestonesis
Cremacrinus guttenbergensis
Cremacrinus punctatus
Cupulocrinus canaliculatus
Cupulocrinus cylindricus
Cupulocrinus heterocostalis
Cupulocrinus humilis
Cupulocrinus jewetti
Cupulocrinus jewetti
Cupulocrinus kentuckyiensis
Cupulocrinus levorsoni
Cupulocrinus plattevillensis
Daedalocrinus bellevillensis
Daedalocrinus kirki
Dendrocrinus aculidactylus
Dendrocrinus alternatus
Dendrocrinus gracilis
Dendrocrinus navigiolum
Ectenocrinus geniculatus
Ectenocrinus simplex
Eopatelliocrinus ornatus
Eustenocrinus springeri
Glaucocrinus falconeri
Glyptocrinus sp.
Glyptocrinus circumcarinatus
Glyptocrinus ramulosus
Glyptocrinus tridactylus
Grenprisia billingsi
Grenprisia springeri
Hybocrinus conicus
Hybocystis problematicus
Hybocystites eldonensis
Illemnocrinus amphiatus
Iocrinid
Iocrinus subcrassus
Iocrinus trentonensis
Isotomocrinus minutus
Isotomocrinus typus
Merocrinus corroboratus
Merocrinus curtus
Merocrinus typus

Ottawacrinus typus
Palaeocrinus angulatus
Palaeocrinus pulchellus
Palaeocrinus rhombiferus
Palaeocrinus rhombiferus
Paleocrinus sp.
Peniculocrinus milleri
Periglyptocrinus billingsi
Periglyptocrinus priscus
Periglyptocrinus spinuliferus
Plicodendrocrinus proboscidiatus
Porocrinus conicus
Porocrinus elegans
Porocrinus kentuckyensis
Porocrinus pentagonius
Porocrinus petersenae
Porocrinus shawi
Porocrinus smithi
Praecupulocrinus conjugans
Protaxocrinus elegans
Protaxocrinus laevis
Pycnocrinus multibrachialis
Pycnocrinus sardesoni
Quinquecaudex springeri
Reteocrinus alveolatus
Reteocrinus alveolatus
Reteocrinus mahlburgi
Reteocrinus rocktnensis
Reteocrinus spinosus
Reteocrinus stellaris
Rhaphanocrinus buckleyi
Rhaphanocrinus subnodosus
Schizocrinus nodosus
Schizocrinus striatus
Tenuicrinus longibasalis

Time interval	Bin	Abbreviation	Age of base	Duration
Soudleyan	10	S	456.9	1.1

Species

Abludoglyptocrinus charltoni
Abludoglyptocrinus pustulosus
Archaeocrinus desideratus
Archaeocrinus lacunosus
Archaeocrinus microbasalis
Calceocrinus barrandii
Calceocrinus gossmani
Calceocrinus multibifurcatus
Caleidocrinus gerki
Carabocrinus radiatus
Carabocrinus conoideus

Carabocrinus dicyclicus
Carabocrinus huronensis
Carabocrinus magnificus
Carabocrinus oogyi
Carabocrinus radiatus
Carabocrinus sp.
Carabocrinus treadwelli
Carabocrinus vancortlandi
Cataraquicrinus elongatus
Cincinnaticrinus varibrachialus
Cleicrinus sculptus
Cleiocrinus magnificus
Cleiocrinus regius
Cotylacrinna sandra
Cremacrinus articulosus
Cremacrinus articulosus v1
Cremacrinus forrestonesis
Cremacrinus gerki
Cremacrinus guttenbergensis
Cremacrinus punctatus
Cupulocrinus canaliculatus
Cupulocrinus cylindricus
Cupulocrinus heterocostalis
Cupulocrinus humilis
Cupulocrinus jewetti
Cupulocrinus kentuckyiensis
Cupulocrinus levorsoni
Cupulocrinus molanderi
Cupulocrinus plattevillensis
Daedalocrinus bellevillensis
Daedalocrinus kirki
Dendrocrinus aculidatylus
Dendrocrinus alternatus
Dendrocrinus gracilis
Ectenocrinus simplex
Eopatelliocrinus ornatus
Eopatelliocrinus ornatus
Euptychocrinus skapaios
Eustenocrinus springeri
Glaucocrinus falconeri
Glyptocrinus circumcarinatus
Glyptocrinus ramulosus
Glyptocrinus tridactylus
Grenprisia billingsi
Grenprisia springeri
Hybocrinus conicus
Hybocystis problematicus
Hybocystites eldonensis
Illemnocrinus amphiatus
Iocrinid
Iocrinus trentonensis

Isotomocrinus minutus
Isotomocrinus tenuis
Merocrinus corroboratus
Merocrinus typus
Ohiocrinus levorsoni
Ottawacrinus typus
Palaeocrinus angulatus
Palaeocrinus angulatus
Palaeocrinus pulchellus
Palaeocrinus rhombiferus
Paleocrinus sp.
Peniculocrinus milleri
Periglyptocrinus billingsi
Periglyptocrinus priscus
Periglyptocrinus spinuliferus
Plicodendrocrinus proboscidiatus
Porocrinus conicus
Porocrinus elegans
Porocrinus kentuckyensis
Porocrinus pentagonius
Porocrinus petersenae
Porocrinus smithi
Praecupulocrinus conjugans
Protaxocrinus elegans
Protaxocrinus laevis
Pycnocrinus multibrachialis
Pycnocrinus sardesoni
Quinquecaudex springeri
Reteocrinus alveolatus
Reteocrinus mahlburgi
Reteocrinus rocktnensis
Reteocrinus spinosus
Reteocrinus stellaris
Rhaphanocrinus buckleyi
Rhaphanocrinus subnodosus
Schizocrinus nodosus
Schizocrinus striatus

Time interval	Bin	Abbreviation	Age of base	Duration
Harnagian-Costian	9	H	459	2.1

Species

Abludoglyptocrinus charltoni
Abludoglyptocrinus laticostatus
Acolocrinus arbucklensis
Acolocrinus crinerensis
Acolocrinus hydraulicus
Agostocrinus xenus
Agostocrinus xenus
Anomalocrinus antiquus
Anthracocrinus primitivus

Anulocrinus forrestonensis
Apodasmocrinus daubei
Apodasmocrinus punctatus
Apodasmocrinus sp. cf. *A. daubei*
Archaeocrinus buckhornensis
Archaeocrinus conicus
Archaeocrinus peculiaris
Archaeocrinus snyderi
Archaeocrinus subovalis
Archeocrinus sp.
Balacrinus sp.
Bromidocrinus nodosus
Calceocrinus longifrons
Carabocrinus sp.
Carabocrinus cf. *treadwelli*
Carabocrinus conoideus
Carabocrinus dicyclicus
Carabocrinus micropunctatus
Carabocrinus stellifer
Carabocrinus treadwelli
Cleiocrinus bromidensis
Cleiocrinus laevis
Cleiocrinus magnificus
Cleiocrinus ornatus
Cleiocrinus springeri
Cleiocrinus tessellatus
Colpodecrinus quadrifidus
Columbicrinus crassus
Columbicrinus sulphurensis
Cremacrinus sp.
Cremacrinus arctus
Cremacrinus latus
Cremacrinus punctatus
Cremacrinus ramifer
Crinerocrinus parvicostatus
Cupulocrinus gacilis
Cupulocrinus molanderi
Cupulocrinus plattevillensis
Cupulocrinus species cf. *C. gracilis*
Dendrocrinus villosus
Diablocrinus sp.
Diablocrinus perplexus
Diablocrinus vesperalis
Diabolocrinus arbucklensis
Diabolocrinus constrictus
Diabolocrinus n. sp.
Diabolocrinus oklahomensis
Diabolocrinus perplexus
Diabolocrinus poolevillensis
Diabolocrinus vesperalus
Difficilicrinus coneyi

Doliocrinus monilicaulis
Doliocrinus pustulatus
Eopinnacrinus pinnulatus
Geraocrinus sculptus
Geraocrinus sculptus
Glyptocrinus charltoni
Glyptocrinus pustulosis
Gustabilocrinus latomium
Gustabilocrinus plektanikaulos
Hybocrinus bilateralis
Hybocrinus crinerensis
Hybocrinus nitidus
Hybocrinus perperamnominatus
Hybocrinus punctatocristatus
Hybocrinus punctatus
Isotomocrinus minutus
Isotomocrinus n. sp.
Merocrinus britonensis
Merocrinus impressus
Palaeocrinus avondalensis
Palaeocrinus hudsoni
Palaeocrinus planobasalis
Palaeocrinus sp. cf. *P. planobasalis*
Parachaeocrinus convexus
Parachaeocrinus decoratus
Paracremacrinus laticardinalis
Paradiabolocrinus irregularis
Paradiabolocrinus sinuorugosus
Paradiabolocrinus stellatus
Pararchaeocrinus convexus
Peltacrinus sculptatus
Penicillicrinus parvus
Peniculocrinus milleri
Porocrinus bromidensis
Porocrinus cf. *smithi*
Porocrinus lebanonensis
Porocrinus pentagonius
Porocrinus plattinensis
Quinquecaudex glabellus
Quinquecaudex species A
Reteocrinus depressus
Reteocrinus fenestratus
Reteocrinus polki
Reteocrinus spinosus
Reteocrinus variabilicaulis
Reterocrinus sp.
Rhaphanocrinus buckleyi
Rhaphanocrinus simplex
Ristnacrinus altobasalis
Tornatilicrinus longicaudis
Traskocrinus mahlburgi

Triboloporus cryptoplicatus
Triboloporus xystrotus
Tryssocrinus endotomous
Undescribed cladid 1
Wilsonicrinus culmeninuosus

Time interval	Bin	Abbreviation	Age of base	Duration
gracilis Zone	8	g	460.9	1.9

Species
na

Time interval	Bin	Abbreviation	Age of base	Duration
teretiusculus Zone	7	t	463.7	2.8

Species
na

Time interval	Bin	Abbreviation	Age of base	Duration
murchisoni Zone	6	m	464.8	1.1

Species
na

Time interval	Bin	Abbreviation	Age of base	Duration
bifidus Zone	5	b	466.2	1.4

Species
Brechmocrinus eos
Trichinocrinus terranovicus
Tripatocrinus pustulatus

Time interval	Bin	Abbreviation	Age of base	Duration
hirundo Zone	4	h	470.8	4.6

Species
Archaetaxocrinus lanei
Ibexocrinus lepton
undescribed cladid

Time interval	Bin	Abbreviation	Age of base	Duration
extensus Zone	3	e	478.6	7.8

Species
Adelpicrinus fortuitus
Archaetaxocrinus burfordi
Cnemocrinus fillmorensis
Elpasocrinus radiatu
Habrotecrinus ibexensis
Inyocrinus strimplei
Pogoniporinus antiquus

Proexenocrinus inyoensis
undescribed big disparid I
undescribed cladid I1
undescribed cladid I2
undescribed hybocrinid
undescribed Hybocrinus
undescribed iocrinid I

Time interval	Bin	Abbreviation	Age of base	Duration
Late Tremadoc	2	Tu	485.5	6.9

Species

Cnemecrinus fillmorenesis
Eknomocrinus wahwahensis
Forest ?
Forest 13 cladid
Forest 15
Forest 18
Forest 2
Forest 3
Forest 4 cleicrinid
Forest 5 Cam
Forest 6
Forest 7
Forest 9 Disparid
Glenocrinus globularis
Titanocrinus sumralli
undescribed Iocrinid 1b

Time interval	Bin	Abbreviation	Age of base	Duration
Early Tremadoc	1	T1	488.3	2.8

Species

Eknomocrinus wahwahensis
Glenocrinus globularis
Titanocrinus sumralli
undescribed Iocrinid 1b

APPENDIX 9

Chapter 3; Species Character States

Morphological character states of the 421 crinoid species examined in Chapter 3. Descriptions of the characters and individual states are given in appendix 1. Crinoids were coded morphologically based on inspection of published crinoid plates and inspection of museum, private, and field collections.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Abacocrinus latus	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abacocrinus sp A	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abacocrinus sp B	3	NA	NA	1	NA	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Abludoglyptocrinus charltoni	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Abludoglyptocrinus laticostatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Abludoglyptocrinus pustulosus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Acacocrinus anebos	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Aclistocrinus articus	3	1	2	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Acolocrinus arbucklensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1
Acolocrinus crinerensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	1
Acolocrinus hydraulicus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	2	5	3	3	1	0	2
Adelplicrinus fortuitus	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Aetocrinus gracilis	3	NA	2	1	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	2	1	1
Agostocrinus xenus	3	1	1	1	1	6	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Agostocrinus xenus (benbolt)	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Alisocrinus tetrarmatus	3	1	1	1	1	1	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Alisocrinus? heterodactylus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Allocrinus cf. A. *subglobosus*	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Allozygocrinus dubuquensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	2	3	1
Allozygocrinus exallos	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	2	3	1
Alopocrinus parvus	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Anomalocrinus antiquus	3	NA	1	1	2	1	NA	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Anomalocrinus incurvus	3	1	1	1	2	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	2	2	2	3	5	1	0	1
Anthracocrinus primitivus	3	NA	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Apoarchaeocrinus anticostiensis	3	2	2	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Apodasmocrinus daubei	3	1	2	1	2	5	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1
Apodasmocrinus punctatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Apodasmocrinus sp. cf. *A. daubei*	3	1	2	1	2	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	0	2	3	3	5	1	0	1
Archaeocalyptocrinus nodosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Archaeocalyptocrinus iowensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Archaeocrinus buckhornensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus conicus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus desideratus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus lacunosus	1	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus microbasalis	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus ottawaensis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Archaeocrinus peculiaris	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	2	1	0	3	5	1	0	2
Archaeocrinus snyderi	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Archaeocrinus subovalis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Astakocrinus teren	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	2	1	0	1
Balacrinus sp.	3	1	2	1	2	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Abacocrinus latus	2	1	0	0	0	0	2	1	1	2	2	NA	NA	1	2	1	2	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abacocrinus sp A	2	1	0	0	0	0	2	1	1	2	2	NA	NA	1	2	1	2	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abacocrinus sp B	2	1	0	0	0	0	2	1	1	3	2	NA	NA	1	2	1	2	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Abludoglyptocrinus charltoni	1	1	0	0	0	0	1	1	1	3	2	1	4	1	2	1	2	1	2	10	2	1	3	1	1	0	1	0	1
Abludoglyptocrinus laticostatus	1	1	0	0	0	0	1	1	1	3	2	3	6	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Abludoglyptocrinus pustulosus	2	1	0	0	0	0	1	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Acacocrinus anebos	2	1	0	0	0	0	2	1	1	3	2	1	5	1	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Aclistocrinus articus	2	1	0	0	0	0	2	1	1	2	2	2	2	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	2
Acolocrinus arbucklensis	1	1	0	0	0	0	1	1	1	4	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Acolocrinus crinerensis	1	1	0	0	0	0	1	1	1	8	3	1	1	2	2	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Acolocrinus hydraulicus	2	1	0	0	0	0	2	1	1	8	2	2	1	2	2	1	1	1	1	0	0	0	0	1	0	0	0	0	0
Adelplicrinus fortuitus	2	1	0	0	0	0	1	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Aetocrinus gracilis	NA	3	5	1	1	NA	9	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	3	1	0	1
Agostocrinus xenus	2	3	5	1	1	1	3	1	1	3	2	1	1	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Agostocrinus xenus (benbolt)	2	1	0	0	0	0	2	1	1	3	2	2	2	2	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Alisocrinus tetrarmatus	2	1	0	0	0	0	2	1	1	3	2	1	6	1	2	1	2	2	2	20	1	1	2	1	1	0	1	0	1
Alisocrinus? heterodactylus	2	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	1	2	20	1	1	2	1	1	0	0	0	1
Allocrinus cf. A. *subglobosus*	1	1	0	0	0	0	1	1	1	4	2	1	5	1	2	1	1	1	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Allozygocrinus dubuquensis	2	3	5	1	1	2	NA	1	1	8	3	1	1	1	2	1	1	1	2	NA	1	NA	NA	NA	NA	NA	NA	NA	NA
Allozygocrinus exallos	2	3	5	1	1	1	1	2	1	3	2	NA	NA	NA	NA	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alopocrinus parvus	2	1	0	0	0	0	1	1	1	3	2	2	6	1	2	1	2	2	2	10	1	1	NA	1	1	0	0	0	2
Anomalocrinus antiquus	3	1	0	0	0	0	1	1	1	3	1	3	6	1	2	1	1	1	2	5	1	1	3	1	2	3	2	1	1
Anomalocrinus incurvus	1	1	0	0	0	0	1	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	2	5	1
Anthracocrinus primitivus	2	2	5	1	1	1	3	1	1	3	1	1	5	2	2	1	1	1	2	15	1	1	3	1	1	0	0	0	1
Apoarchaeocrinus anticostiensis	1	2	5	1	1	1	2	1	1	4	2	NA	5	2	2	1	1	1	2	10	1	1	NA	1	1	0	0	0	1
Apodasmocrinus daubei	2	1	0	0	0	0	2	1	1	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Apodasmocrinus punctatus	2	1	0	0	0	0	1	1	1	3	1	2	6	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Apodasmocrinus sp. cf. *A. daubei*	2	1	0	0	0	0	2	1	1	4	2	1	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Archaeocalyptocrinus nodosus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	1	1	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Archaeocalyptocrinus rowensis	1	1	0	0	0	0	1	1	1	1	3	3	5	1	2	2	1	1	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Archaeocrinus buckhornensis	2	2	5	1	1	1	1	1	1	8	3	1	5	2	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus conicus	2	2	5	1	1	1	1	1	1	9	3	1	5	2	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Archaeocrinus desideratus	0	3	5	1	1	1	1	1	1	3	2	3	1	2	2	1	1	1	2	40	1	2	2	1	2	2	1	0	1
Archaeocrinus lacunosus	2	2	5	1	1	1	NA	1	1	3	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	2
Archaeocrinus microbasalis	2	3	5	1	1	1	1	1	1	3	2	3	1	2	2	1	1	1	2	10	1	1	3	1	2	2	1	0	1
Archaeocrinus ottawaensis	2	3	5	1	1	1	NA	1	1	4	2	1	6	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	2
Archaeocrinus peculiaris	2	2	5	1	2	1	1	1	1	4	2	1	1	1	2	1	1	1	2	NA	1	1	2	1	NA	NA	NA	NA	NA
Archaeocrinus snyderi	2	2	5	1	1	1	0	1	1	3	2	2	1	1	2	1	1	1	2	10	1	1	3	1	2	3	1	0	1
Archaeocrinus subovalis	2	2	5	1	1	1	1	1	1	3	2	2	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1
Astakocrinus teren	2	1	0	0	0	0	2	1	1	3	2	NA	5	1	2	1	1	1	2	10	1	1	NA	1	1	0	0	0	2
Balacrinus sp.	2	3	5	1	1	1	1	1	1	8	2	3	6	1	2	1	2	2	2	10	1	1	3	1	2	1	1	1	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Abacocrinus latus	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abacocrinus sp A	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abacocrinus sp B	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	2	2	NA	NA	NA	NA	2	1	NA	NA	1	1
Abludoglyptocrinus charltoni	1	2	1	1	1	1	2	6	2	1	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	1	1	1
Abludoglyptocrinus laticostatus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Abludoglyptocrinus pustulosus	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Acacocrinus anebos	NA	NA	NA	NA	NA	1	2	3	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Aclistocrinus articus	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	1	1	2	NA	1	1
Acolocrinus arbucklensis	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	1
Acolocrinus crinerensis	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	2	1	0	0	0	0	1	1	0	0	0	2
Acolocrinus hydraulicus	0	0	0	0	0	0	1	0	1	0	2	11	1	0	0	0	0	1	1	0	0	0	0	1	1	0	NA	1	1
Adelplicrinus fortuitus	1	1	1	1	1	1	2	3	2	1	1	0	1	0	0	2	1	1	2	1	1	1	2	2	1	3	0	1	1
Aetocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Agostocrinus xenus	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Agostocrinus xenus (benbolt)	1	1	2	1	2	2	1	0	1	0	1	0	1	0	0	1	1	1	1	0	0	0	0	2	1	0	NA	1	1
Alisocrinus tetrarmatus	1	1	2	1	1	1	2	7	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	1	1	1
Alisocrinus? heterodactylus	1	1	2	1	1	1	2	7	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Allocrinus cf. A. *subglobosus*	NA	NA	NA	NA	NA	1	2	3	2	3	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Allozygocrinus dubuquensis	NA	NA	NA	NA	NA	1	2	3	2	1	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Allozygocrinus exallos	NA	NA	NA	NA	NA	NA	2	NA	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Alopocrinus parvus	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Anomalocrinus antiquus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	2	1	1	0	1	1
Anomalocrinus incurvus	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1
Anthracocrinus primitivus	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	2	1	1	NA	NA	1	0	2	NA	2	1
Apoarchaeocrinus anticostiensis	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	0	NA	1	1
Apodasmocrinus daubei	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	0	4	1	1
Apodasmocrinus punctatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Apodasmocrinus sp. cf. *A. daubei*	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	0	4	1	1
Archaeocalyptocrinus nodosus	NA	NA	NA	NA	NA	NA	2	6	2	2	NA	NA	1	0	0	NA	NA	1	0	0	0	0	0	2	2	2	NA	1	1
Archaeocalyptocrinus rowensis	NA	NA	NA	NA	NA	NA	2	6	2	2	NA	NA	1	0	0	NA	NA	1	0	0	0	0	0	2	2	2	NA	1	1
Archaeocrinus buckhornensis	NA	NA	NA	NA	NA	NA	2	5	2	2	NA	NA	1	0	1	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Archaeocrinus conicus	NA	NA	NA	NA	NA	NA	2	5	2	2	NA	NA	1	0	1	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Archaeocrinus desideratus	1	1	2	1	1	1	2	8	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Archaeocrinus lacunosus	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Archaeocrinus microbasalis	1	2	2	1	1	1	2	8	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	1	1	1
Archaeocrinus ottawaensis	1	0	2	1	1	1	2	4	2	2	1	1	1	0	0	3	1	1	1	0	0	0	0	NA	NA	0	NA	1	1
Archaeocrinus peculiaris	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	2	2	NA	1	1	2	1	2	NA	1	2
Archaeocrinus snyderi	1	2	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	2	1	1	1
Archaeocrinus subovalis	1	2	1	1	1	1	2	7	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Astakocrinus teren	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Balacrinus sp.	1	1	1	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	1	1	1	2

Species	88	89	90	91	92
Abacocrinus latus	1	1	1	NA	1
Abacocrinus sp A	1	1	1	NA	1
Abacocrinus sp B	1	1	1	NA	1
Abludoglyptocrinus charltoni	*1*	1	1	0	1
Abludoglyptocrinus laticostatus	1	1	1	NA	1
Abludoglyptocrinus pustulosus	1	1	1	NA	1
Acacocrinus anebos	1	1	1	NA	1
Aclistocrinus articus	*1*	1	1	0	1
Acolocrinus arbucklensis	1	1	1	0	1
Acolocrinus crinerensis	1	1	2	0	1
Acolocrinus hydraulicus	1	1	1	0	1
Adelplicrinus fortuitus	*2*	1	1	1	1
Aetocrinus gracilis	1	1	1	1	1
Agostocrinus xenus	1	1	1	NA	1
Agostocrinus xenus (benbolt)	*1*	1	1	0	1
Alisocrinus tetrarmatus	*1*	1	1	0	1
Alisocrinus? heterodactylus	1	1	1	NA	1
Allocrinus cf. A. *subglobosus*	*1*	1	1	0	1
Allozygocrinus dubuquensis	*1*	1	1	NA	1
Allozygocrinus exallos	1	1	1	NA	1
Alopocrinus parvus	1	1	1	NA	1
Anomalocrinus antiquus	*1*	1	1	0	1
Anomalocrinus incurvus	1	1	1	1	1
Anthracocrinus primitivus	*1*	1	1	1	1
Apoarchaeocrinus anticostiensis	1	1	1	0	1
Apodasmocrinus daubei	1	1	1	1	1
Apodasmocrinus punctatus	*1*	1	1	0	1
Apodasmocrinus sp. cf. *A. daubei*	1	1	1	1	1
Archaeocalyptocrinus nodosus	*1*	1	1	0	2
Archaeocalyptocrinus rowensis	*1*	1	1	0	2
Archaeocrinus buckhornensis	1	1	1	NA	1
Archaeocrinus conicus	1	1	1	NA	1
Archaeocrinus desideratus	*1*	1	1	NA	1
Archaeocrinus lacunosus	*1*	1	1	NA	1
Archaeocrinus microbasalis	*1*	1	1	1	1
Archaeocrinus ottawaensis	1	1	1	0	1
Archaeocrinus peculiaris	*1*	1	1	NA	1
Archaeocrinus snyderi	1	1	1	0	1
Archaeocrinus subovalis	1	1	1	NA	1
Astakocrinus teren	1	1	1	NA	1
Balacrinus sp.	*1*	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Balbocrinus sp.	3	1	1	1	2	5	NA	1	1	1	0	0	NA	NA	2	3	6	1	1	0	1	1	1	0	3	6	1	0	1
Becsciecrinus adonis	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Bikocrinus baios	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Bolicrinus deflatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Bolicrinus globosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Bromidocrinus nodosus	3	1	2	1	1	5	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Bucucrinus saccus	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Calceocrinus alleni	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	2	1	0	1	2	2	3	3	4	NA	NA	NA
Calceocrinus barrandii	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	4	1	1	0	1	2	2	2	3	4	1	0	2
Calceocrinus gamachicus	3	1	1	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Calceocrinus gossmani	3	1	2	1	1	1	NA	1	NA	1	0	0	2	3	2	3	5	2	2	1	1	2	2	3	3	1	1	0	1
Calceocrinus incertus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	4	2	2	1	1	2	2	2	3	4	1	0	2
Calceocrinus levorsoni	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	3	4	1	0	2
Calceocrinus longifrons	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	4	2	2	1	1	2	2	3	3	4	1	0	2
Calceocrinus tridactylus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	4	1	0	2
Caleidocrinus gerki	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Calliocrinus longspinus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1
Callistocrinus tesselatus	3	2	2	1	1	1	NA	1	NA	2	2	1	NA	NA	2	3	5	1	2	3	1	1	1	1	3	5	1	0	1
Canistrocrinus richardsoni	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Canistrocrinus typus	3	NA	NA	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	1	3	5	1	0	1
Carabocrinus sp.	3	1	1	1	1	1	6	1	2	1	0	0	NA	0	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Carabocrinus (Kimmswik)	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus boltoni	3	NA	1	1	2	1	6	1	NA	1	0	0	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	4	2	1	2
Carabocrinus sp. cf. *treadwelli*	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus conoideus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus dicyclicus	3	1	1	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus huronensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus magnificus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Carabocrinus micropunctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	2
Carabocrinus oogyi	3	1	1	1	2	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus radiatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus slocomi	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus stellifer	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Carabocrinus treadwelli	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Carabocrinus radiatus	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Carpocrinus bodei	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	2
Cataractocrinus clementi	3	2	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Cataraquicrinus elongatus	3	1	2	1	2	5	6	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	2	2	3	3	5	1	0	1
Charactocrinus billingsi	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	2	2	3	3	3	1	0	NA
Chenocrinus canadaensis	3	NA	2	1	1	1	5	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Cincinnaticrinus pentagonus	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Balbocrinus sp.	2	3	6	1	1	2	NA	1	1	2	2	2	1	1	2	1	1	2	2	6	1	1	3	1	1	0	0	0	1
Becsciecrinus adonis	NA	2	5	1	1	1	2	1	1	3	2	NA	5	2	2	1	2	1	2	10	1	1	NA	1	2	2	1	0	1
Bikocrinus baios	2	1	0	0	0	0	1	1	1	3	2	3	6	1	NA	1	2	2	2	10	1	1	NA	1	NA	NA	NA	NA	NA
Bolicrinus deflatus	1	1	0	0	0	0	1	1	1	3	2	2	5	1	2	1	2	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Bolicrinus globosus	1	1	0	0	0	0	1	1	1	4	2	2	5	1	2	1	2	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Bromidocrinus nodosus	2	2	5	1	1	1	1	1	1	4	2	1	1	1	2	1	1	2	2	10	1	1	3	1	1	0	1	0	2
Bucucrinus saccus	NA	2	5	1	1	1	2	1	1	3	2	NA	5	2	NA	2	1	1	2	40	1	1	NA	1	1	0	0	0	1
Calceocrinus alleni	NA	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	NA	1	1	NA	NA	NA	NA	NA
Calceocrinus barrandii	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	2	2	5	1
Calceocrinus gamachicus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	2	2	5	1
Calceocrinus gossmani	2	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	3	2	3	1	1	2	1	1	0	1
Calceocrinus incertus	2	1	0	0	0	0	4	1	1	10	2	2	1	1	2	1	1	1	2	3	1	3	1	1	2	3	2	1	1
Calceocrinus levorsoni	2	1	0	0	0	0	2	1	1	10	1	2	2	1	2	1	1	1	2	3	2	3	1	1	2	3	2	4	1
Calceocrinus longifrons	2	1	0	0	0	0	3	1	1	10	2	2	1	1	2	1	1	1	2	3	1	3	1	1	2	2	2	1	1
Calceocrinus tridactylus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	5	1
Caleidocrinus gerki	1	1	0	0	0	0	1	1	1	3	2	2	5	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Calliocrinus longspinus	2	1	0	0	0	0	NA	1	1	1	2	2	6	2	2	3	1	1	2	NA	1	1	1	1	NA	NA	NA	NA	NA
Callistocrinus tesselatus	2	2	5	1	1	1	1	1	1	8	2	1	1	1	2	1	2	1	2	30	1	2	1	1	2	2	2	3	1
Canistrocrinus richardsoni	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*1*	*2*	*20*	*1*	*1*	*3*	*1*	*2*	*1*	*1*	*0*	*1*
Canistrocrinus typus	2	3	5	1	1	1	2	1	1	3	2	5	1	2	1	2	1	2	2	20	1	1	3	1	2	2	1	0	1
Carabocrinus sp.	2	NA	NA	NA	NA	NA	NA	1	1	3	2	3	5	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Carabocrinus (Kimmswik)	2	3	5	1	1	1	2	1	1	3	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	1
Carabocrinus boltoni	2	3	5	1	2	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus sp. cf. *treadwelli*	2	3	5	1	1	1	1	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Carabocrinus conoideus	2	3	5	1	1	1	4	1	1	NA	2	1	1	1	2	1	2	2	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Carabocrinus dicyclicus	2	3	5	1	1	1	4	1	1	8	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Carabocrinus huronensis	2	3	5	1	1	1	2	1	1	8	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Carabocrinus magnificus	2	3	5	1	1	1	4	1	1	8	2	1	1	1	2	2	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Carabocrinus micropunctatus	2	3	5	1	1	1	4	1	1	3	2	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Carabocrinus oogyi	2	3	5	1	1	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus radiatus	2	3	5	1	1	1	4	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus slocomi	2	3	5	1	1	1	4	1	1	2	3	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Carabocrinus stellifer	2	3	5	1	1	1	4	1	1	4	1	2	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Carabocrinus treadwelli	2	3	5	1	1	1	1	1	1	4	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Carbocrinus radiatus	2	3	4	1	2	1	3	1	1	8	2	1	6	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Carpocrinus bodei	2	1	0	0	0	0	2	1	1	3	2	2	1	1	2	1	1	2	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Cataractocrinus clementi	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	4	1	1	1	1	2	1	1	0	1
Cataraquicrinus elongatus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Charactocrinus billingsi	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	2	2	4	1
Chenocrinus canadaensis	2	1	0	0	0	0	1	1	1	2	2	3	6	1	NA	2	1	1	2	20	1	1	NA	1	1	0	0	0	1
Cincinnaticrinus pentagonus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Balbocrinus sp.	1	1	2	1	1	1	2	5	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	2	1	1	0	1	1
Becsciecrinus adonis	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Bikocrinus baios	NA	NA	NA	NA	1	1	2	3	2	2	NA	NA	1	0	0	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Bolicrinus deflatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Bolicrinus globosus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Bromidocrinus nodosus	1	1	2	1	1	1	2	9	2	2	2	1	1	0	0	NA	1	1	2	1	1	1	1	2	1	2	2	1	1
Bucucrinus saccus	1	2	NA	1	1	1	2	NA	2	2	2	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	NA	NA	1	1
Calceocrinus alleni	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	2	NA	NA	NA	NA	1	1	NA	NA	1	1
Calceocrinus barrandii	1	1	3	1	1	1	2	1	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	2	NA	1	2
Calceocrinus gamachicus	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Calceocrinus gossmani	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	2
Calceocrinus incertus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	NA	NA	NA	1	2	NA	1	1
Calceocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Calceocrinus longifrons	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	2	2	1	1	1	1	1	1	2	NA	1	2
Calceocrinus tridactylus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Caleidocrinus gerki	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	2	1	2	NA	1	1
Calliocrinus longspinus	1	NA	NA	1	1	1	2	NA	NA	NA	NA	NA	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	2
Callistocrinus tesselatus	1	1	3	1	1	1	2	7	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	NA	NA	3	NA	1	1
Canistrocrinus richardsoni	*1*	*2*	*2*	*1*	*1*	*1*	*2*	*3*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*1*	*2*	*1*	*1*	*1*
Canistrocrinus typus	1	2	1	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	2	1	NA	1	1	NA	NA	1	NA	1	1
Carabocrinus sp.	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	1	1	1	1
Carabocrinus (Kimmswik)	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	1	NA	1	1
Carabocrinus boltoni	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	2	1	0	0	0	0	1	1	NA	NA	1	1
Carabocrinus sp. cf. *treadwelli*	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
Carabocrinus conoideus	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Carabocrinus dicyclicus	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1
Carabocrinus huronensis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1
Carabocrinus magnificus	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Carabocrinus micropunctatus	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	2
Carabocrinus oogyi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	3	NA	1	1
Carabocrinus radiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carabocrinus slocomi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carabocrinus stellifer	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Carabocrinus treadwelli	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
Carbocrinus radiatus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Carpocrinus bodei	NA	NA	NA	NA	NA	1	2	3	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Cataractocrinus clementi	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	4	NA	1	1
Cataraquicrinus elongatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	3	NA	1	1
Charactocrinus billingsi	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Chenocrinus canadaensis	1	1	NA	1	1	1	2	NA	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1
Cincinnaticrinus pentagonus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1

Species	88	89	90	91	92
Balbocrinus sp.	2	2	1	0	1
Becsciecrinus adonis	1	1	1	NA	1
Bikocrinus baios	1	1	1	NA	1
Bolicrinus deflatus	*1*	1	1	0	1
Bolicrinus globosus	*1*	1	1	0	1
Bromidocrinus nodosus	1	1	1	1	1
Bucucrinus saccus	1	1	1	NA	1
Calceocrinus alleni	*1*	1	1	1	1
Calceocrinus barrandii	1	1	1	1	1
Calceocrinus gamachicus	1	1	1	NA	1
Calceocrinus gossmani	1	1	1	1	1
Calceocrinus incertus	*1*	1	1	NA	1
Calceocrinus levorsoni	1	1	1	1	1
Calceocrinus longifrons	*1*	1	1	1	1
Calceocrinus tridactylus	*1*	1	1	1	1
Caleidocrinus gerki	1	1	1	1	1
Calliocrinus longspinus	1	1	1	1	2
Callistocrinus tesselatus	*1*	1	1	0	1
Canistrocrinus richardsoni	*1*	1	*1*	*NA*	1
Canistrocrinus typus	1	1	1	1	1
Carabocrinus sp.	*1*	1	1	0	1
Carabocrinus (Kimmswik)	1	1	1	NA	1
Carabocrinus boltoni	1	1	1	0	1
Carabocrinus sp. cf. *treadwelli*	*1*	1	1	0	1
Carabocrinus conoideus	1	1	1	0	1
Carabocrinus dicyclicus	*1*	1	1	1	1
Carabocrinus huronensis	*1*	1	1	0	1
Carabocrinus magnificus	1	1	1	NA	1
Carabocrinus micropunctatus	*1*	1	1	NA	1
Carabocrinus oogyi	1	1	1	0	1
Carabocrinus radiatus	1	1	1	NA	1
Carabocrinus slocomi	1	1	2	NA	1
Carabocrinus stellifer	*1*	1	1	NA	1
Carabocrinus treadwelli	*1*	1	1	0	1
Carbocrinus radiatus	*1*	1	1	0	1
Carpocrinus bodei	*1*	1	1	NA	1
Cataractocrinus clementi	*1*	1	1	1	1
Cataraquicrinus elongatus	1	1	1	1	1
Charactocrinus billingsi	1	1	1	NA	1
Chenocrinus canadaensis	1	1	1	NA	1
Cincinnaticrinus pentagonus	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Cincinnaticrinus varibrachialis	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Cleiocrinus regius	3	1	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleicrinus sculptus	3	1	1	1	1	5	5	1	NA	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus bromidensis	3	1	NA	NA	NA	NA	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus laevis	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus magnificus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cleiocrinus ornatus	3	1	1	1	1	6	6	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus springeri	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Cleiocrinus tessellatus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Clematocrinus ohioensis	3	NA	NA	NA	NA	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Clidochirus americanus	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Clidochirus anebos	3	1	1	1	1	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Clidochirus serrulatus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Clidochirus springeri	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Clidochirus ulrichi	3	1	1	1	1	1	1	2	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Colpodecrinus quadrifidus	3	1	2	1	2	3	4	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Columbicrinus crassus	3	2	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Columbicrinus sulphurensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Compsocrinus miamiensis	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Compsocrinus nodosus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	1	0	3	5	1	0	2
Corvucrinus schucherti	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	NA
Cotylacrinus sandra	3	2	2	1	1	1	6	1	NA	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Cremacrinus sp.	3	1	1	1	1	1	1	1	?	1	0	0	1	0	2	3	1	1	1	0	1	0	1	0	3	5	1	0	2
Cremacrinus arctus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	1	0	3	3	1	0	2
Cremacrinus articulosus v1	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	2	3	4	1	0	2
Cremacrinus articulosus v2	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Cremacrinus crossmani	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	NA	NA	NA	NA	NA
Cremacrinus forrestonensis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	2	1	0	1	2	2	3	3	3	1	0	2
Cremacrinus gerki	3	1	1	1	1	1	2	1	1	1	0	0	NA	NA	2	3	5	2	2	1	1	2	2	3	3	4	1	0	1
Cremacrinus guttenbergensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	4	2	2	1	1	2	2	2	2	4	1	0	1
Cremacrinus latus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	1	1	0	1
Cremacrinus punctatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	4	1	0	2
Cremacrinus ramifer	3	1	1	1	1	1	NA	NA	NA	1	0	0	NA	NA	2	3	1	1	1	0	1	0	1	0	3	3	1	0	2
Crinerocrinus parvicostatus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	6	1	2	2	1	1	1	0	3	5	1	0	1
Culicocrinus? girardeauensis	*3*	*1*	*2*	*1*	*1*	*1*	*1*	*1*	*2*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Cupulocrinus canaliculatus	3	1	2	1	1	7	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus crossmani	3	1	1	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus cylindricus	3	1	2	1	1	1	3	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cupulocrinus dixiei	3	1	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	2	1	1
Cupulocrinus gracilis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Cupulocrinus heterocostalis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Cincinnaticrinus varibrachialis	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Cleicrinus regius	2	2	5	1	1	2	1	1	1	7	1	1	5	1	2	1	1	1	2	40	2	1	2	1	2	1	1	0	1
Cleicrinus sculptus	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus bromidensis	2	3	5	1	1	1	1	1	1	7	1	1	6	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus laevis	0	2	5	1	1	1	0	1	1	7	3	1	1	1	2	1	2	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus magnificus	2	2	5	1	1	1	1	1	1	7	3	1	NA	2	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus ornatus	0	2	5	1	1	1	1	1	1	7	3	1	6	1	2	1	1	1	2	80	1	1	3	1	NA	NA	NA	NA	NA
Cleiocrinus springeri	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cleiocrinus tessellatus	0	1	0	0	0	0	1	1	1	7	1	1	5	1	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Clematocrinus ohioensis	2	1	0	0	0	0	1	1	1	3	1	1	6	1	1	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Clidochirus americanus	2	3	5	1	1	1	2	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Clidochirus anebos	1	3	3	1	1	2	4	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Clidochirus serrulatus	1	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	2	5	1
Clidochirus springeri	2	3	5	1	1	1	2	1	1	2	2	1	1	1	2	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Clidochirus ulrichi	2	3	5	1	1	1	3	1	1	3	2	1	1	1	2	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Colpodecrinus quadrifidus	2	3	4	1	1	2	1	1	1	8	3	1	1	1	2	1	1	2	2	5	1	1	3	1	2	1	1	0	1
Columbicrinus crassus	2	1	0	0	0	0	1	1	1	1	2	1	5	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Columbicrinus sulphurensis	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Compsocrinus miamiensis	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*1*	*2*	*14*	*1*	*2*	*3*	*1*	*1*	*0*	*0*	*0*	*1*
Compsocrinus nodosus	2	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Corvucrinus schucherti	2	1	0	0	0	0	1	1	1	10	2	2	2	2	2	1	1	1	2	3	1	3	1	1	NA	NA	NA	NA	NA
Cotylacrinus sandra	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	2
Cremacrinus sp.	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	6	1	3	1	1	2	3	2	5	1
Cremacrinus arctus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	2	1	1	2	4	1	3	1	1	2	3	2	1	1
Cremacrinus articulosus v1	2	1	0	0	0	0	1	1	1	10	2	2	1	1	1	1	1	1	2	4	1	3	1	1	2	2	2	1	1
Cremacrinus articulosus v2	2	1	0	0	0	0	1	1	1	10	2	2	2	1	1	1	1	1	2	4	1	3	1	1	2	2	2	1	1
Cremacrinus crossmani	NA	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	4	2	3	2	1	2	2	1	0	1
Cremacrinus forrestonensis	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	4	2	3	1	1	2	3	1	0	1
Cremacrinus gerki	2	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	4	2	3	1	1	2	3	2	2	1
Cremacrinus guttenbergensis	1	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	4	2	3	1	1	2	2	2	1	1
Cremacrinus latus	2	1	0	0	0	0	1	1	1	10	2	2	1	1	1	1	1	1	2	5	1	3	1	1	2	3	2	5	1
Cremacrinus punctatus	2	1	0	0	0	0	1	1	1	10	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	3	2	5	1
Cremacrinus ramifer	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	3	3	1	1	2	2	2	5	1
Crinerocrinus parvicostatus	2	2	5	1	1	1	1	1	1	4	1	1	6	1	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Culicocrinus? girardeauensis	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*3*	*2*	*3*	*5*	*1*	*2*	*1*	*1*	*1*	*2*	*10*	*1*	*1*	*3*	*1*	*1*	*0*	*0*	*0*	*1*
Cupulocrinus canaliculatus	2	3	5	1	1	1	2	1	1	2	2	2	2	1	1	1	1	1	2	2	1	1	2	1	2	2	1	0	1
Cupulocrinus crossmani	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Cupulocrinus cylindricus	2	3	5	1	1	1	0	1	1	3	2	2	5	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Cupulocrinus dixiei	2	3	4	1	2	1	3	1	1	8	2	1	6	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Cupulocrinus gracilis	2	3	5	1	1	1	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Cupulocrinus heterocostalis	2	3	5	1	1	1	NA	1	1	3	2	2	6	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Cincinnaticrinus varibrachialis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	4	1	1
Cleicrinus regius	1	1	2	1	1	1	2	20	1	0	1	0	1	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	2	1
Cleicrinus sculptus	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Cleiocrinus bromidensis	NA	NA	NA	NA	NA	NA	2	NA	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	1	1	1
Cleiocrinus laevis	NA	NA	NA	NA	NA	1	2	6	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1	NA	2	2
Cleiocrinus magnificus	NA	NA	NA	NA	1	1	2	40	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	3	NA	2	1
Cleiocrinus ornatus	NA	NA	NA	1	1	1	2	17	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	2	1
Cleiocrinus springeri	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Cleiocrinus tessellatus	NA	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Clematocrinus ohioensis	1	2	2	1	1	1	2	1	2	3	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	NA	1	1
Clidochirus americanus	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Clidochirus anebos	2	1	2	1	1	1	2	3	1	0	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Clidochirus serrulatus	1	2	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	1	NA	1	1
Clidochirus springeri	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Clidochirus ulrichi	1	1	1	1	1	1	2	2	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	2	0	1	1
Colpodecrinus quadrifidus	1	1	2	1	1	1	2	4	2	2	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	3	1	1
Columbicrinus crassus	1	2	3	1	1	1	1	0	1	0	2	1	1	0	0	4	1	1	2	1	1	1	1	1	1	2	2	1	1
Columbicrinus sulphurensis	1	2	2	1	1	1	2	2	1	0	2	1	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1
Compsocrinus miamiensis	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*6*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*3*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*
Compsocrinus nodosus	1	1	2	1	1	1	2	3	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Corvucrinus schucherti	NA	NA	NA	NA	NA	1	1	0	1	0	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cotylacrinus sandra	1	1	2	1	2	1	2	4	2	2	2	1	1	0	0	2	1	1	0	0	0	0	0	2	2	0	NA	1	1
Cremacrinus sp.	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1
Cremacrinus arctus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	2
Cremacrinus articulosus v1	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cremacrinus articulosus v2	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cremacrinus crossmani	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus forrestonensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	NA	1	1	1	2	NA	1	2
Cremacrinus gerki	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	NA	NA	NA	NA	1	1	2	0	1	2
Cremacrinus guttenbergensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus latus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	2
Cremacrinus punctatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Cremacrinus ramifer	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	2
Crinerocrinus parvicostatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Culicocrinus? girardeauensis	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*8*	*2*	*1*	*2*	*1*	*1*	*0*	*0*	*3*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*
Cupulocrinus canaliculatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1
Cupulocrinus crossmani	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	1	1	1	3	NA	1	1
Cupulocrinus cylindricus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	2	1	1	1
Cupulocrinus dixiei	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Cupulocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	NA	NA	NA	2	NA	NA	NA	NA	1	1
Cupulocrinus heterocostalis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	1	1	2	0	1	1

Species	88	89	90	91	92
Cincinnaticrinus varibrachialis	1	1	1	NA	1
Cleicrinus regius	*1*	1	1	NA	1
Cleicrinus sculptus	*1*	1	1	NA	1
Cleiocrinus bromidensis	*1*	1	1	NA	1
Cleiocrinus laevis	1	1	1	NA	1
Cleiocrinus magnificus	1	1	1	NA	1
Cleiocrinus ornatus	*1*	1	1	NA	1
Cleiocrinus springeri	*1*	1	1	NA	1
Cleiocrinus tessellatus	*1*	1	1	NA	1
Clematocrinus ohioensis	1	1	1	0	1
Clidochirus americanus	*1*	1	1	0	1
Clidochirus anebos	1	1	1	NA	1
Clidochirus serrulatus	1	1	1	0	1
Clidochirus springeri	*1*	1	1	0	1
Clidochirus ulrichi	*1*	1	1	0	1
Colpodecrinus quadrifidus	1	1	2	NA	1
Columbicrinus crassus	*1*	1	1	1	1
Columbicrinus sulphurensis	1	1	1	1	1
Compsocrinus miamiensis	*1*	1	*1*	*NA*	1
Compsocrinus nodosus	1	1	1	NA	1
Corvucrinus schucherti	1	1	1	NA	1
Cotylacrinus sandra	1	1	1	1	1
Cremacrinus sp.	*1*	1	1	0	1
Cremacrinus arctus	*1*	1	1	1	1
Cremacrinus articulosus v1	*1*	1	1	1	1
Cremacrinus articulosus v2	*1*	1	1	1	1
Cremacrinus crossmani	1	1	1	1	1
Cremacrinus forrestonensis	1	1	1	1	1
Cremacrinus gerki	1	1	1	1	1
Cremacrinus guttenbergensis	1	1	1	1	1
Cremacrinus latus	*1*	1	1	NA	1
Cremacrinus punctatus	1	1	1	1	1
Cremacrinus ramifer	*1*	1	1	0	1
Crinerocrinus parvicostatus	1	1	1	NA	1
Culicocrinus? girardeauensis	*1*	1	*1*	*NA*	1
Cupulocrinus canaliculatus	1	1	1	NA	1
Cupulocrinus crossmani	1	1	1	1	1
Cupulocrinus cylindricus	*1*	1	1	1	1
Cupulocrinus dixiei	*1*	1	1	0	1
Cupulocrinus gracilis	1	1	1	1	1
Cupulocrinus heterocostalis	*1*	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Cupulocrinus humulis	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Cupulocrinus jewetti	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus jewetti (Decorah)	3	2	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus kentuckyensis	3	NA	NA	NA	NA	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Cupulocrinus latibrachiatus	3	NA	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus levorsoni	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus minimus	3	2	NA	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus molanderi	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cupulocrinus plattevillensis	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Cupulocrinus plolydactylus	3	1	1	1	1	1	1	2	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus sp A	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	NA	NA	NA
Cupulocrinus sp. cf. *Latibrachialus*	3	1	1	1	1	8	1	2	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Cupulocrinus sp. cf. *C. gracilis*	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Cupulocrinus angustatus	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Cybelecrinus ladus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Cybelecrinus nebros	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Daedalocrinus bellevillnsis	3	1	1	1	2	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Daedalocrinus kirki	3	1	2	1	1	5	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	1
Dendrocrinus abactronodosus	3	1	2	1	2	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus acutidactylus	3	2	1	1	1	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Dendrocrinus alternatus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Dendrocrinus cauduceus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus constrictus	3	2	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Dendrocrinus curvijunctus	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus daytonensis	3	2	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Dendrocrinus gracilis	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Dendrocrinus leptos	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Dendrocrinus minutus	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	2	1	1	0	3	5	1	0	1
Dendrocrinus n. sp. aff. *navigiolum*	3	1	2	1	1	1	NA	1	NA	2	1	1	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus navigiolum	3	2	1	1	1	5	NA	1	NA	1	0	0	1	0	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Dendrocrinus parvus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus posticus	3	1	1	1	1	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Dendrocrinus sp. Indet	3	1	NA	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Dendrocrinus ursae	3	1	2	1	2	5	NA	1	NA	2	2	2	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dendrocrinus villosus	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Dendrocrinus aphelos	3	1	2	1	2	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Diablocrinus sp.	3	1	2	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Diabolocrinus arbucklensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus constrictus	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus n. sp.	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus oklahomensis	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Cupulocrinus humulis	2	3	5	1	1	1	3	1	1	2	2	3	1	1	2	1	1	1	2	5	1	1	2	1	2	4	1	0	1
Cupulocrinus jewetti	2	3	5	1	0	1	2	1	1	2	2	2	2	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus jewetti (Decorah)	2	3	5	1	1	1	2	1	1	2	2	2	2	1	2	1	1	2	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus kentuckyensis	2	3	5	1	1	2	3	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	3	1	0	1
Cupulocrinus latibrachiatus	2	3	5	1	1	1	6	1	1	3	2	NA	1	1	2	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Cupulocrinus levorsoni	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Cupulocrinus minimus	2	3	5	1	1	1	2	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	2	NA	NA	NA	1
Cupulocrinus molanderi	2	3	5	1	1	1	2	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Cupulocrinus plattevillensis	2	3	5	1	1	1	NA	1	1	2	3	2	6	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus plolydactylus	1	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus sp A	NA	3	NA	NA	NA	NA	2	1	1	2	NA	2	5	1	1	1	1	1	2	10	1	1	1	1	2	3	1	0	1
Cupulocrinus sp. cf. *Latibrachialus*	1	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cupulocrinus sp. cf. *C. gracilis*	1	3	5	1	1	1	0	1	1	2	2	3	5	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Cupulorcrinus angustatus	2	3	5	1	1	1	2	1	1	2	2	2	6	1	2	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Cybelecrinus ladus	2	3	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	2	2	20	1	1	NA	1	1	0	0	0	1
Cybelecrinus nebros	2	3	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	2	2	20	1	1	NA	1	1	0	0	0	1
Daedalocrinus bellevillnsis	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	2	2	1
Daedalocrinus kirki	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	2	2	1
Dendrocrinus abactronodosus	2	3	5	1	1	1	3	1	1	2	3	1	1	1	1	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Dendrocrinus acutidactylus	2	3	5	1	1	1	NA	1	1	2	2	1	NA	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Dendrocrinus alternatus	2	3	5	1	1	1	1	1	1	2	2	1	6	1	2	1	1	1	2	5	1	1	3	1	NA	NA	NA	NA	1
Dendrocrinus cauduceus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Dendrocrinus constrictus	2	3	5	1	1	1	4	1	1	2	3	2	1	1	1	1	1	1	2	5	1	NA	2	NA	NA	NA	NA	NA	NA
Dendrocrinus curvijunctus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Dendrocrinus daytonensis	2	3	5	1	1	2	2	1	1	2	3	2	1	1	1	1	1	1	2	5	1	NA	2	NA	NA	NA	NA	NA	NA
Dendrocrinus gracilis	2	3	5	1	1	2	1	1	1	2	1	1	5	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Dendrocrinus leptos	2	3	5	1	0	NA	3	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1
Dendrocrinus minutus	2	3	5	1	1	1	NA	1	1	2	2	2	NA	NA	1	1	1	1	2	5	1	1	NA	1	2	3	1	0	1
Dendrocrinus n. sp. aff. *navigiolum*	2	3	5	1	1	1	2	1	1	2	3	2	1	1	2	1	1	1	2	5	1	1	3	1	2	1	1	0	1
Dendrocrinus navigiolum	2	3	5	1	1	2	NA	1	1	2	3	2	NA	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Dendrocrinus parvus	2	3	5	1	1	1	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Dendrocrinus posticus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Dendrocrinus sp. Indet	2	3	5	1	1	2	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Dendrocrinus ursae	2	3	5	1	1	1	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	NA	2	1	NA	NA	NA	NA	NA
Dendrocrinus villosus	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	NA	2	1	NA	NA	NA	NA	NA
Dendrocrius aphelos	2	3	5	1	1	2	4	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Diablocrinus sp.	2	2	5	1	1	1	1	1	1	3	2	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	1	0	1
Diabolocrinus arbucklensis	1	2	5	1	1	1	2	1	1	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2
Diabolocrinus constrictus	1	2	5	1	1	1	2	1	1	3	1	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	1
Diabolocrinus n. sp.	2	2	5	1	1	1	1	1	1	4	1	2	5	1	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Diabolocrinus oklahomensis	1	2	5	1	1	1	2	1	1	3	1	3	1	2	2	1	1	2	2	0	1	1	3	1	1	0	0	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Cupulocrinus humulis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	2	1	3	NA	1	1
Cupulocrinus jewetti	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cupulocrinus jewetti (Decorah)	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Cupulocrinus kentuckyensis	1	1	1	1	1	1	2	1	2	3	1	0	1	0	0	NA	1	1	2	1	2	1	2	NA	NA	3	NA	1	1
Cupulocrinus latibrachiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	NA	NA	NA	NA	NA	NA	1	1
Cupulocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	4	NA	1	1
Cupulocrinus minimus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	3	NA	1	1
Cupulocrinus molanderi	1	1	2	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Cupulocrinus plattevillensis	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	3	0	1	1
Cupulocrinus plolydactylus	1	1	2	1	1	1	1	0	1	0	1	1	1	0	1	4	1	1	2	1	1	1	1	1	1	3	NA	1	1
Cupulocrinus sp A	1	1	2	1	1	1	2	3	2	2	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Cupulocrinus sp. cf. *Latibrachialus*	1	1	2	1	1	1	1	0	1	0	1	1	1	0	1	4	1	1	2	1	1	1	1	1	1	3	NA	1	1
Cupulocrinus sp. cf. *C. gracilis*	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	NA	1	1
Cupulorcrinus angustatus	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	1	1	1	1	1	2	0	1	1
Cybelecrinus ladus	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Cybelecrinus nebros	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	2	NA	1	1	2	2	3	NA	NA	1	1
Daedalocrinus bellevillnsis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	1	0	1	1
Daedalocrinus kirki	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	0	1	1
Dendrocrinus abactronodosus	1	1	3	1	1	1	1	0	1	0	0	0	1	0	0	4	1	1	2	2	2	1	1	1	1	3	NA	1	1
Dendrocrinus acutidactylus	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	NA	NA	1	NA	1	1
Dendrocrinus alternatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	NA	1	1	1
Dendrocrinus cauduceus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	1	NA	1	1	1	1	NA	NA	1	1
Dendrocrinus constrictus	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	0	1	2
Dendrocrinus curvijunctus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	3	NA	1	1
Dendrocrinus daytonensis	NA	NA	NA	NA	1	1	1	0	1	0	1	0	1	0	0	NA	NA	1	1	0	0	0	0	1	1	0	NA	1	1
Dendrocrinus gracilis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	NA	NA	3	1	1	1
Dendrocrinus leptos	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	NA	NA	2	1	NA	NA	NA	NA	1	1
Dendrocrinus minutus	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dendrocrinus n. sp. aff. *navigiolum*	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Dendrocrinus navigiolum	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	3	NA	1	1
Dendrocrinus parvus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	NA	1	1
Dendrocrinus posticus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	1	1	1	1	3	NA	1	1
Dendrocrinus sp. Indet	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Dendrocrinus ursae	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dendrocrinus villosus	NA	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Dendrocrius aphelos	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	4	NA	1	1
Diablocrinus sp.	1	2	2	1	1	1	2	2	1	0	2	1	1	0	0	3	1	1	1	1	1	1	1	1	1	2	NA	1	1
Diabolocrinus arbucklensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus constrictus	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus n. sp.	NA	NA	NA	NA	2	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	1	2	1	2	1	1	1
Diabolocrinus oklahomensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1

Species	88	89	90	91	92
Cupulocrinus humulis	1	1	1	1	1
Cupulocrinus jewetti	1	1	1	NA	1
Cupulocrinus jewetti (Decorah)	1	1	1	1	1
Cupulocrinus kentuckyensis	1	1	1	1	1
Cupulocrinus latibrachiatus	1	1	1	1	1
Cupulocrinus levorsoni	1	1	1	1	1
Cupulocrinus minimus	1	1	1	NA	1
Cupulocrinus molanderi	*1*	1	1	NA	1
Cupulocrinus plattevillensis	*1*	1	1	0	1
Cupulocrinus plolydactylus	1	1	1	1	1
Cupulocrinus sp A	1	1	1	NA	1
Cupulocrinus sp. cf. *Latibrachialus*	1	1	1	1	1
Cupulocrinus sp. cf. *C. gracilis*	*1*	1	1	1	1
Cupulorcrinus angustatus	*1*	1	1	1	1
Cybelecrinus ladus	1	1	NA	1	1
Cybelecrinus nebros	1	1	NA	1	1
Daedalocrinus bellevillnsis	*1*	1	1	1	1
Daedalocrinus kirki	*1*	1	1	1	1
Dendrocrinus abactronodosus	*1*	1	1	1	1
Dendrocrinus acutidactylus	1	1	1	1	1
Dendrocrinus alternatus	1	1	1	0	1
Dendrocrinus cauduceus	1	1	1	1	1
Dendrocrinus constrictus	*1*	1	1	NA	1
Dendrocrinus curvijunctus	1	1	1	1	1
Dendrocrinus daytonensis	*1*	1	1	0	1
Dendrocrinus gracilis	1	1	1	0	1
Dendrocrinus leptos	1	1	1	1	1
Dendrocrinus minutus	1	1	1	NA	1
Dendrocrinus n. sp. aff. *navigiolum*	1	1	1	NA	1
Dendrocrinus navigiolum	1	1	1	NA	1
Dendrocrinus parvus	*1*	1	1	1	1
Dendrocrinus posticus	1	1	1	1	1
Dendrocrinus sp. Indet	1	1	1	1	1
Dendrocrinus ursae	*1*	1	1	1	1
Dendrocrinus villosus	1	1	1	NA	1
Dendrocrius aphelos	*1*	1	1	1	1
Diablocrinus sp.	*1*	1	1	1	1
Diabolocrinus arbucklensis	1	1	1	1	1
Diabolocrinus constrictus	1	1	1	1	1
Diabolocrinus n. sp.	*1*	1	1	1	1
Diabolocrinus oklahomensis	1	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Diabolocrinus perplexus	3	1	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus poolevillensis	3	1	2	1	1	1	NA	1	2	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diabolocrinus vesperalus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Diaphorocrinus pleniramulus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	3	1	0	2
Difficilicrinus coneyi	3	NA	NA	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Dimerocrinites elegans	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Dimerocrinites hopkintonensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinites sculptus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinites sp.	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Dimerocrinities sculptus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Doliocrinus monilicaulis	3	1	2	1	1	1	5	2	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Doliocrinus pustulatus	3	1	2	1	1	1	5	1	NA	1	0	0	NA	NA	2	5	5	1	1	0	1	1	2	2	3	5	1	0	1
Dynamocrinus robustus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Dystactocrinus constrictus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Ectenocrinus geniculatus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Ectenocrinus simplex	3	2	2	1	1	1	5	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Ectenocrinus sp.	3	2	1	1	1	1	1	1	1	1	0	0	2	3	2	3	5	1	2	3	1	1	2	3	3	5	1	0	2
Eknomocrinus wahwahnsis	*3*	*1*	*1*	*1*	*2*	*1*	*5*	*1*	*1*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*2*	*1*	*1*	*2*	*1*	*0*	*3*	*5*	*2*	*2*	*1*
Eomyelodactylus plumosus	3	1	2	2	1	1	NA	1	NA	2	2	1	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus richardsoni	3	2	2	2	2	1	2	1	2	2	2	3	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eomyelodactylus rotundus	3	2	1	2	2	2	5	1	1	NA	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus sp.	3	2	2	2	2	2	2	1	2	2	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus sparteus	3	2	2	2	2	2	2	1	2	2	2	3	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eomyelodactylus springeri	3	2	2	2	2	1	2	1	2	2	2	NA	NA	NA	2	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomylodactylus uniformis	3	1	1	2	2	2	5	1	1	2	1	1	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Eoparisocrinus siluricus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Eopatelliocrinus latibrachiatus	3	1	2	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eopatelliocrinus ornatus	3	1	2	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	2	5	1	0	1
Eopatelliocrinus scyphogracilis	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Eopinnacrinus pinnulatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	2	5	1	0	1
Eucalyptocrinities depressus	3	1	1	1	1	1	NA	1	2	1	0	0	2	2	2	3	5	1	1	0	1	1	1	0	2	5	1	0	1
Eucalyptocrinities proboscidialis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Eucalyptocrinities sp. cf. *E. ornates*	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Euptychocrinus fimbriatus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Euptychocrinus skopaios	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Euspirocrinus gagoni	3	1	2	1	1	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Euspirocrinus heliktos	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Euspirocrinus wolcottense	3	2	2	1	2	1	1	2	NA	1	0	0	2	3	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Eustenocrinidae Indeterminante	3	NA	2	1	2	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	4	3	NA	NA	NA	NA
Eustenocrinus springeri	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Fibrocrinus phragmos	3	NA	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	2

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Diabolocrinus perplexus	2	2	5	1	1	1	1	1	1	6	1	2	5	2	2	1	1	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Diabolocrinus poolevillensis	1	2	5	1	1	1	2	1	1	3	2	3	1	2	2	1	2	2	2	0	1	1	3	1	1	0	0	0	2
Diabolocrinus vesperalus	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Diaphorocrinus pleniramulus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	4	2	5	1
Difficilicrinus coneyi	2	1	0	0	0	0	1	1	1	1	2	2	2	1	1	1	1	1	2	5	1	NA	1	NA	NA	NA	NA	NA	NA
Dimerocrinites elegans	2	2	5	1	1	1	2	1	1	2	2	NA	NA	2	2	1	2	NA	2	10	1	1	NA	1	1	0	0	0	1
Dimerocrinites hopkintonensis	2	3	5	1	1	1	2	1	1	8	2	1	1	1	2	1	2	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinites sculptus	2	3	5	1	1	2	2	1	1	9	3	1	1	1	2	1	1	2	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinites sp.	2	3	5	1	1	2	2	1	1	8	2	1	5	1	2	1	2	2	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Dimerocrinities sculptus	2	2	5	1	1	1	2	1	1	8	2	2	5	2	2	1	1	2	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Doliocrinus monilicaulis	2	1	0	0	0	0	1	1	1	1	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Doliocrinus pustulatus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	2	1	1	0	0	0	1
Dynamocrinus robustus	2	1	0	0	0	0	1	1	1	3	2	1	5	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	2
Dystactocrinus constrictus	2	1	0	0	0	0	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	2	2	4	1
Ectenocrinus geniculatus	2	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Ectenocrinus simplex	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	10	1	1	1	1	2	2	2	2	1
Ectenocrinus sp.	2	1	0	0	0	0	2	1	1	8	2	1	1	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Eknomocrinus wahwahnsis	*2*	*1*	*0*	*0*	*0*	*0*	*2*	*1*	1	*3*	*2*	*3*	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*5*	*1*	*1*	*3*	*1*	*2*	*1*	*1*	*0*	*1*
Eomyelodactylus plumosus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	2	1	0	0	0	0	1	1	1	NA	2	NA	NA	1	1	1	1	1	2	10	1	1	NA	1	2	2	1	0	1
Eomyelodactylus rotundus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus springeri	NA	1	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA	NA	2	NA	1	1	NA	1	2	2	1	0	1
Eomylodactylus uniformis	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eoparisocrinus siluricus	2	3	5	1	1	2	NA	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Eopatelliocrinus latibrachiatus	2	1	0	0	0	0	1	1	1	3	2	2	5	1	2	1	1	1	2	10	1	1	3	1	1	0	0	0	1
Eopatelliocrinus ornatus	1	1	0	0	0	0	1	1	1	3	2	3	1	1	2	1	2	2	2	10	1	1	3	1	1	0	1	0	1
Eopatelliocrinus scyphogracilis	2	1	0	0	0	0	1	1	1	2	2	2	5	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Eopinnacrinus pinnulatus	2	3	5	1	1	1	3	1	1	3	1	1	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Eucalyptocrinities depressus	1	1	0	0	0	0	1	1	1	2	2	1	6	2	2	1	1	1	2	20	1	1	1	1	1	0	0	0	2
Eucalyptocrinities proboscidialis	2	1	0	0	0	0	1	1	1	2	3	1	6	2	2	1	1	1	2	NA	1	NA	2	NA	NA	NA	NA	NA	NA
Eucalyptocrinities sp. cf. *E. ornates*	2	1	0	0	0	0	1	1	1	8	2	1	6	2	2	1	1	1	2	NA	1	NA	2	NA	NA	NA	NA	NA	NA
Euptychocrinus fimbriatus	2	3	5	1	1	1	2	1	1	3	2	3	1	1	2	1	2	1	2	10	1	1	3	1	1	0	0	0	1
Euptychocrinus skopaios	2	3	5	1	1	1	1	1	1	3	2	3	2	1	2	1	2	1	2	10	1	1	3	1	1	0	0	0	1
Euspirocrinus gagoni	2	3	5	1	1	NA	4	1	1	3	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	3	2	2	1
Euspirocrinus heliktos	2	3	5	1	1	1	3	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	2	2	2	2	1
Euspirocrinus wolcottense	2	3	5	1	1	1	5	1	1	3	2	1	2	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Eustenocrinidae Indeterminante	2	1	0	0	0	0	1	1	1	1	2	2	7	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Eustenocrinus springeri	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Fibrocrinus phragmos	2	1	0	0	0	0	2	1	1	3	2	NA	NA	1	2	1	1	1	2	20	1	1	NA	1	1	0	0	0	2

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Diabolocrinus perplexus	NA	NA	NA	NA	2	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	2	2	1	1	1	2	1	2	1	1	1
Diabolocrinus poolevillensis	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	1	NA	1	1
Diabolocrinus vesperalus	1	1	2	1	1	1	2	4	2	2	2	1	1	1	1	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Diaphorocrinus pleniramulus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Difficilicrinus coneyi	NA	NA	NA	NA	1	1	1	0	1	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	1	NA	NA	1	1
Dimerocrinites elegans	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Dimerocrinites hopkintonensis	NA	NA	NA	1	NA	1	2	2	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinites sculptus	NA	NA	NA	1	NA	1	2	5	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinites sp.	NA	NA	NA	1	NA	1	2	NA	2	1	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	1	NA	1	1
Dimerocrinities sculptus	NA	NA	NA	NA	NA	1	2	5	2	2	1	0	1	0	0	0	NA	NA	1	1	0	0	0	0	2	2	2	NA	1
Doliocrinus monilicaulis	1	1	2	1	1	1	2	1	2	1	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	4	NA	1	1
Doliocrinus pustulatus	0	2	2	1	1	1	2	1	1	0	2	1	1	0	0	NA	1	1	2	1	1	1	1	1	1	0	NA	1	2
Dynamocrinus robustus	1	1	1	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Dystactocrinus constrictus	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	4	1	1
Ectenocrinus geniculatus	1	2	2	1	1	1	1	0	1	0	1	0	1	0	0	4	2	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Ectenocrinus simplex	1	1	3	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	1	1	1
Ectenocrinus sp.	NA	NA	NA	NA	NA	1	2	1	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	1	1	NA	0	1	1
Eknomocrinus wahwahnsis	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*3*	*2*	*2*	*1*	*0*	*1*	*0*	*0*	*NA*	*1*	*1*	*1*	*0*	*0*	*0*	*0*	*2*	*1*	*4*	*0*	*1*	*1*
Eomyelodactylus plumosus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eomyelodactylus rotundus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eomyelodactylus springeri	1	1	NA	1	1	1	NA	NA	NA	1	0	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eomylodactylus uniformis	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Eoparisocrinus siluricus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	NA	NA	1	1
Eopatelliocrinus latibrachiatus	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Eopatelliocrinus ornatus	1	2	1	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Eopatelliocrinus scyphogracilis	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Eopinnacrinus pinnulatus	1	2	2	1	1	1	1	0	1	1	2	1	1	0	0	4	1	1	2	1	NA	1	1	1	1	1	NA	1	1
Eucalyptocrinities depressus	1	1	2	1	1	1	2	8	2	2	2	1	1	0	0	1	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Eucalyptocrinities proboscidialis	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Eucalyptocrinities sp. cf. *E. ornates*	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Euptychocrinus fimbriatus	1	1	3	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	2	1	1	1	1	1	1	2	NA	1	2
Euptychocrinus skopaios	1	1	2	1	1	1	2	6	2	1	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Euspirocrinus gagoni	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Euspirocrinus heliktos	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	2	2	1	1	2	1	1	2	1	1	1
Euspirocrinus wolcottense	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	1	1	1	2	1	1	1	1	1	1	2	NA	1	1
Eustenocrinidae Indeterminante	NA	NA	NA	NA	1	1	2	1	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Eustenocrinus springeri	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	4	4	1	1
Fibrocrinus phragmos	1	2	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	NA	NA	1	1

Species	88	89	90	91	92
Diabolocrinus perplexus	*1*	1	1	1	1
Diabolocrinus poolevillensis	1	1	1	1	1
Diabolocrinus vesperalus	*1*	1	1	1	1
Diaphorocrinus pleniramulus	*1*	1	1	1	1
Difficilicrinus coneyi	*1*	1	1	0	1
Dimerocrinites elegans	1	1	1	NA	1
Dimerocrinites hopkintonensis	*1*	1	1	0	1
Dimerocrinites sculptus	*1*	1	1	0	1
Dimerocrinites sp.	*1*	1	1	0	1
Dimerocrinities sculptus	1	1	1	0	1
Doliocrinus monilicaulis	*1*	1	1	1	1
Doliocrinus pustulatus	1	1	1	1	1
Dynamocrinus robustus	*1*	1	1	NA	1
Dystactocrinus constrictus	*1*	1	1	0	1
Ectenocrinus geniculatus	*1*	1	1	NA	1
Ectenocrinus simplex	1	1	1	1	1
Ectenocrinus sp.	1	1	1	NA	1
Eknomocrinus wahwahnsis	*2*	1	1	*0*	1
Eomyelodactylus plumosus	NA	NA	NA	NA	NA
Eomyelodactylus richardsoni	1	1	1	NA	1
Eomyelodactylus rotundus	NA	NA	NA	NA	NA
Eomyelodactylus sp.	NA	NA	NA	NA	NA
Eomyelodactylus sparteus	NA	NA	NA	NA	NA
Eomyelodactylus springeri	1	1	1	NA	1
Eomylodactylus uniformis	NA	NA	NA	NA	NA
Eoparisocrinus siluricus	*1*	1	1	NA	1
Eopatelliocrinus latibrachiatus	*1*	1	1	NA	1
Eopatelliocrinus ornatus	1	1	1	NA	1
Eopatelliocrinus scyphogracilis	*1*	1	1	NA	1
Eopinnacrinus pinnulatus	1	1	1	1	1
Eucalyptocrinities depressus	1	1	1	NA	1
Eucalyptocrinities proboscidialis	1	1	1	NA	2
Eucalyptocrinities sp. cf. *E. ornates*	1	1	1	NA	2
Euptychocrinus fimbriatus	*1*	1	1	1	1
Euptychocrinus skopaios	1	1	1	NA	1
Euspirocrinus gagoni	1	1	1	NA	1
Euspirocrinus heliktos	*1*	1	1	1	1
Euspirocrinus wolcottense	*1*	1	1	1	1
Eustenocrinidae Indeterminante	1	1	1	NA	1
Eustenocrinus springeri	*1*	1	1	0	1
Fibrocrinus phragmos	1	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Forest ?	3	NA	NA	NA	2	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	NA	3	5	1	0	1
Forest 13 cladid	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Forest 18	3	1	1	1	2	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Forest 2	3	1	2	1	2	6	NA	1	NA	1	0	0	2	3	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 3	3	1	2	1	2	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 4 cleicrinid	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Forest 5 Cam	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 6	3	1	1	1	2	6	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Forest 7	3	1	1	1	2	6	NA	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	1	1	0	3	4	1	0	1
Forest 9 Disparid	3	1	2	1	1	1	NA	1	NA	1	0	0	2	3	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Fragucrinus bothros	3	1	2	1	2	1	5	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	2	1	0	3	5	1	0	1
Gaurocrinus fimbriatus	3	1	2	1	1	6	5	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Gaurocrinus nealli	3	1	2	1	1	6	6	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Geraocrinus sculptus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Geraocrinus sculptus (Benbolt)	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Glaucocorinus falconeri	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	NA	NA	3	5	NA	NA	NA
Glenocrinus globularis	3	1	1	1	2	5	5	1	1	1	0	0	NA	NA	1	3	5	1	2	3	1	1	1	0	3	3	2	3	1
Glyptocrinus circumcarinatus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus decadactylus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus fornshelli	*3*	*1*	*2*	*1*	*1*	*5*	*1*	*1*	*2*	*1*	*0*	*0*	*2*	*6*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Glyptocrinus ramulosus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Glyptocrinus tridactylus	3	NA	NA	NA	NA	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Grenprisa springeri	3	1	1	1	2	5	5	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Grenprisia billingsi	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Gustabilocrinus latomium	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Gustabilocrinus plektanikaulos	3	1	2	1	1	5	1	1	1	1	0	0	2	6	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Habrotecrinus ibexensis	3	1	1	1	2	6	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Haptocrinus calvatus	3	2	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	2	5	1	0	1
Homocrinus diminutus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Hormocrinus quebecensis	3	NA	1	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Hybocrinus bilateralis	3	2	2	1	2	1	NA	1	1	1	0	0	2	3	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus conicus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus crinerensis	3	NA	NA	1	1	1	6	NA	1	1	0	0	NA	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocrinus nitidus	2	0	0	0	0	0	0	0	0	1	0	0	2	2	2	3	5	1	1	0	1	2	1	1	3	5	1	0	1
Hybocrinus perperamnominatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocrinus punctatocritatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocrinus punctatus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Hybocystis eldonensis	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Hybocystis problematicus	3	1	1	1	1	1	NA	1	NA	1	0	0	1	0	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Iocrinus similis	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	NA	3	NA	NA	NA	NA

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Forest ?	2	1	0	0	0	0	1	1	1	9	2	2	1	1	1	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Forest 13 cladid	2	3	5	1	1	1	NA	1	1	2	2	3	5	1	1	1	2	2	2	5	1	2	3	1	2	2	1	0	1
Forest 15	1	1	0	0	0	0	1	1	1	2	2	2	6	1	NA	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Forest 18	2	1	0	0	0	0	1	1	1	3	1	2	6	1	1	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Forest 2	2	3	5	1	1	2	NA	1	1	2	3	3	NA	1	1	1	2	2	2	10	1	1	2	1	2	3	2	2	1
Forest 3	2	1	0	0	0	0	NA	1	1	2	2	3	NA	1	1	1	1	2	2	10	1	1	3	1	2	3	2	2	1
Forest 4 cleicrinid	2	1	0	0	0	0	1	1	1	2	2	2	5	1	1	1	1	1	2	20	1	1	1	1	2	2	2	5	1
Forest 5 Cam	2	NA	NA	NA	NA	NA	NA	1	1	3	1	1	NA	NA	2	1	1	2	2	10	1	1	2	1	2	2	NA	NA	1
Forest 6	1	1	0	0	0	0	1	1	1	3	2	2	NA	1	1	1	1	2	2	10	1	1	2	1	2	3	1	0	1
Forest 7	2	1	0	0	0	0	1	1	1	9	3	3	NA	1	2	1	2	2	2	20	1	1	3	1	2	3	2	2	1
Forest 9 Disparid	2	1	0	0	0	0	1	1	1	2	2	3	6	1	1	1	1	1	2	5	1	1	2	1	2	3	2	4	1
Fragucrinus bothros	NA	3	5	1	1	NA	2	1	1	2	1	NA	NA	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Gaurocrinus fimbriatus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	2	2	10	1	1	NA	1	2	2	NA	NA	1
Gaurocrinus nealli	2	2	5	1	1	1	1	1	1	3	2	3	5	1	2	1	2	1	2	10	1	1	3	1	2	2	1	0	1
Geraocrinus sculptus	1	1	0	0	0	0	1	1	1	1	2	2	2	1	1	1	1	1	2	4	1	1	3	1	2	1	1	0	1
Geraocrinus sculptus (Benbolt)	1	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	1	2	1	2	4	2	2	1
Glaucocorinus falconeri	NA	1	0	0	0	0	NA	1	1	3	1	3	6	1	1	1	1	1	2	10	1	1	2	1	2	2	2	3	1
Glenocrinus globularis	2	3	5	2	2	2	NA	1	1	2	2	1	1	1	2	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Glyptocrinus circumcarinatus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	2	2	2	10	1	2	3	1	2	1	1	0	1
Glyptocrinus decadactylus	1	1	0	0	0	0	2	1	1	2	3	3	6	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Glyptocrinus fornshelli	2	1	0	0	0	0	1	1	1	9	3	1	5	1	2	1	2	2	2	10	1	1	3	1	1	0	1	0	1
Glyptocrinus ramulosus	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	2	1	2	20	1	1	3	1	2	2	1	0	1
Glyptocrinus tridactylus	1	1	0	0	0	0	NA	1	1	8	2	3	5	1	2	1	2	2	2	15	1	1	2	1	2	2	2	5	1
Grenprisa springeri	2	3	5	1	1	2	2	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Grenprisia billingsi	2	3	5	1	1	2	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	2	NA	1
Gustabilocrinus latomium	2	3	5	1	1	2	2	1	1	2	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1
Gustabilocrinus plektanikaulos	2	3	5	1	1	2	2	1	1	3	2	1	5	2	2	1	1	1	2	20	1	1	3	1	1	0	0	0	1
Habrotecrinus ibexensis	2	1	0	0	0	0	NA	1	2	8	2	1	1	1	2	1	2	2	2	5	1	1	3	1	2	2	1	0	1
Haptocrinus calvatus	2	1	0	0	0	0	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	3	2	2	1
Homocrinus diminutus	2	1	0	0	0	0	1	1	1	1	3	2	1	1	1	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Hormocrinus quebecensis	2	3	NA	NA	NA	NA	2	1	1	2	1	1	5	1	NA	1	2	1	2	5	1	1	NA	1	2	2	1	0	1
Hybocrinus bilateralis	2	1	0	0	0	0	2	1	1	8	2	1	2	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus conicus	2	1	0	0	0	0	2	1	1	2	3	2	1	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus crinerensis	2	1	0	0	0	0	2	1	1	2	2	3	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus nitidus	2	1	0	0	0	0	2	1	1	4	2	1	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Hybocrinus perperamnominatus	2	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocrinus punctatocritatus	2	1	0	0	0	0	2	1	1	1	3	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocrinus punctatus	2	1	0	0	0	0	2	1	1	4	2	2	1	1	2	1	1	1	2	5	1	NA	3	1	NA	NA	NA	NA	NA
Hybocystis eldonensis	2	1	0	0	0	0	2	1	1	8	2	2	2	1	2	1	1	1	2	3	1	1	3	1	1	0	0	0	1
Hybocystis problematicus	2	1	0	0	0	0	2	1	1	8	2	2	2	1	2	1	1	1	2	3	1	1	3	1	1	0	0	0	1
Iocrinus similis	NA	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	3	1	2	3	1	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Forest ?	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	1	1
Forest 13 cladid	1	1	2	3	1	1	2	2	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	2	NA	1	1
Forest 15	1	1	2	1	1	1	2	2	2	2	1	0	1	0	0	3	1	NA	NA	NA	NA	NA	NA	NA	NA	3	NA	1	1
Forest 18	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	2	2	1	2	1	1	0	NA	1	1
Forest 2	1	1	2	1	1	1	2	7	2	1	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	4	NA	1	1
Forest 3	2	1	2	1	1	1	2	5	2	2	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2
Forest 4 cleicrinid	1	1	2	2	1	1	2	9	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	NA	NA	3	0	1	2
Forest 5 Cam	1	1	2	1	1	1	2	1	2	3	1	0	1	0	0	3	1	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Forest 6	1	1	2	1	1	1	2	3	2	2	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Forest 7	1	1	2	1	1	1	2	7	2	2	1	0	1	0	0	NA	1	1	0	0	0	0	0	2	3	4	NA	1	1
Forest 9 Disparid	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Fragucrinus bothros	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	NA	NA	1	2
Gaurocrinus fimbriatus	1	2	NA	1	1	1	2	NA	2	2	1	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	NA	NA	1	1
Gaurocrinus nealli	0	2	1	1	1	1	2	7	2	1	2	1	1	0	0	NA	1	1	2	1	NA	NA	NA	NA	NA	2	2	1	1
Geraocrinus sculptus	1	1	2	1	1	1	2	2	1	0	2	1	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	1
Geraocrinus sculptus (Benbolt)	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Glaucocorinus falconeri	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	4	1	NA	NA	NA	NA	NA	NA	NA	1	1	NA	1	1
Glenocrinus globularis	1	1	1	1	1	1	2	3	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	2	1	3	0	1	1
Glyptocrinus circumcarinatus	1	1	2	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	NA	1	1	1	1
Glyptocrinus decadactylus	1	2	2	1	1	1	2	6	2	1	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	1	1	1
Glyptocrinus fornshelli	*1*	*1*	*2*	*1*	*1*	*1*	*2*	*5*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*4*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*1*	*2*	*1*	*1*	*1*
Glyptocrinus ramulosus	1	2	2	1	1	1	2	8	2	2	2	1	1	0	0	0	1	1	1	0	0	0	0	2	1	2	NA	1	1
Glyptocrinus tridactylus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Grenprisa springeri	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	3	1	1	1
Grenprisia billingsi	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	3	NA	1	1
Gustabilocrinus latomium	1	2	2	1	1	1	1	7	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Gustabilocrinus plektanikaulos	1	2	2	1	1	1	1	7	2	2	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Habrotecrinus ibexensis	1	1	1	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	3	0	1	1
Haptocrinus calvatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	1	1	1	3	NA	1	1
Homocrinus diminutus	1	1	4	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	0	NA	1	1
Hormocrinus quebecensis	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Hybocrinus bilateralis	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	1	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus conicus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus crinerensis	1	1	NA	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	0	1	2
Hybocrinus nitidus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocrinus perperamnominatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocrinus punctatocritatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocrinus punctatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	2
Hybocystis eldonensis	1	1	1	1	1	1	1	0	1	0	1	0	2	3	2	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Hybocystis problematicus	1	1	2	1	1	1	1	0	1	0	1	0	2	5	2	1	1	1	1	0	0	0	0	1	1	0	0	1	1
Iocrinus similis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	2	1	3	NA	1	1

Species	88	89	90	91	92
Forest ?	1	1	1	NA	1
Forest 13 cladid	1	1	1	1	1
Forest 15	1	1	1	NA	1
Forest 18	1	1	1	1	1
Forest 2	1	1	1	NA	1
Forest 3	1	1	1	NA	1
Forest 4 cleicrinid	1	1	1	1	1
Forest 5 Cam	1	1	1	NA	1
Forest 6	1	1	1	NA	1
Forest 7	1	1	1	0	1
Forest 9 Disparid	1	1	1	NA	1
Fragucrinus bothros	1	1	1	1	1
Gaurocrinus fimbriatus	1	1	1	0	1
Gaurocrinus nealli	1	1	1	1	1
Geraocrinus sculptus	1	1	1	1	1
Geraocrinus sculptus (Benbolt)	*1*	1	1	1	1
Glaucocorinus falconeri	*1*	1	1	NA	1
Glenocrinus globularis	2	1	1	0	1
Glyptocrinus circumcarinatus	*1*	NA	1	NA	1
Glyptocrinus decadactylus	1	1	1	0	1
Glyptocrinus fornshelli	*1*	1	*1*	*1*	1
Glyptocrinus ramulosus	1	1	1	0	1
Glyptocrinus tridactylus	1	1	1	NA	1
Grenprisa springeri	1	1	1	1	1
Grenprisia billingsi	1	1	1	1	1
Gustabilocrinus latomium	*1*	1	1	NA	1
Gustabilocrinus plektanikaulos	*1*	1	1	NA	1
Habrotecrinus ibexensis	*2*	1	1	0	1
Haptocrinus calvatus	*1*	1	1	1	1
Homocrinus diminutus	*1*	1	1	NA	1
Hormocrinus quebecensis	1	1	1	NA	1
Hybocrinus bilateralis	*1*	1	1	0	1
Hybocrinus conicus	*1*	1	1	0	1
Hybocrinus crinerensis	*1*	1	1	0	1
Hybocrinus nitidus	*1*	1	1	0	1
Hybocrinus perperamnominatus	1	1	1	0	1
Hybocrinus punctatocritatus	1	1	1	0	1
Hybocrinus punctatus	1	1	1	0	1
Hybocystis eldonensis	*1*	1	1	0	1
Hybocystis problematicus	*1*	1	1	0	1
Iocrinus similis	1	1	1	1	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Iocrinus subcrassus	3	1	2	1	1	6	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Iocrinus tretonensis	3	1	2	1	1	6	1	1	NA	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Isotomocrinus minutus	3	2	2	1	2	1	5	1	NA	1	0	0	2	2	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Isotomocrinus n. sp.	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	2	2	5	1	0	1
Isotomocrinus tenuis	3	1	2	1	1	5	1	1	2	1	0	0	2	2	2	3	5	1	1	0	1	0	1	0	3	5	1	0	1
Jovacrinus jugum	3	NA	2	1	1	1	6	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Jovacrinus spinosus	3	NA	2	1	1	1	6	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Kanabinocrinus thyaros	3	1	1	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Krinocrinus inflatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Kryphosocrinus tetreaulti	3	2	2	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Kylixocrinus latus	3	1	2	1	1	1	6	1	2	2	2	2	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Kyreocrinus constellatus	3	1	1	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Ladacrinus asynaptos	3	NA	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ladacrinus sp?	3	1	1	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	NA	1	1	0	3	5	1	0	1
Laurucrinus sandtopensis	3	1	2	1	1	5	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Levicyathocrinites sablensis	3	NA	2	1	1	1	NA	1	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	2	1	1	0	3	5	1	0	1
Luxocrinus simplex	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Macrostylocrinus B D	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus C	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus compressus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus E F	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus jordanensis	3	NA	2	1	1	1	NA	1	NA	2	NA	1	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Macrostylocrinus pristinus	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Macrostylocrinus vermiculates	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Macrostylocrinus wyomingensis	3	1	1	1	1	1	NA	1	NA	2	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	2
Manticrinus exaitos	3	1	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Marsupiocrinus primaevus	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Merocrinus britonensis	3	1	1	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Merocrinus corroboratus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Merocrinus curtus	3	1	1	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Merocrinus impressus	3	1	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Merocrinus typus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Myeldactylus sp.	3	1	1	2	1	2	3	1	3	NA	NA	NA	NA	NA	2	3	5	NA	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Myelodactylus linae	3	2	1	2	2	2	2	1	NA	2	2	1	2	2	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Myosocrinus chicottensis	3	NA	NA	NA	NA	1	1	1	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	2	1	1
Nexocrinus delicatulus	3	1	2	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	2	2	1	1	1	0	3	5	1	0	2
Ohiocrinus sp.	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Ohiocrinus brauni	3	2	2	1	1	5	1	1	2	1	0	0	2	3	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Ohiocrinus exilis	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	NA	NA	3	5	NA	NA	NA
Ohiocrinus laxus	3	2	2	1	1	5	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	2	3	3	5	1	0	0
Ohiocrinus levorsoni	3	1	2	1	2	1	6	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Iocrinus subcrassus	1	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Iocrinus tretonensis	1	1	0	0	0	0	1	1	1	2	2	2	4	1	2	1	1	2	2	10	1	1	2	1	2	1	1	0	1
Isotomocrinus minutus	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Isotomocrinus n. sp.	2	1	0	0	0	0	2	1	1	2	2	2	5	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Isotomocrinus tenuis	2	1	0	0	0	0	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Jovacrinus jugum	2	1	0	0	0	0	1	1	1	2	2	NA	NA	1	1	1	2	2	2	10	1	1	NA	1	1	0	0	0	1
Jovacrinus spinosus	2	1	0	0	0	0	1	1	1	2	2	NA	NA	1	1	3	2	1	2	10	1	1	NA	1	1	0	0	0	2
Kanabinocrinus thyaros	2	3	5	1	1	2	1	1	1	2	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Krinocrinus inflatus	1	1	0	0	0	0	1	1	1	8	3	1	5	1	2	1	1	NA	2	10	1	NA	2	1	NA	NA	NA	NA	NA
Kryphosocrinus tetreaulti	2	3	3	1	2	1	3	2	1	8	2	1	1	1	2	1	1	1	2	10	1	1	1	1	2	2	1	0	1
Kylixocrinus latus	1	1	0	0	0	0	1	1	1	3	2	2	1	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	1
Kyreocrinus constellatus	2	2	5	1	1	1	2	1	1	3	2	1	1	2	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ladacrinus asynaptos	2	3	3	1	1	1	3	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Ladacrinus sp?	2	2	NA	NA	NA	NA	NA	1	1	3	1	1	NA	1	NA	NA	NA	NA	2	5	1	1	NA	1	2	2	1	0	1
Laurucrinus sandtopensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	2	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Levicyathocrinites sablensis	2	3	5	1	1	1	NA	1	1	2	2	NA	NA	1	1	1	1	1	2	5	1	NA	NA	1	NA	NA	NA	NA	1
Luxocrinus simplex	2	2	5	1	1	1	1	1	1	3	1	1	6	2	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Macrostylocrinus B D	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus C	1	1	0	0	0	0	1	1	1	3	2	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus compressus	1	1	0	0	0	0	1	1	1	8	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus E F	1	1	0	0	0	0	1	1	1	9	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus jordanensis	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	1
Macrostylocrinus pristinus	2	1	0	0	0	0	1	1	1	3	2	3	6	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	1
Macrostylocrinus vermiculates	1	1	0	0	0	0	1	1	1	9	3	3	5	1	2	1	1	1	2	10	1	NA	2	NA	NA	NA	NA	NA	NA
Macrostylocrinus wyomingensis	2	1	0	0	0	0	1	1	1	2	2	2	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Manticrinus exaitos	2	1	0	0	0	0	1	1	1	3	2	1	5	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Marsupiocrinus primaevus	1	1	0	0	0	0	1	1	1	3	1	2	6	1	2	1	1	2	2	10	2	NA	2	1	NA	NA	NA	NA	NA
Merocrinus britonensis	2	3	4	1	0	2	1	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	NA	NA	NA	NA	1
Merocrinus corroboratus	2	3	5	1	1	2	1	1	1	1	1	1	6	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Merocrinus curtus	2	3	5	1	1	2	1	1	1	2	1	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	2	1	1
Merocrinus impressus	2	3	5	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Merocrinus typus	2	3	5	1	1	2	1	1	1	1	1	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Myeldactylus sp.	NA	1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Myelodactylus linae	2	1	0	0	0	0	1	1	1	2	2	2	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Myosocrinus chicottensis	2	3	5	1	1	2	3	1	1	3	2	1	1	1	2	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Nexocrinus delicatulus	2	2	5	1	1	1	2	1	1	3	2	1	5	2	2	1	2	1	2	20	1	1	3	1	2	1	1	0	1
Ohiocrinus sp.	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Ohiocrinus brauni	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Ohiocrinus exilis	NA	1	0	0	0	0	NA	1	1	NA	2	2	NA	1	1	1	1	1	2	10	1	1	1	1	1	0	0	0	1
Ohiocrinus laxus	2	1	0	0	0	0	1	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	3	1	0	0
Ohiocrinus levorsoni	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Iocrinus subcrassus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	1	1	3	3	1	1
Iocrinus tretonensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	2	NA	1	1
Isotomocrinus minutus	1	1	3	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Isotomocrinus n. sp.	1	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Isotomocrinus tenuis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	3	3	1	1
Jovacrinus jugum	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Jovacrinus spinosus	1	1	NA	1	1	1	2	NA	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Kanabinocrinus thyaros	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	NA	Na	1	1
Krinocrinus inflatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	2	2	NA	1	1
Kryphosocrinus tetreaulti	1	1	1	1	1	1	2	2	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Kylixocrinus latus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	4	1	1	2	1	NA	1	NA	NA	NA	1	NA	1	1
Kyreocrinus constellatus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Ladacrinus asynaptos	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Ladacrinus sp?	1	1	1	1	1	1	2	NA	2	2	1	0	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Laurucrinus sandtopensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Levicyathocrinites sablensis	1	1	1	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Luxocrinus simplex	NA	NA	NA	NA	NA	1	2	1	2	3	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Macrostylocrinus B D	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	2	2	NA	1	1
Macrostylocrinus C	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus compressus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus E F	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Macrostylocrinus jordanensis	1	2	2	1	1	1	2	2	2	2	2	1	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Macrostylocrinus pristinus	1	1	1	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	1	1	2	NA	1	1
Macrostylocrinus vermiculates	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	2
Macrostylocrinus wyomingensis	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Manticrinus exaitos	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	2	1	1	1	1
Marsupiocrinus primaevus	NA	NA	NA	NA	NA	NA	2	1	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	NA	NA	1	1
Merocrinus britonensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Merocrinus corroboratus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Merocrinus curtus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	1	1	1
Merocrinus impressus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	1	1	1
Merocrinus typus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Myeldactylus sp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Myelodactylus linae	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	NA	NA	1	1
Myosocrinus chicottensis	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Nexocrinus delicatulus	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Ohiocrinus sp.	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1
Ohiocrinus brauni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1
Ohiocrinus exilis	1	2	2	1	1	1	2	3	1	0	2	1	1	0	0	4	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Ohiocrinus laxus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	1	2	1	1	3	4	1	1
Ohiocrinus levorsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	NA	2	1	2	1	1	3	0	1	1

Species	88	89	90	91	92
Iocrinus subcrassus	1	1	1	1	1
Iocrinus tretonensis	*1*	1	1	1	1
Isotomocrinus minutus	1	1	1	1	1
Isotomocrinus n. sp.	1	1	1	NA	1
Isotomocrinus tenuis	*1*	1	1	1	1
Jovacrinus jugum	1	1	1	NA	1
Jovacrinus spinosus	1	1	1	NA	1
Kanabinocrinus thyaros	*1*	1	1	NA	1
Krinocrinus inflatus	*1*	1	1	0	1
Kryphosocrinus tetreaulti	*1*	1	1	0	1
Kylixocrinus latus	*1*	1	1	1	1
Kyreocrinus constellatus	1	1	1	NA	1
Ladacrinus asynaptos	1	1	1	NA	1
Ladacrinus sp?	1	1	1	NA	1
Laurucrinus sandtopensis	1	1	1	NA	1
Levicyathocrinites sablensis	1	1	1	NA	1
Luxocrinus simplex	*1*	1	1	NA	1
Macrostylocrinus B D	*1*	1	1	0	1
Macrostylocrinus C	*1*	1	1	0	1
Macrostylocrinus compressus	*1*	1	1	0	1
Macrostylocrinus E F	*1*	1	1	0	1
Macrostylocrinus jordanensis	*1*	1	1	NA	1
Macrostylocrinus pristinus	*1*	1	1	0	1
Macrostylocrinus vermiculates	*1*	1	1	0	1
Macrostylocrinus wyomingensis	1	1	1	0	1
Manticrinus exaitos	1	1	1	0	1
Marsupiocrinus primaevus	*1*	1	1	0	1
Merocrinus britonensis	1	1	1	1	1
Merocrinus corroboratus	1	1	1	1	1
Merocrinus curtus	1	1	1	1	1
Merocrinus impressus	1	1	1	NA	1
Merocrinus typus	1	1	1	1	1
Myeldactylus sp.	NA	NA	NA	NA	NA
Myelodactylus linae	*1*	1	1	0	1
Myosocrinus chicottensis	1	1	1	NA	1
Nexocrinus delicatulus	*1*	1	1	NA	1
Ohiocrinus sp.	1	1	1	2	1
Ohiocrinus brauni	1	1	1	2	1
Ohiocrinus exilis	1	1	1	2	1
Ohiocrinus laxus	1	1	1	2	1
Ohiocrinus levorsoni	1	1	1	2	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Ottawacrinus typus	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Paiderocrinus asketos	3	NA	2	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Paiderocrinus ochthos	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Palaeocrinus angulatus	3	1	2	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Palaeocrinus avondalensis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Palaeocrinus hudsoni	3	1	2	1	2	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	2	1	1
Palaeocrinus planobasalis	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Palaeocrinus pulchellus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Palaeocrinus rhombiferus	3	1	1	1	1	NA	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Palaeocrinus sp.	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Palaeocrinus sp. cf. *P. planobasalis*	3	NA	NA	1	1	1	1	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	2
Parachaeocrinus decoratus	3	1	2	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	2
Paracremacrinus laticardinalis	3	1	1	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	2	1	0	1	2	2	1	3	4	1	0	2
Paradiabolocrinus irregularis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Paradiabolocrinus sinuorugosus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Paradiabolocrinus stellatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Parapisocrinus quinquelobus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	2	1	1	0	3	5	1	0	1
Pararchaeocrinus convexus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Pariocrinus heterodactylus	3	2	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Patelliocrinus planus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	3	1	0	1
Peltacrinus sculptatus	3	1	2	1	2	7	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	2	5	1	0	1
Penicillicrinus parvus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	3	3	5	1	0	2
Peniculocrinus miller	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	NA	NA	2	5	1	0	1
Periechocrinid incertae sedis	3	NA	NA	NA	NA	NA	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	5	1	0	1
Periechocrinus B	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	3	1	0	1
Periglyptocrinus billingsi	*3*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*1*	*0*	*0*	*NA*	*NA*	*2*	*3*	*5*	*1*	*1*	*0*	*1*	*1*	*1*	*0*	*3*	*5*	*1*	*0*	*1*
Periglyptocrinus spinuliferus	3	NA	NA	NA	NA	1	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	2	5	1	0	1
Phrygilocrinus batheri	3	NA	NA	NA	NA	1	1	NA	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Plicodendrocrinus casei	3	1	2	1	1	6	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	2	1	3	5	1	0	1
Plicodendrocrinus epinettensis	3	2	2	1	1	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Plicodendrocrinus observationensis	3	2	2	1	1	6	5	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Plicodendrocrinus proboscidiatus	3	2	1	1	1	6	1	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Pogonipocrinus antiquus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Porocrinus bromidensis	3	2	1	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus conicus	3	1	2	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus fayettensis	3	2	1	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus kentuckiensis	3	1	1	1	1	1	1	1	1	1	0	0	1	0	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Porocrinus lebanonensis	3	2	1	1	1	1	5	1	1	1	0	0	1	0	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Porocrinus pentagonius	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus petersenae	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	2	1	1
Porocrinus shawi	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Ottawacrinus typus	2	3	5	1	1	1	1	1	1	1	2	2	5	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Paiderocrinus asketos	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	1	0	0	0	2
Paiderocrinus ochthos	2	1	0	0	0	0	1	1	1	3	1	1	6	1	2	1	1	1	2	10	1	1	2	1	NA	NA	NA	NA	NA
Palaeocrinus angulatus	2	3	5	1	1	1	3	1	1	3	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	2	1	1	1
Palaeocrinus avondalensis	2	3	5	1	1	2	3	1	1	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA
Palaeocrinus hudsoni	2	3	5	1	1	2	3	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Palaeocrinus planobasalis	2	3	5	1	1	2	3	1	1	3	2	2	1	1	2	1	1	2	2	5	1	1	3	1	2	NA	NA	NA	NA
Palaeocrinus pulchellus	2	3	5	1	1	1	NA	1	1	2	2	3	NA	1	2	1	1	2	2	5	1	1	3	1	2	3	1	0	1
Palaeocrinus rhombiferus	2	3	5	1	1	2	NA	1	1	3	2	2	NA	1	2	1	1	1	2	5	1	1	3	1	2	3	1	0	1
Palaeocrinus sp.	2	3	5	1	1	1	1	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	2	2	2	4	1
Palaeocrinus sp. cf. *P. planobasalis*	2	3	5	1	1	1	3	1	1	3	1	1	1	1	2	1	1	2	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA
Parachaeocrinus decoratus	1	2	5	1	1	1	3	1	1	3	1	1	1	1	2	1	2	2	2	10	1	1	3	NA	NA	NA	NA	NA	NA
Paracremacrinus laticardinalis	1	1	0	0	0	0	1	1	1	0	2	2	1	1	2	1	1	1	2	4	1	3	1	1	2	2	2	5	1
Paradiabolocrinus irregularis	2	2	5	1	1	1	NA	1	1	3	1	1	1	2	2	1	2	2	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Paradiabolocrinus sinuorugosus	2	2	5	1	1	1	NA	1	1	3	1	1	1	2	2	1	1	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Paradiabolocrinus stellatus	2	2	5	1	1	1	1	1	1	3	1	1	1	2	2	1	2	1	2	10	1	1	3	1	NA	NA	NA	NA	NA
Parapisocrinus quinquelobus	2	1	0	0	0	0	1	1	1	3	2	3	6	2	2	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Pararchaeocrinus convexus	2	2	5	1	1	1	NA	1	1	3	2	1	1	2	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Pariocrinus heterodactylus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Patelliocrinus planus	2	1	0	0	0	0	NA	1	1	2	2	1	NA	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	2
Peltacrinus sculptatus	2	1	0	0	0	0	0	1	1	3	2	1	2	1	1	1	1	2	2	5	1	1	1	1	2	2	2	2	1
Penicillicrinus parvus	2	1	0	0	0	0	2	1	1	2	2	2	1	1	1	1	1	1	2	10	1	1	1	1	2	2	1	0	1
Peniculocrinus miller	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Periechocrinid incertae sedis	1	1	0	0	0	0	2	1	1	3	1	1	NA	1	1	1	1	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Periechocrinus B	1	1	0	0	0	0	2	1	1	8	3	1	5	1	2	1	2	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Periglyptocrinus billingsi	*2*	*1*	*0*	*0*	*0*	*0*	*1*	*1*	1	*8*	*2*	*3*	*5*	*1*	*2*	*1*	*2*	*2*	*2*	*20*	*1*	*1*	*2*	*1*	*1*	*0*	*0*	*0*	*1*
Periglyptocrinus spinuliferus	2	1	0	0	0	0	1	1	1	2	2	3	1	1	2	1	2	2	2	10	1	1	2	1	1	0	0	0	2
Phrygilocrinus batheri	2	1	0	0	0	0	1	1	1	2	2	2	5	1	2	1	1	1	2	20	1	1	NA	NA	NA	NA	NA	NA	NA
Plicodendrocrinus casei	2	3	5	1	1	1	2	1	1	2	2	2	1	1	1	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Plicodendrocrinus epinettensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1
Plicodendrocrinus observationensis	NA	3	5	1	1	NA	4	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	2	4	1
Plicodendrocrinus proboscidiatus	2	3	5	1	1	1	NA	1	1	2	2	2	5	1	1	1	1	1	2	5	1	1	3	1	2	2	1	0	1
Pogonipocrinus antiquus	2	1	0	0	0	0	NA	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Porocrinus bromidensis	2	3	5	1	1	2	3	1	1	4	2	1	1	0	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus conicus	2	3	5	1	1	1	1	1	1	4	2	1	5	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus fayettensis	2	3	5	1	1	1	2	1	1	4	2	1	1	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus kentuckiensis	2	3	5	1	1	1	1	1	1	4	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus lebanonensis	2	3	5	1	1	1	2	1	1	3	2	1	5	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus pentagonius	2	3	5	1	1	1	3	1	1	4	2	2	5	1	1	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Porocrinus petersenae	2	3	5	1	1	1	3	1	1	1	3	2	1	1	1	1	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Porocrinus shawi	2	3	5	1	1	1	3	1	1	4	2	2	1	1	1	1	1	2	2	5	1	NA	3	NA	NA	NA	NA	NA	NA

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Ottawacrinus typus	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	1	1	3	0	1	1
Paiderocrinus asketos	1	1	2	1	1	1	2	4	2	1	2	1	1	0	0	NA	1	1	1	1	1	NA	NA	NA	NA	1	NA	1	1
Paiderocrinus ochthos	NA	NA	NA	NA	NA	1	2	4	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	NA	NA	NA	NA	1	NA	1	1
Palaeocrinus angulatus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Palaeocrinus avondalensis	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	2	NA	1	1
Palaeocrinus hudsoni	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	2	1	0	0	0	0	2	2	3	NA	1	1
Palaeocrinus planobasalis	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	1	1	1	0	0	0	0	1	1	1	NA	1	1
Palaeocrinus pulchellus	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Palaeocrinus rhombiferus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	NA	2	1	1	NA	NA	2	NA	1	1
Palaeocrinus sp.	1	1	2	1	1	1	1	0	1	0	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	1	1	1	NA	1	1
Palaeocrinus sp. cf. *P. planobasalis*	NA	NA	NA	NA	NA	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	1	1	0	NA	1	1
Parachaeocrinus decoratus	NA	NA	NA	1	1	1	2	6	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	1	2	0	1	1
Paracremacrinus laticardinalis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	2	1	2	1	NA	1	1	1	1	2	NA	1	1
Paradiabolocrinus irregularis	1	NA	NA	NA	1	1	2	7	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	2
Paradiabolocrinus sinuorugosus	1	NA	NA	NA	1	1	2	7	2	1	NA	NA	1	0	0	NA	1	1	1	1	1	1	1	2	1	NA	NA	1	1
Paradiabolocrinus stellatus	NA	NA	NA	NA	NA	1	2	3	2	1	NA	NA	1	0	0	NA	NA	1	2	2	1	1	2	2	1	2	NA	1	*2*
Parapisocrinus quinquelobus	1	1	4	1	1	1	1	0	1	0	1	1	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Pararchaeocrinus convexus	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Pariocrinus heterodactylus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Patelliocrinus planus	1	0	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Peltacrinus sculptatus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	3	0	1	1
Penicillicrinus parvus	1	1	3	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Peniculocrinus miller	1	1	2	1	1	1	2	2	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	4	NA	1	1
Periechocrinid incertae sedis	NA	NA	NA	NA	NA	1	2	NA	2	NA	NA	NA	1	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Periechocrinus B	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	NA	2	NA	1	1
Periglyptocrinus billingsi	*1*	*1*	*1*	*1*	*1*	*1*	*2*	*5*	*2*	*2*	*2*	*1*	*1*	*0*	*0*	*2*	*1*	*1*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*2*	*NA*	*1*	*1*
Periglyptocrinus spinuliferus	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	2	1	2	NA	1	2
Phrygilocrinus batheri	NA	NA	NA	NA	NA	1	2	5	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	0	1	1
Plicodendrocrinus casei	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	3	1	1
Plicodendrocrinus epinettensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	NA	NA	NA	NA	1	1
Plicodendrocrinus observationensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	NA	NA	NA	NA	1	1
Plicodendrocrinus proboscidiatus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	3	NA	1	1
Pogonipocrinus antiquus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	2	1	1	2	NA	1	1
Porocrinus bromidensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	2	1	0	0	0	0	1	2	0	2	1	1
Porocrinus conicus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus fayettensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	1	1	1
Porocrinus kentuckiensis	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus lebanonensis	0	0	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	1	1	1
Porocrinus pentagonius	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	1	0	0	0	0	1	1	0	NA	1	1
Porocrinus petersenae	NA	NA	NA	NA	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Porocrinus shawi	NA	NA	NA	NA	NA	NA	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1

Species	88	89	90	91	92
Ottawacrinus typus	*1*	1	1	1	1
Paiderocrinus asketos	1	1	1	NA	1
Paiderocrinus ochthos	1	1	1	NA	1
Palaeocrinus angulatus	1	1	1	NA	1
Palaeocrinus avondalensis	*1*	1	1	0	1
Palaeocrinus hudsoni	1	1	1	0	1
Palaeocrinus planobasalis	*1*	1	1	0	1
Palaeocrinus pulchellus	1	1	1	NA	1
Palaeocrinus rhombiferus	1	1	1	1	1
Palaeocrinus sp.	1	1	1	NA	1
Palaeocrinus sp. cf. *P. planobasalis*	*1*	1	1	NA	1
Parachaeocrinus decoratus	*1*	1	1	NA	1
Paracremacrinus laticardinalis	1	1	1	1	1
Paradiabolocrinus irregularis	1	1	1	1	1
Paradiabolocrinus sinuorugosus	1	1	1	1	1
Paradiabolocrinus stellatus	1	1	1	1	1
Parapisocrinus quinquelobus	1	1	1	1	1
Pararchaeocrinus convexus	2	1	1	NA	1
Pariocrinus heterodactylus	*1*	1	1	1	1
Patelliocrinus planus	1	1	1	NA	1
Peltacrinus sculptatus	1	1	1	1	1
Penicillicrinus parvus	1	1	1	NA	1
Peniculocrinus miller	1	1	1	NA	1
Periechocrinid incertae sedis	1	1	1	NA	1
Periechocrinus B	*1*	1	1	0	1
Periglyptocrinus billingsi	*1*	1	1	NA	1
Periglyptocrinus spinuliferus	1	1	1	0	1
Phrygilocrinus batheri	*1*	1	1	NA	1
Plicodendrocrinus casei	1	1	1	1	1
Plicodendrocrinus epinettensis	1	1	1	1	1
Plicodendrocrinus observationensis	1	1	1	1	1
Plicodendrocrinus proboscidiatus	*1*	1	1	1	1
Pogonipocrinus antiquus	*1*	1	1	1	1
Porocrinus bromidensis	1	1	2	0	1
Porocrinus conicus	*1*	1	1	0	1
Porocrinus fayettensis	1	1	2	0	1
Porocrinus kentuckiensis	*1*	1	1	0	1
Porocrinus lebanonensis	*1*	1	1	0	1
Porocrinus pentagonius	1	1	1	0	1
Porocrinus petersenae	*1*	1	2	0	1
Porocrinus shawi	1	1	1	0	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Porocrinus sp. cf. *P.smithi*	3	2	2	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Praecupulocrinus conjugans	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	2	1	1	1	0	3	5	1	0	1
Pregazacrinus hemisphericus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Protaxocrinus cataractensis	3	2	1	1	1	1	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Protaxocrinus elegans	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Protaxocrinus girardeau	3	1	1	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Protaxocrinus girvanensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	NA	NA	NA	NA	3	5	NA	NA	NA
Protaxocrinus laevis	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	2
Protaxocrinus nodocaudis	3	2	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	2
Protaxocrinus paraios	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Protaxocrinus sideros	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	2	1	1	0	3	5	1	0	1
Ptychocrinus insperatus	3	1	2	1	1	1	6	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	1	0	1
Ptychocrinus parvus	3	1	2	1	1	1	1	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Ptychocrinus pentagonus	3	NA	NA	NA	NA	1	6	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Ptychocrinus splendens	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Pychnocrinus dyeri	3	1	2	1	1	1	5	1	2	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus multibrachialis	3	NA	NA	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus sardesoni	3	NA	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Pycnocrinus shafferi	3	2	2	1	1	1	NA	1	NA	1	0	0	2	6	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Quinquecaudex cincinnatiensis	3	1	1	1	1	6	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Quinquecaudex glabellus	3	1	2	1	2	6	6	1	2	1	0	0	2	2	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Quinquecaudex species A	3	2	1	1	2	6	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Quinquecaudex springeri	3	2	1	1	1	5	1	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Reteocrinus alveolatus	3	1	1	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus depressus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus fenestratus	3	2	1	1	1	1	NA	1	1	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	1	1
Reteocrinus magnificus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus mahlburgi	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus polki	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus rocktonnsis	3	2	2	1	1	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus spinosus	3	1	2	1	1	5	NA	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Reteocrinus stellaris	3	1	2	1	1	1	6	1	1	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reteocrinus variabilicaulis	3	1	2	1	1	1	1	1	2	1	0	0	2	3	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Reterocrinus sp.	3	2	1	1	1	1	5	1	2	1	0	0	2	1	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Rhachicrinus wrighti	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus buckleyi	3	1	2	1	1	1	NA	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus sculptus	3	1	1	1	1	5	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Rhaphanocrinus simplex	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Rhaphanocrinus subnodosus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Ristnacrinus altobasalis	3	1	2	1	1	1	1	1	2	1	0	0	1	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Salinocrinus conus	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Porocrinus sp. cf. *P.smithi*	2	3	5	1	1	2	NA	1	1	8	2	1	1	1	2	1	1	2	2	5	1	1	3	1	1	0	0	0	1
Praecupulocrinus conjugans	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Pregazacrinus hemisphericus	2	2	5	1	1	1	2	1	1	3	2	3	1	5	2	1	1	1	2	10	1	NA	NA	NA	NA	NA	NA	NA	NA
Protaxocrinus cataractensis	2	3	3	1	2	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Protaxocrinus elegans	2	3	5	1	0	1	NA	1	1	2	2	NA	NA	1	2	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Protaxocrinus girardeau	2	3	5	1	1	1	2	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Protaxocrinus girvanensis	3	5	NA	NA	NA	NA	NA	1	1	NA	NA	NA	NA	1	NA	1	2	1	2	5	1	NA	2	1	2	3	1	0	1
Protaxocrinus laevis	2	3	5	1	1	1	2	1	1	2	2	1	1	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Protaxocrinus nodocaudis	2	3	3	1	2	2	3	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Protaxocrinus paraios	2	3	3	1	2	1	3	1	1	2	2	NA	1	1	NA	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Protaxocrinus sideros	2	3	3	1	2	1	3	1	1	2	2	NA	1	1	1	1	1	1	2	5	1	1	NA	1	2	2	1	0	1
Ptychocrinus insperatus	2	3	5	1	1	1	NA	1	1	2	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	NA	NA	NA	NA	1
Ptychocrinus parvus	2	2	5	1	1	1	1	1	1	8	3	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Ptychocrinus pentagonus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	2	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Ptychocrinus splendens	2	3	5	1	1	1	2	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	3	1	2	1	1	0	1
Pychnocrinus dyeri	2	1	0	0	0	0	1	1	1	8	2	3	5	1	2	1	2	2	2	10	1	1	2	1	2	1	1	0	1
Pycnocrinus multibrachialis	1	1	0	0	0	0	NA	1	1	2	3	3	6	1	2	2	2	2	2	10	1	1	3	1	2	2	1	0	1
Pycnocrinus sardesoni	1	1	0	0	0	0	1	1	1	8	2	3	2	1	2	2	2	2	2	20	1	1	3	1	1	0	0	0	1
Pycnocrinus shafferi	2	1	0	0	0	0	1	1	1	1	2	2	6	1	1	1	1	2	2	10	1	1	2	1	2	1	1	0	1
Quinquecaudex cincinnatiensis	2	3	5	1	1	1	2	1	1	2	2	1	5	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Quinquecaudex glabellus	2	3	5	1	1	2	3	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Quinquecaudex species A	2	3	5	1	1	2	0	1	1	1	2	2	6	1	1	1	1	1	2	5	1	1	1	1	2	1	1	0	1
Quinquecaudex springeri	2	3	5	1	2	2	2	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	1	1	0	1
Reteocrinus alveolatus	2	3	5	1	1	1	1	1	1	3	2	3	5	1	1	1	1	1	2	5	1	1	2	1	2	3	1	0	1
Reteocrinus depressus	2	3	5	1	1	1	2	1	1	2	2	3	5	1	2	1	2	1	2	5	1	1	2	1	2	3	1	0	1
Reteocrinus fenestratus	2	3	5	1	1	2	1	1	1	1	2	2	1	1	1	1	1	2	2	5	1	1	2	1	2	2	NA	NA	1
Reteocrinus magnificus	2	3	5	1	1	1	0	1	1	3	2	3	6	1	2	1	2	2	2	10	1	1	2	1	2	2	1	0	1
Reteocrinus mahlburgi	2	3	5	1	1	1	1	1	1	3	2	2	5	1	2	1	2	2	2	5	1	1	3	1	2	3	1	0	1
Reteocrinus polki	2	3	5	1	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Reteocrinus rocktonnsis	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Reteocrinus spinosus	2	3	5	1	1	1	2	1	1	2	2	1	5	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Reteocrinus stellaris	2	3	5	1	1	2	1	1	1	3	2	3	6	1	1	1	2	2	2	5	1	1	3	1	2	3	1	0	1
Reteocrinus variabilicaulis	2	3	5	1	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Reterocrinus sp.	2	3	5	2	1	1	2	1	1	2	1	1	5	1	1	1	2	2	2	20	1	1	2	1	2	3	1	0	1
Rhachicrinus wrighti	2	2	5	1	1	1	2	1	1	3	1	2	5	2	2	1	2	2	2	20	1	NA	3	1	NA	NA	NA	NA	NA
Rhaphanocrinus buckleyi	2	2	5	1	1	1	1	1	1	8	2	3	6	2	2	1	2	2	2	10	1	1	2	1	1	0	0	0	1
Rhaphanocrinus sculptus	2	3	5	1	1	1	NA	1	1	8	2	3	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	1
Rhaphanocrinus simplex	2	2	5	1	1	1	1	1	1	8	3	3	1	2	2	1	2	1	2	10	1	NA	3	NA	NA	NA	NA	NA	NA
Rhaphanocrinus subnodosus	2	2	5	1	1	1	NA	1	1	3	2	3	NA	1	2	1	2	2	2	10	1	1	3	1	1	0	0	0	1
Ristnacrinus altobasalis	2	1	0	0	0	0	NA	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	1	0	0	0	1
Salinocrinus conus	2	3	3	1	2	1	3	1	1	3	2	NA	1	1	1	1	1	1	2	5	1	NA	NA	NA	NA	NA	NA	NA	NA

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Porocrinus sp. cf. *P.smithi*	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	1	NA	1	1
Praecupulocrinus conjugans	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	1	1	1	1	1	3	NA	1	1
Pregazacrinus hemisphericus	NA	NA	NA	NA	NA	NA	2	3	2	2	NA	NA	1	0	0	NA	NA	1	2	1	1	NA	NA	NA	1	2	NA	1	1
Protaxocrinus cataractensis	1	1	2	1	1	1	2	1	2	1	1	0	1	0	0	3	1	1	2	1	2	1	1	1	1	2	NA	1	1
Protaxocrinus elegans	1	1	1	1	1	1	2	1	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Protaxocrinus girardeau	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	2	1	2	1	1	2	NA	1	1
Protaxocrinus girvanensis	2	1	1	1	1	1	NA	NA	NA	NA	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Protaxocrinus laevis	1	1	2	1	1	1	2	1	2	2	1	0	1	0	0	3	1	1	2	1	1	1	1	NA	NA	2	NA	1	1
Protaxocrinus nodocaudis	1	1	2	1	1	1	2	1	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Protaxocrinus paraios	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Protaxocrinus sideros	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Ptychocrinus insperatus	1	2	2	1	1	1	2	6	2	1	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	1
Ptychocrinus parvus	1	1	3	1	1	1	2	6	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	1	1	1
Ptychocrinus pentagonus	NA	NA	NA	NA	1	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Ptychocrinus splendens	1	2	2	1	1	1	2	5	2	2	2	1	1	0	0	2	1	1	2	2	1	1	2	2	1	2	NA	1	1
Pychnocrinus dyeri	1	2	2	1	1	1	2	10	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	2	1	1	1	1	1
Pycnocrinus multibrachialis	1	1	1	1	1	1	2	4	2	2	2	1	1	0	0	3	1	1	1	0	0	0	0	NA	1	1	1	1	1
Pycnocrinus sardesoni	1	2	1	1	1	1	2	10	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	NA	1	1
Pycnocrinus shafferi	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	NA	NA	2	NA	1	1
Quinquecaudex cincinnatiensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	2	2	2	1	1	1	3	0	1	1
Quinquecaudex glabellus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	NA	1	1
Quinquecaudex species A	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	1	1	1	1	1	4	0	1	1
Quinquecaudex springeri	1	1	1	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	2	1	1	1	1	NA	1	1
Reteocrinus alveolatus	1	1	2	1	1	1	2	3	2	1	1	0	1	0	0	3	1	1	1	1	0	0	0	NA	NA	NA	3	1	1
Reteocrinus depressus	1	1	1	1	1	1	2	1	2	1	1	0	1	0	0	NA	1	1	2	1	NA	NA	NA	NA	NA	2	NA	1	1
Reteocrinus fenestratus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	2	2	1	1	1	3	0	1	2
Reteocrinus magnificus	1	1	1	1	1	1	2	4	2	1	2	1	1	0	0	4	1	1	1	0	0	0	0	2	1	1	2	1	2
Reteocrinus mahlburgi	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	2	3	3	NA	1	2
Reteocrinus polki	1	1	3	1	1	1	2	8	2	1	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	2
Reteocrinus rocktonnsis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	NA	NA	3	0	1	2
Reteocrinus spinosus	2	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	NA	1	1	2	1	3	0	1	2
Reteocrinus stellaris	1	1	2	1	1	1	1	0	2	1	1	0	1	0	0	NA	1	1	2	1	2	1	2	NA	NA	2	0	1	1
Reteocrinus variabilicaulis	1	1	3	1	1	1	2	8	2	1	1	0	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	2	NA	1	2
Reterocrinus sp.	1	1	3	1	1	1	2	8	2	1	2	1	1	0	0	2	1	1	NA	NA	NA	NA	NA	2	1	3	NA	1	1
Rhachicrinus wrighti	NA	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Rhaphanocrinus buckleyi	1	2	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Rhaphanocrinus sculptus	1	2	1	1	1	1	2	7	2	2	2	1	1	0	0	4	1	1	1	0	0	0	0	1	1	2	NA	1	1
Rhaphanocrinus simplex	1	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Rhaphanocrinus subnodosus	1	1	2	1	1	1	2	5	2	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Ristnacrinus altobasalis	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	1	0	0	0	0	1	1	0	NA	1	1
Salinocrinus conus	NA	NA	NA	NA	1	1	2	NA	1	0	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1

Species	88	89	90	91	92
Porocrinus sp. cf. *P.smithi*	*1*	1	1	0	1
Praecupulocrinus conjugans	1	1	1	1	1
Pregazacrinus hemisphericus	*1*	1	1	1	1
Protaxocrinus cataractensis	*1*	1	1	1	1
Protaxocrinus elegans	*1*	1	1	NA	1
Protaxocrinus girardeau	*1*	1	1	1	1
Protaxocrinus girvanensis	1	1	1	NA	1
Protaxocrinus laevis	1	1	1	1	1
Protaxocrinus nodocaudis	*1*	1	1	0	1
Protaxocrinus paraios	1	1	1	NA	1
Protaxocrinus sideros	1	1	1	NA	1
Ptychocrinus insperatus	*1*	1	1	NA	1
Ptychocrinus parvus	1	1	1	NA	1
Ptychocrinus pentagonus	*1*	1	1	NA	1
Ptychocrinus splendens	*1*	1	1	1	1
Pychnocrinus dyeri	1	1	1	0	1
Pycnocrinus multibrachialis	*1*	1	1	0	1
Pycnocrinus sardesoni	1	1	1	0	1
Pycnocrinus shafferi	1	1	1	0	1
Quinquecaudex cincinnatiensis	1	1	1	1	1
Quinquecaudex glabellus	1	1	1	1	1
Quinquecaudex species A	*1*	1	1	1	1
Quinquecaudex springeri	*1*	1	1	1	1
Reteocrinus alveolatus	1	1	1	NA	1
Reteocrinus depressus	1	1	1	NA	1
Reteocrinus fenestratus	*1*	1	1	1	1
Reteocrinus magnificus	*1*	1	1	0	1
Reteocrinus mahlburgi	1	1	1	0	1
Reteocrinus polki	*1*	1	1	NA	1
Reteocrinus rocktonnsis	1	1	1	1	1
Reteocrinus spinosus	1	1	1	1	1
Reteocrinus stellaris	1	1	1	1	1
Reteocrinus variabilicaulis	*1*	1	1	NA	1
Reterocrinus sp.	*1*	1	1	NA	1
Rhachicrinus wrighti	1	1	1	NA	1
Rhaphanocrinus buckleyi	1	1	1	NA	1
Rhaphanocrinus sculptus	*1*	1	1	0	1
Rhaphanocrinus simplex	1	1	1	NA	1
Rhaphanocrinus subnodosus	1	1	1	NA	1
Ristnacrinus altobasalis	*1*	1	1	0	1
Salinocrinus conus	1	1	1	NA	1

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Scapanocrinus muricatus	3	1	2	1	1	1	NA	1	NA	1	0	0	2	2	2	3	5	1	2	1	1	1	1	0	3	5	1	0	1
Schizocrinus nodosus	3	1	2	1	1	1	1	1	2	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Schizocrinus striatus	3	1	1	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Silfonocrinus siluricus	3	1	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Simplococrinus persculptus	3	NA	NA	NA	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Siphonocrinus nobilis	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	3	5	1	NA	NA	1	1	1	0	3	5	NA	NA	1
Stereoaster squamosus	3	2	2	1	1	1	1	1	NA	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Stibarocrinus centervillensis	3	1	1	1	1	1	NA	2	NA	1	0	0	NA	NA	2	3	4	2	1	0	1	2	2	3	3	4	1	0	1
Stipatocrinus hulveri	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	4	1	0	2
Sygcaulocrinus typus	3	2	1	1	1	1	5	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	3	3	5	1	0	1
Tenuicrinus longibasalis	3	1	2	1	2	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	2	3	5	1	0	1
Thaerocrinus crenalus	3	2	2	1	1	1	NA	1	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	3	1	0	2
Thaleproktocrinus davidsoni	3	NA	NA	NA	NA	NA	6	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	2
Thomasocrinus cylindrisa	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	3	1	0	1
Tirocrinus trochos	3	1	2	1	1	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	NA	NA	NA	NA
Titanocrinus sumralli	3	1	1	1	2	1	5	1	1	1	0	0	NA	NA	1	3	5	1	2	3	1	1	1	0	3	NA	2	3	1
Tormosocrinus furberi	3	1	2	1	1	1	6	1	NA	1	0	0	2	2	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Tornatilicrinus longicaudis	3	1	1	1	1	5	5	1	2	1	0	0	NA	0	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Triboloporus cryptoplicatus	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	2	1	0	3	5	1	0	1
Trypherocrinus brassfieldensis	3	2	1	1	1	2	1	1	NA	1	0	0	2	4	2	3	5	1	2	1	1	2	2	3	3	3	1	0	2
Tryssocrinus endotomous	3	2	2	1	1	1	6	2	1	1	0	0	2	3	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
Turbocrinus punctum	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Typanocrinus strombos	3	NA	NA	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
undescribed big disparid I	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	NA	NA	3	5	1	0	1
Undescribed cladid 1	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	5	3	5	1	0	1
undescribed cladid I1	3	1	1	1	2	1	1	1	NA	1	0	0	NA	NA	2	3	5	1	1	1	1	1	1	0	3	5	1	0	1
undescribed cladid I1	3	NA	NA	NA	2	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	1	1	1	1	0	3	5	1	0	1
undescribed cladid I2	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1
Undescribed hybocrinid zone g	3	1	1	1	1	1	1	1	1	1	0	0	NA	NA	2	3	5	1	2	1	1	2	2	1	3	5	1	0	1
Undescribed hybocrinid zone I	3	1	1	1	2	1	1	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Undescribed Iocrinid	3	1	2	1	1	5	NA	1	NA	1	0	0	NA	NA	2	3	5	1	NA	NA	1	1	NA	NA	3	5	1	0	1
Undescribed iocrinid zone b	3	1	1	1	2	1	5	1	1	1	0	0	NA	NA	2	3	5	1	1	0	1	1	2	1	3	5	1	0	1
Undescribed iocrinid zone I	3	1	1	1	2	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	1	0	1	2	2	1	3	5	1	0	1
Wilsonicrinus culmeninuosus	3	NA	NA	NA	NA	5	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Xenocrinus baeri	3	1	1	1	1	4	NA	1	NA	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	2	4	1	0	1
Xenocrinus penicillus	3	1	1	1	1	4	5	1	2	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	1	0	1
Xenocrinus rubus	3	2	2	1	1	3	6	1	2	1	0	0	NA	NA	2	3	5	1	2	1	1	1	1	0	3	4	1	0	1
Xysmacrinus greenensis	3	NA	NA	NA	NA	NA	NA	NA	NA	1	0	0	NA	NA	2	3	5	1	2	3	1	1	1	0	3	5	2	3	1
Zirocrinus litos	3	NA	2	1	1	1	6	1	NA	NA	NA	NA	NA	NA	2	3	5	1	1	0	1	1	1	0	3	5	1	0	1

Species	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
Scapanocrinus muricatus	2	3	3	1	2	1	3	1	1	3	2	3	1	1	2	1	1	1	2	20	1	2	2	1	2	3	2	4	1
Schizocrinus nodosus	2	1	0	0	0	0	1	1	1	3	2	1	6	1	2	1	1	1	2	10	1	1	3	1	2	1	1	0	1
Schizocrinus striatus	2	1	0	0	0	0	1	1	1	2	2	1	6	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	1
Silfonocrinus siluricus	2	2	5	1	1	1	2	1	1	3	2	2	5	2	2	1	2	1	2	20	1	2	2	1	2	2	2	4	2
Simplococrinus persculptus	2	2	5	1	1	1	1	2	1	3	2	1	5	1	2	1	2	2	2	20	1	1	2	1	1	0	0	0	2
Siphonocrinus nobilis	2	3	5	NA	1	2	NA	1	1	9	3	3	1	1	2	1	1	2	2	20	1	NA	2	NA	NA	NA	NA	NA	NA
Stereoaster squamosus	2	2	5	1	1	1	2	1	1	3	1	1	6	2	2	1	1	2	2	20	1	NA	2	1	NA	NA	NA	NA	NA
Stibarocrinus centervillensis	1	1	0	0	0	0	2	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	4	1
Stipatocrinus hulveri	1	1	0	0	0	0	1	1	1	2	3	3	5	1	NA	1	1	1	2	10	1	1	3	1	1	0	0	0	1
Sygcaulocrinus typus	2	1	0	0	0	0	1	1	1	1	2	2	1	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
Tenuicrinus longibasalis	2	1	0	0	0	0	1	1	1	2	3	2	1	1	1	1	1	1	2	5	1	1	1	1	NA	NA	NA	NA	NA
Thaerocrinus crenalus	2	1	0	0	0	0	1	1	1	10	2	2	2	1	2	1	1	1	2	3	1	3	1	1	2	3	2	5	1
Thaleproktocrinus davidsoni	2	1	0	0	0	0	2	1	1	4	2	1	1	1	2	1	1	1	2	10	1	NA	3	1	NA	NA	NA	NA	NA
Thomasocrinus cylindrisa	1	1	0	0	0	0	1	1	1	8	3	2	6	2	NA	1	1	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Tirocrinus trochos	1	1	0	0	0	0	2	1	1	3	1	1	5	2	2	1	2	1	3	20	1	1	2	1	1	0	0	0	1
Titanocrinus sumralli	2	3	5	2	2	1	NA	1	1	9	3	1	1	1	2	1	2	2	2	5	1	1	3	1	2	1	1	0	1
Tormosocrinus furberi	2	2	5	1	1	1	2	1	1	3	2	2	2	2	1	1	1	1	2	10	1	1	3	1	1	0	0	0	2
Tornatilicrinus longicaudis	2	1	0	0	0	0	1	1	1	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	1	2	2	1
Triboloporus cryptoplicatus	2	3	5	1	1	1	3	1	1	4	2	1	1	1	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
Trypherocrinus brassfieldensis	2	1	0	0	0	0	2	1	1	10	2	2	2	1	1	1	1	1	2	3	1	3	1	1	2	3	2	4	1
Tryssocrinus endotomous	2	1	0	0	0	0	1	1	1	1	2	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	2	2	1
Turbocrinus punctum	2	2	5	1	1	1	2	1	1	3	2	1	6	2	2	1	1	1	1	NA	NA	NA	NA	1	NA	NA	NA	NA	NA
Typanocrinus strombos	2	1	0	0	0	0	1	1	1	2	2	2	6	1	2	1	1	2	2	10	1	1	2	1	1	0	0	0	2
undescribed big disparid I	2	1	0	0	0	0	NA	1	1	2	2	2	NA	1	1	1	1	1	2	5	1	1	3	1	NA	NA	NA	NA	1
Undescribed cladid 1	2	3	5	1	1	2	2	1	1	1	3	1	6	1	1	1	1	1	2	5	1	1	1	1	2	2	1	0	1
undescribed cladid I1	2	3	5	1	1	2	3	1	1	2	3	1	1	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
undescribed cladid I1	2	3	5	1	1	2	3	1	1	2	3	1	1	1	2	1	1	1	2	5	1	NA	3	NA	NA	NA	NA	NA	NA
undescribed cladid I2	2	3	5	1	1	2	NA	1	1	2	2	2	NA	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Undescribed hybocrinid zone g	1	1	0	0	0	0	2	1	1	8	2	2	5	1	2	1	1	1	2	5	1	1	3	1	1	0	0	0	1
Undescribed hybocrinid zone I	2	1	0	0	0	0	2	1	1	8	2	2	5	1	2	1	1	2	2	5	1	1	3	1	2	2	1	0	1
Undescribed Iocrinid	2	1	0	0	0	0	NA	1	1	2	2	2	1	1	1	1	1	1	2	5	1	1	2	1	2	2	1	0	1
Undescribed iocrinid zone b	1	1	0	0	0	0	2	1	1	3	2	2	5	1	2	1	1	2	2	5	1	1	3	1	2	3	2	2	1
Undescribed iocrinid zone I	2	1	0	0	0	0	2	1	1	2	2	2	1	1	2	1	1	2	2	5	1	1	2	1	2	2	1	0	1
Wilsonicrinus culmeninuosus	2	2	5	1	1	1	1	1	1	3	2	1	6	2	2	1	1	1	2	10	1	NA	NA	1	NA	NA	NA	NA	NA
Xenocrinus baeri	1	1	0	0	0	0	2	1	1	4	2	3	5	2	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Xenocrinus penicillus	2	1	0	0	0	0	2	1	1	8	3	3	5	1	2	1	2	1	2	10	1	1	2	1	1	0	0	0	1
Xenocrinus rubus	NA	1	0	0	0	0	2	1	1	2	2	3	5	1	2	1	1	1	2	20	1	1	NA	1	1	0	0	0	1
Xysmacrinus greenensis	0	3	5	1	1	2	1	1	1	3	NA	NA	6	2	2	1	1	2	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zirocrinus litos	2	1	0	0	0	0	1	1	1	2	2	1	6	1	2	1	2	2	2	10	1	1	2	1	1	0	0	0	1

Species	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87
Scapanocrinus muricatus	1	1	1	1	1	1	2	7	2	1	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	2	NA	1	1
Schizocrinus nodosus	1	2	2	1	1	1	2	4	2	2	2	1	1	0	0	2	1	1	1	0	0	0	0	NA	NA	3	1	1	1
Schizocrinus striatus	1	1	2	1	1	1	2	2	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	1
Silfonocrinus siluricus	1	1	2	1	1	1	2	3	2	2	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Simplococrinus persculptus	1	2	2	1	1	1	2	2	2	1	2	1	1	0	0	3	1	1	NA	NA	NA	NA	NA	2	NA	2	NA	1	1
Siphonocrinus nobilis	NA	NA	NA	NA	NA	1	2	NA	2	NA	NA	NA	1	0	0	NA	NA	1	2	2	2	1	2	2	3	NA	NA	1	1
Stereoaster squamosus	NA	NA	NA	1	1	1	2	4	2	2	NA	NA	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Stibarocrinus centervillensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	1	NA	1	1	1	1	2	NA	1	2
Stipatocrinus hulveri	1	1	1	1	1	1	2	10	2	1	2	1	1	0	0	NA	1	1	2	2	1	1	2	2	1	2	NA	1	1
Sygcaulocrinus typus	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	NA	NA	NA	NA	NA	1	1	2	NA	1	1
Tenuicrinus longibasalis	NA	NA	NA	NA	1	1	2	1	1	0	NA	NA	1	0	0	NA	1	1	2	1	NA	1	1	1	1	NA	NA	1	1
Thaerocrinus crenalus	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	2	NA	1	1
Thaleproktocrinus davidsoni	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	2	1	2	NA	1	1
Thomasocrinus cylindrisa	NA	NA	NA	NA	NA	1	2	4	2	2	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	NA	1	2	NA	1	1
Tirocrinus trochos	1	1	2	1	1	1	2	72	2	2	1	1	0	0	NA	1	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Titanocrinus sumralli	1	1	2	1	1	1	2	4	2	1	1	0	1	0	0	1	1	1	1	0	0	0	0	2	2	4	0	1	1
Tormosocrinus furberi	1	1	2	1	1	1	2	4	2	3	2	1	1	0	0	3	1	1	2	1	2	1	1	NA	NA	2	NA	1	1
Tornatilicrinus longicaudis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	3	1	1	2	2	2	1	1	1	1	4	4	1	1
Triboloporus cryptoplicatus	1	NA	NA	1	1	1	1	0	1	0	NA	NA	1	0	0	NA	NA	1	1	0	0	0	0	1	1	NA	NA	1	1
Trypherocrinus brassfieldensis	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	1	1	1	1	1	2	NA	1	1
Tryssocrinus endotomous	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	1	1	3	0	1	1
Turbocrinus punctum	NA	NA	NA	1	NA	1	2	5	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	1	1
Typanocrinus strombos	1	1	2	1	1	1	2	6	2	2	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	1	2	NA	1	1
undescribed big disparid I	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	NA	NA	NA	NA	NA	1	1	NA	0	1	1
Undescribed cladid 1	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	1	0	0	0	0	1	1	2	0	1	1
undescribed cladid I1	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
undescribed cladid I1	NA	NA	3	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	NA	1	1
undescribed cladid I2	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	NA	1	0	NA	1	1
Undescribed hybocrinid zone g	1	1	4	1	1	1	1	0	1	0	1	0	1	0	0	2	1	1	1	0	0	0	0	1	1	0	0	1	1
Undescribed hybocrinid zone I	1	1	1	1	1	1	1	0	1	0	2	1	1	0	0	NA	1	1	1	0	0	0	0	1	1	2	0	1	1
Undescribed Iocrinid	1	1	3	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	NA	NA	NA	NA	NA	1	1	4	NA	1	1
Undescribed iocrinid zone b	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	4	1	1	2	1	2	1	1	2	1	3	0	1	1
Undescribed iocrinid zone I	1	1	2	1	1	1	1	0	1	0	1	0	1	0	0	NA	1	1	2	1	NA	1	1	1	1	2	NA	1	1
Wilsonicrinus culmeninuosus	NA	NA	NA	NA	1	1	2	5	2	3	NA	NA	1	0	0	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	2	NA	1	1
Xenocrinus baeri	1	2	2	1	1	1	2	5	2	1	2	1	1	0	0	3	1	1	1	0	0	0	0	2	2	2	NA	1	1
Xenocrinus penicillus	1	2	2	1	1	1	2	10	2	1	2	1	1	0	0	NA	1	1	1	0	0	0	0	2	2	2	6	1	1
Xenocrinus rubus	1	2	NA	1	1	1	2	NA	2	1	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	1	1
Xysmacrinus greenensis	NA	NA	NA	NA	NA	1	2	NA	2	2	NA	NA	1	0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	1
Zirocrinus litos	1	1	2	1	1	1	2	4	2	2	2	1	1	0	0	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	1	2

Species	88	89	90	91	92
Scapanocrinus muricatus	*1*	1	1	0	1
Schizocrinus nodosus	1	1	1	0	1
Schizocrinus striatus	1	1	1	NA	1
Silfonocrinus siluricus	1	1	1	NA	1
Simplococrinus persculptus	1	1	1	NA	1
Siphonocrinus nobilis	1	1	1	1	1
Stereoaster squamosus	1	1	1	NA	1
Stibarocrinus centervillensis	1	1	1	1	1
Stipatocrinus hulveri	1	1	1	1	1
Sygcaulocrinus typus	1	1	1	NA	1
Tenuicrinus longibasalis	1	1	1	1	1
Thaerocrinus crenalus	*1*	1	1	1	1
Thaleproktocrinus davidsoni	*1*	1	1	0	1
Thomasocrinus cylindrisa	*1*	1	1	0	1
Tirocrinus trochos	1	1	1	NA	1
Titanocrinus sumralli	2	1	1	0	1
Tormosocrinus furberi	*1*	1	1	1	1
Tornatilicrinus longicaudis	*1*	1	1	1	1
Triboloporus cryptoplicatus	1	1	1	0	1
Trypherocrinus brassfieldensis	1	1	1	1	1
Tryssocrinus endotomous	*1*	1	1	1	1
Turbocrinus punctum	1	1	1	NA	1
Typanocrinus strombos	1	1	1	0	1
undescribed big disparid I	*1*	*1*	1	NA	1
Undescribed cladid 1	*1*	1	1	0	1
undescribed cladid I1	1	1	1	0	1
undescribed cladid I1	1	1	1	0	1
undescribed cladid I2	1	1	1	NA	1
Undescribed hybocrinid zone g	*1*	1	1	0	1
Undescribed hybocrinid zone I	*1*	1	1	0	1
Undescribed Iocrinid	1	1	1	NA	1
Undescribed iocrinid zone b	*1*	1	1	1	1
Undescribed iocrinid zone I	*1*	1	1	1	1
Wilsonicrinus culmeninuosus	1	1	1	NA	1
Xenocrinus baeri	1	1	1	0	1
Xenocrinus penicillus	1	1	1	0	1
Xenocrinus rubus	1	1	NA	1	1
Xysmacrinus greenensis	1	1	1	NA	1
Zirocrinus litos	1	1	1	NA	1

APPENDIX 10

Chapter 3 Species PCO Loadings

The PCO species loadings for the 421 species analyses for chapter 3. The crinoids were coded using the discreete characters explained in Appendix 1. Gower's similarity metric was used on the dataset and was analysed using Principal Coordinate Analysis. All analyses were conducted using R.

	Cladids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Aetocrinus gracilus*	-0.01395	0.09630	0.03839	-0.09960	0.03517	-0.01889	-0.01230	-0.01149	0.01154	0.02478
2	*Agostocrinus xenus*	0.02415	-0.02806	-0.06571	-0.01839	0.01945	0.03374	0.00827	-0.01980	0.01890	0.00415
3	*Agostocrinus xenus*	-0.02404	0.07873		0.02249	0.00205	0.01128	-0.01861	-0.00433	-0.00772	0.01710
4	*Carabocrinus sp.*	-0.02648	-0.00427	-0.04941	-0.01799	0.00059	-0.03956	0.02504	0.01080	0.01712	-0.01264
5	*Carabocrinus radiatus*	-0.05643	0.03583	-0.06360	-0.03677	-0.01358	-0.06273	-0.00458	-0.01162	0.04850	0.00548
6	*Carabocrinus cf. tradwelli*	-0.05309	0.02026	-0.08215	-0.00776	0.02089	0.01541	-0.00263	-0.02892	0.01688	-0.00329
7	*Carabocrinus conoideus*	-0.07409	0.02939	-0.09240	-0.01826	0.01025	-0.01301	0.04395	-0.00291	-0.02037	-0.02541
8	*Carabocrinus dicyclicus*	-0.04641	0.04750	-0.05905	-0.04088	-0.00981	-0.03197	0.02989	-0.01174	0.03961	-0.00283
9	*Carabocrinus huronensis*	-0.04635	0.04129	-0.07321	-0.01113	-0.00028	-0.02410	0.01949	0.00037	-0.00580	-0.02231
10	*Carabocrinus magnificus*	-0.08333	0.07081	-0.04270	-0.04431	-0.03972	-0.00995	0.02956	-0.04736	0.03786	-0.05680
11	*Carabocrinus micropunctatus*	-0.05494	0.07486	-0.03851	-0.04486	-0.04319	-0.00784	0.05882	-0.03903	0.02447	-0.00457
12	*Carabocrinus oogyi*	-0.04318	0.03838	-0.05499	-0.03598	0.01154	-0.02758	0.01986	0.00626	-0.00633	-0.01822
13	*Carabocrinus radiatus*	-0.05109	0.04242	-0.04841	-0.04210	0.00975	-0.03493	0.02437	-0.00704	0.03200	0.00128
14	*Carabocrinus slocomi*	-0.05731	0.05035	-0.05611	-0.05223	0.02197	-0.03779	0.02494	-0.00822	0.02504	0.00169
15	*Carabocrinus sp.*	-0.04275	0.05808	-0.02844	0.01022	0.00052	-0.01156	0.02415	-0.01805	-0.00410	-0.03327
16	*Carabocrinus stellifer*	-0.06622	0.06815	-0.03456	-0.02994	-0.02420	-0.01400	0.01970	-0.05921	0.02676	-0.02949
17	*Carabocrinus treadwelli*	-0.05284	0.01999	-0.08346	-0.00831	0.01845	0.01519	-0.00147	-0.02845	0.01765	-0.00418
18	*Carabocrinus vancortlandi*	-0.04774	0.04977	-0.06500	-0.02631	-0.01685	-0.02100	-0.02402	0.01321	0.02719	0.00414
19	*Chenocrinus canadaensis*	0.02428	-0.05977	0.02276	0.03873	0.04480	0.02026	-0.01690	0.00720	0.01165	-0.00553

20	*Clematocrinus ohioensis*	0.02113	-0.09561	-0.02193	0.02777	0.04435	0.02124	-0.05603	0.01057	0.00776	0.01587
21	*Colpodecrinus quadrifidus*	-0.06269	-0.00206	0.00352	-0.00555	0.01484	-0.02811	0.01652	0.02231	-0.05318	-0.06583
22	*Cupulocrinus canaliculatus*	-0.02075	0.07320	-0.00550	0.00943	0.02114	-0.00206	-0.01213	0.02449	0.00089	0.00501
23	*Cupulocrinus cylindricus*	-0.01191	0.05228	0.03038	0.00838	0.02014	0.00832	0.02027	0.03365	0.02972	-0.03331
24	*Cupulocrinus gracilis*	-0.01520	0.08528	0.01719	0.00278	0.01019	0.00311	0.00545	0.00067	-0.01154	0.02079
25	*Cupulocrinus heterocostalis*	-0.02424	0.06538	-0.01720	0.00465	0.00172	-0.01392	-0.04475	-0.00613	0.02590	0.01702
26	*Cupulocrinus humilis*	0.00074	0.07209	0.00679	0.00426	-0.00115	0.00195	-0.01085	0.00259	0.00058	0.01254
27	*Cupulocrinus humilis*	-0.01954	0.07891	0.02716	0.00040	-0.02701	0.00763	0.01827	-0.00348	-0.00621	-0.00634
28	*Cupulocrinus jewetti*	-0.05994	0.04280	0.06688	0.01523	-0.04409	0.00361	-0.01790	0.00434	-0.02766	-0.00871
29	*Cupulocrinus jewetti*	-0.03657	0.04479	0.02374	0.00923	-0.01031	-0.01375	0.02327	-0.00739	-0.00796	-0.01534
30	*Cupulocrinus jewetti*	0.00074	0.07209	0.00679	0.00426	-0.00115	0.00195	-0.01085	0.00259	0.00058	0.01254
31	*Cupulocrinus latibrachiatus?*	-0.02901	0.06698	0.00127	0.00345	-0.00731	0.01064	0.01533	0.00187	-0.00365	-0.00033
32	*Cupulocrinus levorsoni*	-0.02362	0.06796	0.01535	0.00938	-0.01678	0.00207	-0.00177	-0.00878	0.02351	-0.00530
33	*Cupulocrinus minimus*	0.00915	0.09127	-0.01384	-0.00928	0.01409	0.01396	-0.00139	0.01409	-0.01161	0.02166
34	*Cupulocrinus molanderi*	-0.01991	0.05622	-0.00419	-0.00083	0.03452	0.01869	-0.00861	0.02862	0.03498	0.00707
35	*Cupulocrinus plattevillensis*	-0.02799	0.04092	-0.06270	-0.00273	-0.00716	-0.01096	-0.03720	0.02994	0.00934	0.00799
36	*Cupulocrinus plolydactylus*	0.00126	0.09579	0.00001	0.01675	-0.02348	0.02732	0.02096	0.01108	0.01853	0.00515
37	*Cupulocrinus sp.*	-0.00471	0.10515	-0.00453	0.03671	-0.02761	0.02645	0.01114	0.02328	0.02059	-0.01108
38	*Cupulocrinus* species cf. *C.*	-0.01246	0.05038	0.01474	0.02062	0.00416	-0.00105	-0.00011	0.01694	0.01183	-0.01756

	gracilis										
39	*Dendrocrinus abactronodusus*	-0.02275	0.09895	0.04262	-0.00924	-0.00433	0.00026	-0.01956	-0.00499	-0.02608	-0.02133
40	*Dendrocrinus aculidatylus*	-0.02167	0.08999	0.04481	0.01321	-0.00104	0.00207	-0.03234	0.00084	0.01017	-0.02379
41	*Dendrocrinus alternatus*	-0.02433	0.01903	-0.04305	-0.01533	0.04711	0.00522	0.00149	0.06329	0.03610	-0.02436
42	*Dendrocrinus aphelos*	-0.02875	0.07610	0.05569	-0.01108	0.00986	-0.00142	-0.01564	-0.00874	-0.03017	-0.00123
43	*Dendrocrinus cauduceus*	-0.00026	0.07607	-0.01879	0.00218	-0.01201	0.03327	0.02181	0.00200	0.01317	0.00871
44	*Dendrocrinus constrictus*	-0.00589	0.10336	-0.03776	-0.01501	-0.02552	0.04771	0.00127	0.00663	-0.03211	0.04602
45	*Dendrocrinus curvijunctus*	0.00208	0.09689	0.01413	0.00672	0.01596	0.01783	0.00787	0.00309	-0.00195	0.01663
46	*Dendrocrinus daytonensis*	-0.01759	0.06920	-0.07266	-0.04579	0.01950	0.03053	-0.02329	0.03389	-0.01006	0.02082
47	*Dendrocrinus gracilis*	-0.04493	0.04861	-0.01693	-0.02333	0.04285	-0.01841	-0.03205	0.04335	0.03012	0.02688
48	*Dendrocrinus leptos*	0.00409	0.08562	0.02128	-0.01775	-0.00338	-0.00430	-0.00664	0.00016	-0.03417	-0.00984
49	*Dendrocrinus minutus*	-0.01896	0.07489	-0.00277	-0.01249	0.03890	0.00234	-0.01523	0.01450	-0.00315	0.00521
50	*Dendrocrinus* n. sp. aff. *navigiolum*	-0.00106	0.05938	-0.00064	-0.07448	0.01320	0.02690	0.03053	0.01357	-0.01540	0.01850
51	*Dendrocrinus navigiolum*	-0.02580	0.07452	-0.01073	0.00046	0.02074	-0.00715	-0.04309	0.02128	-0.01613	-0.00554
52	*Dendrocrinus parvus*	-0.01152	0.08778	0.04100	-0.00766	0.01507	0.00903	0.00559	0.00227	-0.00579	0.00412
53	*Dendrocrinus posticus*	-0.00773	0.09870	0.01325	0.01908	-0.02861	0.01573	0.01633	-0.00911	0.00651	-0.00722
54	*Dendrocrinus sp.*	-0.01237	0.11077	0.02518	0.00156	0.00475	0.01114	0.00512	0.01216	-0.00201	0.00138
55	*Dendrocrinus villosus*	-0.02129	0.07238	-0.00484	0.00590	0.02552	0.03751	0.00341	0.03726	0.00266	0.00227
56	*Eopinnacrinus pinnulatus*	-0.03054	0.08638	0.02029	0.03506	0.03251	0.02958	0.01556	0.00693	0.01271	0.02779

57	*Euspirocrinus gagnoni*	0.00184	0.07584	0.01189	-0.07701	0.01129	0.00010	0.01219	0.02163	-0.02511	0.01344
58	*Euspirocrinus heliktos*	-0.02383	0.07228	0.03617	-0.01583	-0.02231	0.03148	0.04415	0.04775	0.02120	-0.02109
59	*Euspirocrinus wolcottense*	-0.02542	0.06779	0.01337	-0.01469	-0.01739	0.01956	0.00970	0.01826	-0.00072	-0.03347
60	Forest 13 cladid	-0.04697	0.04286	0.05886	0.01998	0.03399	-0.04080	0.02777	-0.00711	-0.01321	-0.00084
61	*Fragucrinus bothros*	0.01012	0.10401	0.07073	-0.06735	0.01255	0.00762	0.01833	-0.02174	-0.01154	0.04480
62	*Grenprisia billingsi*	0.00921	0.11316	0.03768	-0.01377	-0.00149	0.00666	0.00199	-0.00717	-0.03206	0.00369
63	*Grenprisia springeri*	-0.02309	0.09752	0.03502	0.01970	-0.01278	-0.01454	-0.04991	-0.02129	-0.01453	-0.01069
64	*Kanabinocrinus thyaros*	-0.00758	0.06794	-0.00808	-0.00380	0.04718	0.00328	-0.03387	0.04381	0.01044	-0.01040
65	*Laurucrinus sandtopensis*	-0.01111	0.07249	0.01310	-0.06283	0.04068	0.01208	-0.00360	0.01239	-0.01679	0.01419
66	*Levicyathocrinites sablensis*	-0.00998	0.05816	0.01592	-0.06402	0.05206	0.02800	-0.00528	0.01446	-0.01064	0.00696
67	*Merocrinus britonensis*	0.03163	0.07472	0.01046	0.01854	0.03811	0.01081	-0.01280	0.00816	0.02292	-0.00337
68	*Merocrinus corroboratus*	-0.02918	0.09024	0.04232	0.00429	0.00488	-0.00676	-0.02719	-0.01769	0.03153	0.01521
69	*Merocrinus curtus*	-0.02382	0.09019	0.05676	-0.00663	-0.00044	-0.00193	-0.01290	0.02767	0.04826	-0.00386
70	*Merocrinus impressus*	0.02145	0.08843	-0.01448	0.00063	0.04545	0.02137	0.00385	0.03546	0.00593	0.00042
71	*Merocrinus typus*	-0.00070	0.08576	0.03605	0.01807	0.02140	-0.01184	-0.03807	-0.00109	0.01827	-0.00718
72	*Myosocrinus chicottensis*	-0.04191	0.07312	-0.01012	-0.14512	-0.01777	0.05152	-0.00633	-0.01469	0.02848	-0.01456
73	*Ottawacrinus typus*	-0.00873	0.05684	0.02053	0.03951	0.00630	-0.00544	-0.04360	0.00607	-0.00805	0.00470
74	*Palaeocrinus angulatus*	-0.04585	0.05830	-0.01548	-0.01375	0.00107	-0.00877	0.03652	0.00803	0.01321	-0.03404
75	*Palaeocrinus avondalensis*	-0.04608	0.04068	-0.06315	-0.01857	0.01742	-0.00978	0.03921	0.00228	-0.01257	0.00042
76	*Palaeocrinus hudsoni*	-0.05748	0.05008	-0.05969	-0.08194	-0.01623	-0.07178	0.01792	-0.01052	-0.00557	-0.02116

77	*Palaeocrinus planobasalis*	-0.04658	0.04127	-0.06571	-0.02152	0.01949	-0.00696	0.03966	-0.00111	-0.01206	0.00003
78	*Palaeocrinus pulchellus*	-0.04233	0.03553	-0.00692	0.00104	0.02417	-0.02075	0.03227	0.00175	0.00531	-0.02516
79	*Palaeocrinus rhombiferus*	-0.02935	0.06914	0.01082	0.01793	-0.01903	-0.00328	-0.00209	0.00224	0.01139	-0.01848
80	*Palaeocrinus* sp. cf. *P. planobasalis*	-0.04723	0.07297	-0.04886	-0.02495	0.00095	0.04766	0.05120	-0.01846	0.02097	-0.04300
81	*Paleocrinus sp.*	-0.04067	0.04237	-0.02493	-0.00035	-0.01386	-0.01845	0.02078	-0.00324	0.01555	-0.03012
82	*Plicodendrocrinus*	-0.01005	0.11048	0.03960	-0.00130	0.04439	-0.00462	0.05660	-0.00014	0.00794	-0.02420
83	*Plicodendrocrinus epinettensis*	-0.01201	0.10957	0.04311	-0.00677	-0.00790	0.00428	-0.00755	0.00905	-0.02212	-0.02362
84	*Plicodendrocrinus observationensis*	-0.01163	0.11044	0.04343	-0.00829	-0.00897	0.00429	-0.00863	0.00951	-0.02170	-0.02504
85	*Plicodendrocrinus proboscidiatus*	-0.01687	0.08609	0.03709	0.01515	0.01354	-0.00532	-0.02163	0.01465	0.01746	-0.02180
86	*Porocrinus bromidensis*	-0.07305	0.03987	-0.08589	-0.08399	0.04936	0.01095	0.02512	-0.03910	0.03559	-0.00859
87	*Porocrinus cf. smithi*	-0.04945	0.02626	-0.06544	-0.03990	0.03426	0.01951	0.03498	-0.00461	0.00987	-0.02195
88	*Porocrinus conicus*	-0.04455	0.03209	-0.06339	-0.01573	0.06148	0.01051	-0.00852	-0.02174	0.00914	0.00649
89	*Porocrinus fayettensis*	-0.05327	0.02564	-0.07331	-0.03882	0.04419	0.03028	0.03803	-0.00564	0.01934	-0.01859
90	*Porocrinus kentuckyensis*	-0.05152	0.02087	-0.08192	-0.00688	0.01905	0.01403	-0.00124	-0.02738	0.01812	-0.00395
91	*Porocrinus lebanonensis*	-0.04596	0.01340	-0.08748	-0.00293	0.02806	0.01077	-0.01823	-0.03459	-0.00103	-0.02772
92	*Porocrinus pentagonius*	-0.04869	0.03542	-0.06167	-0.03894	0.05392	-0.01780	-0.01997	-0.04382	0.04333	0.01386
93	*Porocrinus petersenae*	-0.05484	0.06345	-0.08073	-0.06919	0.04271	-0.02708	-0.00931	-0.02662	0.01215	0.01211
94	*Porocrinus smithi*	-0.04945	0.02626	-0.06544	-0.03990	0.03426	0.01951	0.03498	-0.00461	0.00987	-0.02195
95	*Praecupulocrinus conjugans*	-0.02029	0.08626	0.03158	-0.01185	0.01866	0.01247	0.00190	0.00067	-0.00589	0.01129
96	*Quinquecaudex*	-0.02255	0.09410	0.02805	0.03040	-0.00548	0.00715	-0.03681	-0.01521	0.01001	-0.00259

	cincinnatiensis										
97	*Quinquecaudex glabellus*	-0.01404	0.10544	0.04329	-0.00263	0.01198	-0.00142	-0.00237	0.01492	-0.02210	-0.01110
98	*Quinquecaudex species A*	-0.00221	0.09158	0.01903	0.01799	0.01842	-0.01351	-0.06124	0.00347	-0.02653	-0.03587
99	*Quinquecaudex springeri*	-0.01267	0.11043	0.02876	-0.00366	0.00448	0.01784	-0.00483	-0.00039	-0.00799	-0.00043
100	*Salinocrinus conus*	-0.02085	0.03336	0.02763	-0.07774	0.02146	0.03865	-0.03244	0.00089	-0.04968	0.01119
101	*Triboloporus cryptoplicatus*	-0.03725	0.04742	-0.08175	-0.01270	-0.01364	0.02575	-0.00251	0.02077	-0.00206	-0.00303
102	Undescribed cla*did 1*	0.01805	0.07994	-0.06855	0.00040	0.04143	-0.01952	-0.05738	0.03352	-0.00822	0.02887
103	undescribed cladid I1	-0.03304	0.03123	-0.07487	-0.03685	0.02444	0.03512	-0.02005	0.00014	-0.00974	-0.01404
104	undescribed cladid I2	-0.02148	0.04687	-0.03573	0.00472	0.01826	0.02878	-0.02232	-0.01953	-0.01253	-0.03121
105	*?Euspirocrinus sp*	-0.01329	0.03054	-0.00582	0.01802	-0.02281	-0.01679	-0.01810	0.02785	0.03109	-0.00783

	Disparids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	? Myelodacylus sp.	0.08711	-0.07712	-0.01090	-0.04370	-0.08049	0.00686	0.00243	-0.04697	0.03370	0.02370
2	?*Ectenocrinus simplex*	0.08422	0.00968	0.05744	0.02470	0.00958	-0.01253	-0.00878	0.02978	0.00750	-0.00136
3	*Acolocrinus arbucklensis*	0.10200	-0.02458	-0.16836	-0.06665	-0.03732	0.12064	-0.03613	-0.07498	0.01203	-0.01159
4	*Acolocrinus crinerensis*	0.12074	-0.02299	-0.19009	-0.07500	-0.06129	0.11995	0.00848	-0.07919	0.01163	0.02580
5	*Acolocrinus hydraulicus*	0.09465	-0.03750	-0.14667	-0.04242	-0.03251	0.12408	0.01020	-0.04425	0.01248	0.00057
6	*Anomalocrinus antiquus*	0.07287	-0.01003	-0.06730	-0.00250	-0.00349	-0.04819	-0.02655	-0.00110	-0.00251	-0.01286
7	*Anomalocrinus incurvus*	0.09092	0.02401	0.01803	0.00526	-0.02357	0.00238	0.03923	0.01872	0.00593	-0.03934
8	Anulocrinus forrestonensis	0.13088	0.04394	-0.01391	0.03258	-0.04106	-0.01364	0.04847	0.01230	0.01320	0.02772
9	*Apodasmocrinus daubei*	0.08110	0.01403	0.04310	0.06063	0.01199	0.04374	-0.03244	-0.06131	-0.02933	-0.00934
10	Apodasmocrinus punctatus	0.10823	0.00670	-0.05508	-0.00510	0.04389	-0.02490	-0.02642	0.00482	0.02407	0.03718
11	*Apodasmocrinus* sp. cf. *A. daubei*	0.08249	0.01173	0.04265	0.05213	0.01488	0.04448	-0.02379	-0.06466	-0.02669	0.00193
12	Calceocrinus alleni	0.14290	0.02309	-0.03091	0.01463	-0.04335	0.01655	0.00871	-0.01891	0.05311	-0.04186
13	*Calceocrinus barrandii*	0.12430	0.03456	0.03400	0.04416	-0.05559	-0.01407	0.01216	0.02580	-0.01874	0.02858
14	Calceocrinus gamachicus	0.11267	0.02619	-0.04786	0.02439	-0.05305	-0.01252	0.01194	0.03430	0.00144	-0.02687
15	Calceocrinus gossmani	0.11063	0.05970	0.02057	0.02538	-0.04354	0.00725	0.07184	-0.00692	0.02725	0.03838
16	Calceocrinus incertus	0.10018	0.04777	-0.02595	0.00927	-0.05744	-0.00787	0.04366	0.01219	-0.00127	0.01383
17	Calceocrinus leversoni	0.11778	0.06065	-0.01218	0.01610	-0.09765	-0.00143	0.05774	0.00612	0.01681	0.03123
18	*Calceocrinus longifrons*	0.12130	0.06360	0.00033	0.00848	-0.07623	0.00024	0.07205	-0.00845	0.00512	0.04214

19	Calceocrinus tridactylus	0.11534	0.03807	-0.00426	0.02077	-0.06619	-0.00989	0.03995	0.02415	0.00123	-0.00140
20	Caleidocrinus (Huxleyocrinus) gerki	0.05707	0.01565	0.04921	0.01085	0.02633	-0.01669	-0.00743	-0.01138	0.01612	-0.01487
21	Cataractocrinus clementi	0.10091	0.04232	0.04504	0.02083	0.03789	-0.01300	-0.01717	-0.01829	0.01539	0.00782
22	Charactocrinus billingsi	0.14145	0.01199	-0.01994	-0.04551	-0.04061	-0.01305	0.01493	0.04340	-0.02622	-0.03988
23	Cincinnaticrinus pentagonus	0.09966	0.04060	0.00136	-0.00325	0.04375	-0.00097	-0.00058	0.02868	0.00678	-0.01195
24	*Cincinnaticrinus varibrachialis*	0.09926	0.03742	0.00117	-0.00936	0.04474	0.00038	0.00723	0.02270	0.00766	-0.00169
25	*Columbicrinus crassus*	0.08460	0.00809	0.03771	0.01911	0.05819	0.05204	0.00933	-0.00705	0.04200	-0.01093
26	*Columbicrinus sulphurensis*	0.07194	-0.00453	0.03362	0.04213	0.02922	0.04451	0.00008	-0.02982	-0.00687	0.02160
27	Corvucrinus schucherti	0.15352	-0.00160	-0.02963	-0.03992	-0.02754	0.04253	0.01467	0.01055	-0.01335	-0.05115
28	*Cremacrinus*	0.07334	0.00784	-0.08726	0.01397	-0.03631	-0.02854	-0.00121	0.06743	-0.00143	-0.01803
29	Cremacrinus arctus	0.09688	0.03447	0.02094	0.02627	-0.05878	-0.00616	0.03999	0.02188	0.01204	-0.01182
30	*Cremacrinus articulosus*	0.12150	0.05169	0.00296	0.01927	-0.01136	-0.00899	0.00986	0.02001	0.00079	0.00335
31	*Cremacrinus articulosus v1*	0.11833	0.05283	0.00234	0.01689	-0.01293	-0.00711	0.01235	0.01868	-0.00469	0.00260
32	Cremacrinus forrestonesis	0.13088	0.04394	-0.01391	0.03258	-0.04106	-0.01364	0.04847	0.01230	0.01320	0.02772
33	Cremacrinus gerki	0.10963	0.05518	-0.02808	0.01145	-0.08334	-0.00997	0.04495	-0.00158	0.00002	0.03385
34	Cremacrinus guttenbergensis	0.12449	0.07795	0.01951	0.03720	-0.00463	-0.00880	0.07158	0.03742	0.02777	0.05977
35	*Cremacrinus kentuckyensis*	- 0.01954	0.07891	0.02716	0.00040	-0.02701	0.00763	0.01827	-0.00348	-0.00621	-0.00634
36	*Cremacrinus latus*	0.14187	0.05868	-0.03030	0.02546	-0.03377	-0.03466	0.00611	0.04303	-0.02537	0.00546
37	Cremacrinus punctatus	0.12196	0.03964	0.00463	0.01262	-0.05408	-0.00254	0.05738	0.03206	-0.00566	-0.00149
38	*Cremacrinus*	0.08920	0.00461	-0.09345	0.02815	-0.05064	-0.04293	0.01483	0.07133	0.01376	0.00604

	ramifer										
39	*Daedalocrinus bellevillensis*	0.10660	0.06446	0.01773	0.02313	-0.01216	-0.01373	-0.02893	-0.02786	-0.03587	-0.00890
40	*Daedalocrinus kirki*	0.10415	0.06005	0.01743	0.02372	-0.00048	-0.00384	-0.00256	0.00306	-0.01952	0.00102
41	Diaphorocrinus pleniramulus	0.11765	0.03503	0.00339	0.01842	-0.05676	-0.00386	0.05258	0.03763	-0.00003	-0.00682
42	*Difficilicrinus coneyi*	0.09821	-0.00493	-0.05959	-0.00434	0.03723	-0.00361	-0.03954	0.01293	-0.02090	-0.00528
43	*Doliocrinus monilicaulis*	0.06238	-0.00290	0.04975	0.05170	0.01290	-0.01249	-0.03031	0.00253	0.00035	0.01883
44	*Doliocrinus pustulatus*	0.08232	0.00464	0.02748	0.06351	0.03966	0.05857	0.01864	-0.03849	-0.00402	0.04526
45	*Dystactocrinus constrictus*	0.07621	-0.01339	-0.02070	-0.00065	0.03371	-0.02396	-0.01840	0.06381	0.01195	0.00803
46	Ectenocrinus geniculatus	0.09442	0.02289	-0.00976	0.01927	0.03642	-0.01141	-0.02390	-0.00395	0.02044	0.01475
47	Ectenocrinus simplex	0.08422	0.00968	0.05744	0.02470	0.00958	-0.01253	-0.00878	0.02978	0.00750	-0.00136
48	Ectenocrinus sp.	0.06285	-0.02066	-0.00294	0.02785	-0.05576	0.04029	-0.02276	-0.01868	-0.02181	0.04322
49	Eomyelocrinus sp.	0.11628	-0.13097	0.08010	-0.14736	0.00114	0.00884	0.04157	0.01001	-0.00589	-0.05062
50	Eomyelodactylus ?plumosus	0.12815	-0.13638	0.08838	-0.14973	0.02630	0.02335	0.05294	-0.02382	0.02970	0.08818
51	Eomyelodactylus forestei	0.16391	-0.17796	0.15378	-0.28066	0.05194	0.02724	0.03892	0.03984	-0.01627	-0.02578
52	Eomyelodactylus richardsoni	0.09175	-0.00167	0.03177	-0.07648	0.05421	-0.02455	-0.02362	0.02816	-0.01870	-0.01959
53	Eomyelodactylus rotundatus	0.09821	-0.08080	-0.01826	-0.06950	-0.12731	-0.04804	-0.08126	-0.14298	-0.08916	-0.00295
54	Eomyelodactylus sp.	0.11628	-0.13097	0.08010	-0.14736	0.00114	0.00884	0.04157	0.01001	-0.00589	-0.05062
55	Eomyelodactylus sparteus	0.16216	-0.18026	0.16042	-0.27854	0.04759	0.01467	0.03212	0.02448	-0.03106	-0.01438
56	Eomyelodactylus springeri	0.08483	-0.05337	0.05550	-0.06574	0.01633	-0.08169	0.01191	0.02088	0.01163	0.00291
57	Eomyelodactylus uniformis	0.12654	-0.10949	0.01308	-0.12586	-0.11773	-0.04945	-0.08647	-0.14668	-0.10087	0.04668

58	Eomylodactylus forestei	0.16391	-0.17796	0.15378	-0.28066	0.05194	0.02724	0.03892	0.03984	-0.01627	-0.02578
59	Eustenocrinidae Indeterminate	0.09307	-0.03653	0.03034	-0.02871	0.04073	-0.01337	-0.06098	-0.00661	0.01020	-0.00376
60	*Eustenocrinus springeri*	0.09366	0.01276	-0.04582	-0.00456	0.06481	-0.02828	-0.02753	0.02852	0.02951	0.02142
61	Forest ?	0.09859	0.01710	-0.03031	-0.00918	0.03807	0.02002	0.00150	-0.04335	-0.01447	-0.01155
62	Forest 15	0.03987	-0.05201	0.04705	-0.01627	0.01446	-0.03452	-0.03531	0.01781	-0.01772	-0.00861
63	Forest 18	0.06824	0.02058	0.03972	0.01714	0.04067	0.02801	-0.04185	-0.07473	0.02401	-0.04283
64	Forest 9 Disparid	0.06533	0.00927	0.01167	0.00178	0.01862	-0.03454	-0.01784	0.02417	0.00614	-0.01612
65	*Geraocrinus sculptus*	0.08376	0.02897	0.01036	0.00534	-0.01055	-0.00060	0.02406	0.00275	0.00459	-0.01773
66	Geraocrinus sculptus	0.07501	0.01026	0.05592	0.03320	0.02323	0.00519	0.00488	-0.01607	0.00120	0.01170
67	*Glaucocrinus falconeri*	0.10446	0.00808	0.02367	-0.05313	0.01870	-0.05553	-0.04345	0.01081	0.03136	-0.01386
68	Haptocrinus calvatus	0.10295	0.05047	0.04187	0.02926	0.02208	-0.03061	-0.02241	0.00515	-0.00608	-0.01713
69	Homocrinus diminutus	0.08351	-0.00237	-0.00553	0.01417	0.04279	0.03413	-0.01586	-0.01850	-0.00570	0.01523
70	Iocrinid	0.05972	0.03202	-0.00084	0.00003	0.01735	-0.01163	-0.00766	-0.00001	0.00170	0.00939
71	Iocrinus similis	0.08088	0.03175	0.03060	0.02278	0.02478	-0.04151	-0.02371	-0.00908	0.04431	0.00046
72	Iocrinus subcrassus	0.08059	0.04650	0.05291	0.01583	0.04710	-0.02603	0.04308	-0.01652	0.01522	-0.04395
73	*Iocrinus trentonensis*	0.04617	0.01024	0.03060	0.02031	0.01543	-0.02507	0.03127	-0.01649	0.02852	-0.05702
74	Isotomocrinus minutus	0.08021	0.02314	0.05349	0.01206	0.00790	-0.01591	-0.01490	-0.01122	-0.02920	0.00159
75	*Isotomocrinus n. sp.*	0.08062	0.03407	-0.02655	0.04898	0.02547	0.01288	-0.01849	-0.02498	0.02595	0.03319
76	Isotomocrinus tenuis	0.06661	0.03094	0.06001	0.01803	0.04090	-0.00321	-0.01682	0.01193	0.03547	-0.02550
77	Myelodactylus linae	0.06874	-0.03976	-0.00382	-0.06692	0.04164	-0.04364	-0.06632	0.02753	-0.02096	0.01483
78	*Ohiocrinus brauni*	0.10631	0.05824	0.06205	0.00825	0.03084	0.00893	0.00435	0.00867	0.01155	-0.02109
79	Ohiocrinus exilis	0.06869	-0.02643	0.06936	-0.01658	0.00669	0.03437	-0.02780	-0.03292	0.03011	0.02018

80	*Ohiocrinus laxus*	0.10519	0.05726	0.06170	0.00866	0.03059	0.00990	0.00628	0.01090	0.00791	-0.02189
81	Ohiocrinus levorsoni	0.08901	0.05034	0.03357	0.02200	0.01754	-0.01030	-0.01635	-0.04478	-0.03131	0.00619
82	*Paracremacrinus laticardinalis*	0.12104	0.04139	0.00057	0.02186	-0.05070	-0.00328	0.02504	0.01832	-0.00099	-0.01778
83	Parapisocrinus quinquelobus	0.05256	-0.02371	-0.05527	-0.00358	0.03608	0.02203	-0.02019	-0.02250	0.03038	-0.00860
84	Pariocrinus heterodactylus	0.06834	0.03687	0.03976	0.00946	0.01906	-0.01125	-0.00823	-0.01108	-0.00658	-0.00262
85	*Peltacrinus sculptatus*	0.08940	0.06251	0.01100	0.04454	0.02191	-0.04978	0.00879	-0.02523	-0.02112	-0.04922
86	*Penicillicrinus parvus*	0.09063	0.01858	-0.00410	0.02492	0.01054	-0.01287	-0.01083	0.00659	-0.01775	0.03669
87	*Peniculocrinus milleri*	0.06723	0.01132	0.00207	0.05541	0.03081	-0.03058	-0.04316	0.00940	0.01227	0.02099
88	Pogoniporinus antiquus	0.06505	0.03048	0.03958	0.02013	0.01487	-0.01365	-0.02587	-0.01888	0.02221	-0.00235
89	*Ristnacrinus altobasalis*	0.08941	-0.00388	-0.05761	-0.01131	0.09355	0.02366	-0.01963	0.01154	0.03545	0.01805
90	Stibaraocrinus centervillensis	0.12976	0.04941	-0.01193	0.04119	-0.06878	-0.01583	0.04886	0.02491	0.01173	0.00203
91	Sygcaulocrinus typus	0.08926	0.03624	-0.01373	0.00935	0.02422	-0.01718	-0.01331	-0.00827	-0.00897	0.02047
92	Tenuicrinus longibasalis	0.09122	0.01066	0.03314	0.02388	0.01200	0.02319	-0.02162	-0.00589	-0.03000	-0.01371
93	Thaerocrinus crenatus	0.11282	0.03572	0.01678	0.01337	-0.04758	0.00082	0.03268	0.03275	-0.00103	-0.03996
94	*Tornatilicrinus longicaudis*	0.10569	0.05092	0.04552	0.02941	0.01380	-0.01167	-0.03525	-0.00107	0.01802	-0.01439
95	Trypherocrinus brassfieldensis	0.11352	0.06190	0.01180	0.00213	-0.04747	-0.00020	0.01604	0.02278	-0.00135	0.00418
96	*Tryssocrinus endotomous*	0.10255	0.05471	0.03467	0.04029	0.00425	-0.02145	-0.03809	-0.01412	-0.00202	-0.00326
97	undescribed big disparid I	0.07277	0.02697	-0.02615	0.00964	0.01996	-0.00954	-0.02430	-0.02456	-0.01587	-0.00639
98	undescribed Iocrinid 1b	0.06874	0.02299	0.01056	0.02769	-0.02387	-0.05949	0.01904	-0.05672	-0.01053	-0.04994

99	undescribed iocrinid I	0.07313	0.03257	-0.00652	0.01479	0.00033	-0.03452	0.03987	-0.04303	-0.01027	-0.03339

	Diplobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	Adelpicrinus fortuitus	0.02693	-0.02068	0.03071	0.03053	-0.03445	-0.00831	-0.02108	-0.02913	-0.03865	-0.01673
2	Allozygocrinus dubuquensis	-0.10164	0.01327	-0.01078	-0.02221	-0.06468	0.01118	-0.05385	0.00534	0.01868	-0.02591
3	Allozygocrinus exallos	-0.08766	-0.03209	0.06264	-0.08521	0.01779	0.00347	-0.10925	0.02084	0.01226	-0.02990
4	*Anthracocrinus primitivus*	-0.05198	-0.02168	0.03630	0.02038	0.03127	0.05357	-0.00118	0.02349	0.03122	-0.02797
5	Apoarchaeocrinus anticostiensis	-0.08001	-0.04186	0.00608	-0.00380	0.00694	0.05152	-0.02995	-0.00717	-0.00571	-0.01867
6	*Archaeocrinus buckhornensis*	-0.10673	-0.04190	0.00851	0.02426	-0.05140	0.02735	-0.01505	0.02734	-0.01088	-0.00225
7	*Archaeocrinus conicus*	-0.08800	-0.02277	0.00130	0.01680	-0.06007	0.03998	-0.03357	0.02985	0.00266	-0.02017
8	*Archaeocrinus desideratus*	-0.06588	0.00998	0.05258	0.01956	-0.04853	0.01937	0.00289	0.01920	0.00463	0.00912
9	*Archaeocrinus lacunosus*	-0.10797	-0.01932	0.01075	0.04478	-0.00738	-0.02626	0.05134	0.00056	-0.02062	0.03482
10	Archaeocrinus ottawaensis	-0.12089	-0.08509	-0.02875	-0.07971	0.04189	0.01279	-0.00210	-0.02466	-0.01730	0.00525
11	Archaeocrinus peculiaris	-0.05879	0.00251	-0.00584	0.01894	-0.01690	0.02660	-0.01132	0.00053	-0.02101	-0.00995
12	*Archaeocrinus snyderi*	-0.04944	-0.02930	-0.01686	-0.00475	0.02159	0.01150	0.01282	0.07317	-0.00513	-0.00873
13	*Archaeocrinus subovalis*	-0.07620	-0.02668	0.03096	0.01195	0.00945	-0.00023	0.01648	0.04063	0.00480	0.01770
14	Archeocrinus sp.	-0.06804	0.00916	0.04115	0.02690	-0.08747	0.04629	0.01630	0.01580	-0.02881	0.02505
15	*Balacrinus*	-0.11130	-0.05330	-0.02023	-0.00241	0.00293	-0.04350	0.04545	0.03537	-0.01891	0.01391
16	Becsciecrinus	-0.06511	-0.01934	0.01696	0.01590	0.00453	-0.00074	0.00226	0.02123	-0.00623	0.01924

	adonis										
17	*Bromidocrinus nodosus*	-0.08497	-0.01015	0.04539	0.02338	-0.00523	0.02271	0.03172	-0.01652	-0.00402	-0.02231
18	Bucucrinus saccus	-0.08234	-0.02935	0.02319	0.02210	0.02321	0.05239	-0.03677	-0.00247	0.01166	0.01158
19	*Cleicrinus sculptus*	-0.01818	-0.09269	0.00858	0.00825	-0.07929	-0.06077	-0.01976	-0.08357	0.11429	-0.02587
20	*Cleiocrinus bromidensis*	-0.12406	-0.02605	0.03205	-0.03465	-0.05009	0.01154	-0.04505	0.02796	0.08784	-0.00688
21	*Cleiocrinus laevis*	-0.17688	-0.06399	0.03897	-0.06717	-0.12917	0.01659	0.02485	0.03931	0.03659	0.07139
22	*Cleiocrinus magnificus*	-0.03770	0.01355	-0.01254	0.01803	-0.02893	0.03175	-0.04636	0.03073	0.00150	-0.07143
23	*Cleiocrinus ornatus*	-0.11247	-0.03069	0.03043	-0.00081	-0.05794	-0.01083	-0.05191	0.01734	0.07934	0.00021
24	*Cleiocrinus regius*	-0.08092	0.02814	0.01615	-0.03324	-0.04911	-0.03047	-0.05508	-0.01634	0.07828	0.00855
25	*Cleiocrinus springeri*	0.01566	-0.11910	0.05251	-0.06253	-0.09252	-0.01213	-0.07004	-0.03205	0.11734	-0.00189
26	*Cleiocrinus tessellatus*	-0.01029	-0.13776	0.04201	-0.07063	-0.07035	-0.06496	-0.01222	-0.08453	0.11639	-0.04864
27	Cotylacrinna sandra	-0.09700	-0.06079	-0.01383	-0.00922	0.01158	0.05191	-0.03848	-0.01009	0.01260	0.01181
28	*Crinerocrinus parvicostatus*	-0.10156	-0.05961	0.04168	-0.04389	-0.00590	0.02206	-0.01364	0.02094	-0.01779	-0.00551
29	Cybelecrinus ladas	-0.09994	-0.03016	0.00596	0.02731	0.03440	0.02549	0.02368	-0.03492	-0.02097	0.00641
30	Cybelecrinus nebros	-0.10099	-0.02955	0.04276	0.02385	0.02808	0.03449	0.03404	-0.04050	-0.01586	-0.00406
31	*Diablocrinus*	-0.03091	0.00627	0.01333	0.03580	0.01394	0.03417	-0.01234	0.01516	0.02106	-0.01956
32	Diablocrinus perplexus	-0.07309	-0.01321	0.05571	0.02882	-0.04474	0.03274	-0.00131	0.01064	0.02255	-0.00227
33	Diablocrinus vesperalis	-0.07770	-0.02344	0.06586	0.03343	-0.01044	0.05957	-0.02031	-0.02932	0.01758	0.01104
34	*Diabolocrinus arbucklensis*	-0.09986	-0.03705	0.06129	0.01488	0.01614	0.04832	0.06614	-0.03616	-0.00438	-0.00381
35	*Diabolocrinus constrictus*	-0.09606	-0.02690	0.06238	0.01274	0.01924	0.03989	0.06860	-0.04246	0.00766	0.00013
36	*Diabolocrinus n. sp.*	-0.06801	-0.00229	0.07257	0.02881	-0.03395	0.03894	-0.01373	-0.00431	0.01761	0.00635

37	*Diabolocrinus oklahomensis*	-0.08791	-0.02306	0.05844	0.00902	0.01093	0.05080	0.04842	-0.03688	0.01430	-0.01621
38	Diabolocrinus perplexus	-0.07309	-0.01321	0.05571	0.02882	-0.04474	0.03274	-0.00131	0.01064	0.02255	-0.00227
39	*Diabolocrinus poolevillensis*	-0.09532	-0.02966	0.06117	0.01293	0.01513	0.04651	0.06732	-0.03889	-0.00029	-0.00349
40	*Diabolocrinus vesperalus*	-0.07770	-0.02344	0.06586	0.03343	-0.01044	0.05957	-0.02031	-0.02932	0.01758	0.01104
41	Dimerocrinites elegans	-0.08997	-0.03864	0.01650	0.00955	0.03293	0.03872	0.02090	-0.00033	0.00541	0.01272
42	Dimerocrinites hopkintonesis	-0.08591	-0.02617	-0.06383	0.00415	-0.02281	0.01770	-0.00126	0.02945	-0.03207	0.01925
43	Dimerocrinites scuptus	-0.09852	-0.01936	-0.07647	-0.01278	-0.02180	0.00362	0.00265	0.01166	-0.03514	-0.02256
44	Dimerocrinites sp.	-0.11768	-0.04474	-0.06704	0.00008	-0.00166	-0.02021	0.00476	0.00980	-0.01987	-0.01034
45	Dimerocrinities hopkintonesis	-0.08591	-0.02617	-0.06383	0.00415	-0.02281	0.01770	-0.00126	0.02945	-0.03207	0.01925
46	Eoparisocrinus siluricus	-0.01757	0.06547	-0.00870	0.00234	0.02864	-0.00317	-0.02558	0.01726	0.01450	0.00749
47	*Euptychocrinus fimbriatus*	-0.06506	-0.00470	0.03159	0.02761	-0.00397	0.04809	0.04977	-0.00858	-0.02350	0.04563
48	Euptychocrinus skapaios	-0.07509	-0.01722	0.00260	0.02700	0.00788	0.03010	0.01676	-0.00026	-0.02206	0.02992
49	Forest 2	-0.07571	0.01898	0.04229	0.00802	0.03007	-0.07549	-0.01238	0.03238	-0.07142	-0.02716
50	Gaurocrinus fimbriatus	-0.10382	-0.03679	-0.01926	0.00868	0.02556	-0.03662	0.01889	0.04238	-0.00645	0.00487
51	Gaurocrinus nealli	-0.08339	-0.01480	0.04920	0.03056	-0.00480	0.00344	0.01422	0.03404	-0.00445	0.00440
52	Gnemocrinus fillmorensis	-0.10780	-0.02249	-0.04200	-0.00827	-0.01702	-0.05554	0.01864	-0.01059	-0.08104	0.02329
53	*Gustabilocrinus latomium*	-0.08444	0.00347	-0.00558	0.01924	0.01163	0.05244	-0.01457	-0.00383	0.01194	-0.00795
54	*Gustabilocrinus plektanikaulos*	-0.08465	0.00253	-0.00682	0.01905	0.00900	0.05252	-0.01313	-0.00387	0.01297	-0.00943
55	Habrotecrinus ibexensis	-0.00844	-0.08631	-0.06116	0.03197	0.00272	-0.08424	0.00910	-0.04191	-0.09026	-0.00415
56	Kyreocrinus constellatus	-0.09244	-0.01044	-0.00750	0.00555	-0.03692	0.02807	0.01606	-0.00753	-0.00366	-0.02697

57	Luxocrinus simplex	-0.09030	-0.01821	0.00898	0.01506	-0.02577	0.03075	-0.04646	0.00382	0.01143	-0.02104
58	Nexocrinus delicatulus	-0.07675	-0.02752	0.02695	0.00848	0.01082	0.01909	0.02855	0.05753	0.00500	0.01787
59	Parachaeocrinus convexus	-0.08733	-0.00368	0.00245	0.01330	-0.04354	0.04515	-0.02679	0.00957	-0.03631	-0.01036
60	*Parachaeocrinus decoratus*	-0.10218	-0.02562	-0.00011	0.00842	-0.02307	0.00617	0.04420	-0.02209	-0.02670	0.00767
61	Paradiabolocrinus irregularis	-0.10389	-0.00952	0.03178	0.02213	-0.04175	-0.00662	0.06556	-0.03365	-0.02332	0.01425
62	*Paradiabolocrinus sinuorugosus*	-0.07151	0.00887	0.02526	0.01785	-0.03983	0.03038	-0.01071	-0.00590	-0.00626	-0.00555
63	*Paradiabolocrinus stellatus*	-0.09104	-0.00230	0.07301	0.03307	-0.06404	0.03860	0.02929	-0.01875	-0.02001	0.02307
64	*Pararchaeocrinus convexus*	-0.06708	-0.00282	0.00948	0.02223	-0.06889	0.03420	0.00930	0.02297	-0.01003	0.02792
65	Pregazacrinus hemisphericus	-0.05825	0.00615	0.02207	0.02838	-0.05205	0.06038	0.00063	0.01705	-0.04026	-0.01585
66	Ptychocrinus insperatus	-0.08217	-0.02018	0.01126	0.03182	0.02183	-0.02113	0.02873	-0.00046	-0.02543	-0.00125
67	Ptychocrinus parvus	-0.06970	-0.05486	0.01540	0.02112	0.04240	0.00748	0.04283	0.03098	0.00376	-0.03162
68	Ptychocrinus pentagonus	-0.10700	-0.02623	-0.00543	0.03133	0.00645	-0.01698	0.01359	-0.01648	-0.03710	-0.01279
69	*Ptychocrinus splendens*	-0.08584	-0.01823	0.05402	0.02775	-0.00240	-0.01351	0.04918	-0.00881	-0.01107	-0.00728
70	*Reteocrinus alveolatus*	-0.07319	0.01955	0.00501	-0.00457	-0.00613	-0.04521	-0.07110	0.01890	0.03594	0.04358
71	*Reteocrinus depressus*	-0.08138	0.00495	0.04391	-0.00430	-0.01885	-0.03948	-0.00336	0.01342	0.03463	0.04034
72	*Reteocrinus fenestratus*	-0.03320	0.11903	0.03899	-0.00448	-0.02448	-0.02849	0.01638	-0.05700	-0.01380	0.01898
73	*Reteocrinus magnificus*	-0.09532	-0.03840	-0.01330	-0.01056	0.02497	-0.02731	0.05610	0.04843	0.00856	0.03957
74	Reteocrinus mahlburgi	-0.09308	0.02707	-0.04695	-0.04020	-0.01007	-0.10706	0.02543	-0.00445	0.05386	0.02505
75	*Reteocrinus polki*	-0.10738	0.00281	0.06016	-0.00641	0.00973	-0.08383	0.00388	-0.02078	0.03778	0.07116

76	Reteocrinus rocktnensis	-0.04845	0.07262	0.01920	0.00900	-0.02060	-0.02488	0.02475	-0.02185	0.00675	-0.00851
77	Reteocrinus spinosus	-0.05157	0.07014	0.01711	0.01526	-0.02732	-0.02480	0.02433	-0.02489	0.00971	-0.00350
78	*Reteocrinus stellaris*	-0.08787	0.06687	0.07799	0.00734	0.01268	-0.08350	0.00380	-0.06922	0.01630	0.03378
79	*Reteocrinus variabilicaulis*	-0.09963	0.00753	0.06338	-0.01809	0.02409	-0.07557	0.02526	0.01038	0.05837	0.06126
80	*Reterocrinus sp.*	-0.11201	0.00116	0.05916	-0.00689	0.02733	-0.08330	-0.01920	-0.02256	0.03261	0.04149
81	Rhachicrinus wrighti	-0.09925	-0.03827	0.01922	0.01071	0.00172	-0.01098	0.03355	-0.00619	0.00234	0.00097
82	Rhaphanocrinus buckleyi	-0.09400	-0.05275	0.02076	0.01505	0.02545	0.01584	0.03989	0.00257	0.01256	0.00021
83	*Rhaphanocrinus sculptus*	-0.10608	-0.05656	-0.04592	0.01579	0.01030	0.00889	0.01707	0.00514	0.00901	0.01263
84	Rhaphanocrinus simplex	-0.07711	-0.01803	-0.00627	0.02416	-0.03057	0.01912	0.01161	0.02293	-0.04816	-0.00874
85	*Rhaphanocrinus subnodosus*	-0.09452	-0.03521	-0.00259	0.01894	0.01284	0.00954	0.02200	-0.03976	-0.00939	0.01462
86	Silfonocrinus siluricus	-0.07113	-0.02483	0.02819	0.01277	-0.03338	-0.00176	0.01183	0.04750	-0.01199	0.01373
87	Simplococrinus persculptus	-0.12901	-0.06114	0.02724	-0.00792	0.01072	-0.01079	0.00516	-0.05793	0.05010	0.02189
88	Siphonocrinus nobilis	-0.09502	-0.01272	0.11872	-0.06366	-0.05440	0.00013	0.02070	-0.03028	-0.03978	-0.08875
89	Stereoaster squamosus	-0.08247	-0.02541	0.02298	-0.00281	-0.00146	0.00520	0.01095	0.01051	0.02108	-0.02312
90	Stipatocrinus hulveri	0.00640	-0.05721	0.06622	0.03249	-0.00737	0.03942	-0.00648	-0.02335	0.01227	0.01240
91	Tormosocrinus furberi	-0.06064	0.00625	0.06595	0.03062	0.00709	0.05055	-0.01709	-0.02669	-0.01387	0.02810
92	Traskocrinus mahlburgi	-0.09308	0.02707	-0.04695	-0.04020	-0.01007	-0.10706	0.02543	-0.00445	0.05386	0.02505
93	Turbocrinus punctum	-0.08494	-0.01663	0.00436	0.01444	-0.02971	0.04019	-0.03956	0.00781	0.00407	-0.01087
94	Wilsonicrinus culmensinuosus	-0.07772	-0.01443	0.01108	0.02734	-0.02830	0.02332	-0.04240	0.02056	0.00337	-0.02130

95	Xysmacrinus greenensis	-0.18926	-0.03683	0.02210	-0.03604	-0.04207	-0.03120	-0.05516	-0.04159	0.06959	-0.05409

	Flexibles	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	Clidochirus americanus	-0.03967	0.03490	-0.06698	0.01615	-0.02952	0.00980	-0.02290	0.02259	-0.00841	0.02408
2	*Clidochirus serrulatus*	-0.00101	0.06449	-0.04591	-0.03245	0.02213	0.00866	0.01099	0.06500	0.00228	0.01953
3	Clidochirus ulrichi	-0.04020	0.03601	-0.06746	0.01492	-0.02927	0.00964	-0.02263	0.02253	-0.00956	0.02424
4	Clidocrinus anebo	-0.02611	0.04978	0.00172	-0.00060	-0.00673	-0.00501	-0.03815	-0.00056	-0.02009	0.02458
5	Clidocrinus spirngeri	-0.04283	0.03387	-0.06625	0.01619	-0.02509	0.00789	-0.02245	0.02145	-0.00984	0.02413
6	Hormocrinus quebecensis	-0.03010	-0.02577	0.03147	-0.02060	-0.00002	-0.02177	-0.02093	0.00838	-0.02376	0.04370
7	Kryphosocrinus tetreaulti	-0.04316	-0.00151	-0.03475	-0.03315	-0.00989	0.00701	-0.00347	0.05226	-0.01399	0.01566
8	Ladacrinus synaptos	-0.03888	0.02473	0.00594	0.00067	0.00501	0.00583	-0.02838	0.01441	-0.02160	0.02006
9	Ladacrinus? Sp.	-0.03290	-0.01373	0.00479	0.02068	-0.00970	-0.02448	-0.02453	-0.01729	-0.00699	0.00907
10	Prolixocrinus nodocaudis	-0.01727	0.04434	-0.04038	-0.02602	0.00934	-0.01349	-0.03400	0.03960	-0.04109	0.04460
11	Protaxocrinus cararactensis	-0.03038	0.05313	0.05424	0.01244	0.00087	-0.00029	-0.01774	0.01286	-0.03171	0.01945
12	*Protaxocrinus elegans*	-0.02320	0.02351	-0.01115	0.02130	-0.01589	-0.00389	-0.01658	0.01325	0.01033	0.00183
13	*Protaxocrinus girardeau*	-0.01563	0.07803	0.03316	0.00805	0.00798	0.00832	-0.01428	-0.00100	0.02531	0.00555
14	Protaxocrinus girvanensis	-0.01624	0.02718	-0.00616	0.03516	-0.03124	-0.04652	-0.02011	0.02887	0.00373	0.00448
15	*Protaxocrinus*	-0.03841	0.03949	0.03690	0.02591	-0.01703	0.00394	-0.01941	0.01323	-0.02277	0.02560

	laevis										
16	Protaxocrinus paraios	-0.00540	0.06316	0.00623	-0.09295	0.01852	0.00851	-0.00212	-0.00255	-0.03997	0.00770
17	Protaxocrinus sideros	-0.01405	0.07918	-0.00720	-0.01830	0.03319	0.00152	-0.00534	-0.00811	-0.02504	0.02986
18	Scapanocrinus muricatus	-0.04280	-0.00339	-0.03237	-0.02195	-0.03343	-0.00621	-0.00006	0.05876	-0.02951	0.01292

	Hybocrinoids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Hybocrinus bilateralis*	0.07124	-0.01535	-0.08259	-0.02159	0.01277	0.01515	-0.00132	-0.03284	-0.01133	-0.01607
2	Hybocrinus conicus	0.06962	-0.00630	-0.08451	-0.00943	0.02774	0.02345	0.00998	-0.01601	0.00333	0.00784
3	*Hybocrinus crinerensis*	0.07123	-0.00834	-0.09075	0.02931	0.02090	0.00609	0.00220	-0.03443	0.00432	0.04193
4	*Hybocrinus nitidus*	0.02649	-0.00279	-0.12019	0.08822	0.02665	0.02204	-0.02856	0.02444	0.05690	-0.03146
5	*Hybocrinus perperamnominatus*	0.07558	0.00097	-0.07792	-0.02773	-0.00576	0.01737	0.04369	-0.00549	0.00065	0.04066
6	Hybocrinus punctatocritatus	0.07871	0.00040	-0.08358	-0.03026	-0.00677	0.01718	0.04206	-0.00046	-0.00270	0.03831
7	*Hybocrinus punctatus*	0.07505	-0.00092	-0.08057	-0.02860	-0.01076	0.01757	0.04624	-0.00531	0.00253	0.03751
8	Hybocystis problematicus	0.08723	-0.00915	-0.10535	-0.00341	0.03350	0.02274	0.01976	-0.02774	-0.00113	0.02167
9	*Hybocystites eldonensis*	0.08354	-0.00532	-0.11185	0.00376	0.02334	0.02429	0.01294	-0.02714	-0.00402	0.01921
10	*Hybocystites problematicus*	0.08723	-0.00915	-0.10535	-0.00341	0.03350	0.02274	0.01976	-0.02774	-0.00113	0.02167
11	undescribed hybocrinid	0.06255	-0.01325	-0.08271	-0.00111	0.01074	-0.05469	0.02642	-0.02360	0.00038	-0.02173
12	undescribed Hybocrinus	0.05610	-0.01199	-0.09126	-0.00448	-0.00317	0.01975	0.00249	-0.03021	0.03215	0.01727

	Monobathrids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	Abacocrinus latus	0.01681	-0.09077	0.04016	-0.00812	-0.01977	0.01548	0.01336	-0.01374	-0.03904	0.02622
2	Abacocrinus sp. A	0.00105	-0.10118	0.03347	-0.01283	-0.00511	-0.01708	0.04926	-0.04727	-0.04111	-0.00070
3	Abacocrinus sp. B	0.00044	-0.10257	0.03180	-0.01314	-0.00867	-0.01652	0.05121	-0.04754	-0.03959	-0.00246
4	Abludoglyptocrinus charltoni	-0.00836	-0.11026	-0.01709	-0.00666	0.02501	-0.02541	0.00493	0.01715	0.06688	0.02556
5	*Abludoglyptocrinus charltoni*	-0.00836	-0.11026	-0.01709	-0.00666	0.02501	-0.02541	0.00493	0.01715	0.06688	0.02556
6	*Abludoglyptocrinus laticostatus*	-0.00155	-0.10182	0.02095	0.04327	0.03612	-0.00931	0.06147	-0.01721	0.01209	0.00435
7	Abludoglyptocrinus pustulosus	-0.00311	-0.09454	0.01163	0.03468	0.03272	-0.00663	0.04744	-0.01475	0.00878	-0.02365
8	Acacocrinus anebos	0.01476	-0.05598	0.00150	0.03568	-0.03520	0.02155	-0.01908	0.00139	0.00288	-0.01330
9	Aclistocrinus arctus	0.01641	-0.05629	-0.02462	0.00227	0.02536	0.03464	-0.02111	0.00355	-0.01861	0.05051
10	*Alisocrinus tetrarmatus*	-0.02357	-0.10578	-0.03828	0.02905	0.00781	-0.07336	-0.01816	-0.04808	0.04019	0.03170
11	*Alisocrinus*? *heterodactylus*	0.01443	-0.06162	0.00215	0.03824	0.00427	0.01489	0.00818	-0.01659	-0.01613	0.01736
12	Allocrinus cf. A. sp. Subglobosus	0.02921	-0.09864	-0.04913	0.03186	-0.01950	0.00107	-0.03843	0.03392	0.00386	-0.01824
13	Alopocrinus parvus	0.00074	-0.09177	0.00694	0.04222	0.03531	-0.00456	0.02285	-0.03211	0.00176	-0.02113
14	Archaeocalytpocrinus iowensis	0.02645	-0.13743	-0.04379	0.02900	0.00013	-0.00037	-0.06042	0.04490	-0.01696	-0.02539
15	Archaeocalytpocrinus nodosus	0.02744	-0.13752	-0.05238	0.02593	-0.02282	-0.00320	-0.04736	0.04695	-0.01127	-0.03063
16	Astakocrinus teren	-0.00064	-0.06876	0.00266	0.03478	0.00459	0.04700	-0.00517	-0.01095	0.01349	0.00104
17	Bikocrinus baios	0.02364	-0.11417	0.04726	0.00015	0.04901	-0.04355	0.00857	-0.02273	-0.03808	-0.03122
18	Bolicrinus globosus	0.01620	-0.11700	-0.04672	0.04009	-0.01046	-0.01687	-0.00680	0.02974	-0.01319	0.00023
19	Calliocrinus longispinus	0.05160	-0.07440	0.13772	0.01135	-0.04411	0.01115	-0.01601	-0.01174	0.03305	0.02381

20	Callistocrinus tesselatus	-0.06275	-0.05775	0.00754	-0.08850	-0.03874	-0.00551	0.02145	0.08088	-0.04376	0.04139
21	*Canistrocrinus richardsoni*	0.00889	-0.06881	0.03315	0.03320	0.02283	-0.00750	0.02609	0.03985	0.00966	-0.00001
22	*Canistrocrinus typus*	-0.07900	0.02296	0.05582	0.01574	0.02559	0.00073	0.02532	-0.00675	-0.02305	0.01105
23	Carpocrinus bodei	0.01119	-0.05833	-0.00971	0.02942	-0.03620	0.00250	0.03674	-0.02423	-0.02896	-0.03084
24	*Compsocrinus miamiensis*	0.00517	-0.08485	0.02141	0.03246	0.02627	0.01970	0.02430	0.02143	0.01051	-0.00331
25	*Compsocrinus nodosus*	0.02307	-0.06509	0.00854	0.03525	0.00824	0.01907	0.03037	-0.00326	-0.02503	0.02280
26	*Culicocrinus*? *girardeauensis*	0.01338	-0.06233	0.01572	0.02294	0.02735	0.02507	0.00961	0.01482	0.02253	-0.01672
27	Dynamocrinus robustus	-0.00038	-0.08803	-0.03064	0.00909	0.02744	-0.00041	-0.00247	-0.01949	0.01173	-0.01797
28	*Eopatelliocrinus latibrachiatus*	0.00919	-0.06041	0.00360	0.04733	0.00701	0.02130	-0.01855	-0.00592	0.00435	-0.02134
29	Eopatelliocrinus ornatus	-0.03758	-0.08442	0.01970	0.05069	0.02020	-0.00689	0.06847	-0.01704	0.00035	0.01429
30	*Eopatelliocrinus scyphogracilis*	-0.00387	-0.07996	0.00405	0.04315	0.02823	-0.01084	0.02395	-0.03353	-0.00431	-0.01243
31	Eucalyptocrinites depressus	0.01499	-0.07683	0.00883	0.06666	0.01474	0.03753	-0.02811	0.00222	0.02983	-0.00844
32	Eucalyptocrinites proboscidalis	0.01142	-0.10347	0.04984	-0.01735	-0.03179	0.03567	-0.04391	0.01537	-0.00211	-0.00621
33	Eucalyptocrinus sp. Cf. E. ornatus	0.01580	-0.10516	0.04410	-0.01526	-0.05101	0.03068	-0.02632	0.01530	0.00579	-0.01037
34	Fibrocrinus phragmos	-0.00749	-0.08880	-0.04220	0.01915	0.00190	0.04064	-0.00835	-0.00261	-0.00073	0.02580
35	Forest 3	0.01955	-0.03693	0.04100	0.00967	-0.00636	-0.06732	0.01465	0.00264	-0.04004	-0.00271
36	Forest 4 cleicrinid	0.06882	0.01321	0.06021	0.04378	-0.03561	-0.02265	-0.03372	0.00284	-0.00871	0.01122
37	Forest 5 Cam	-0.03252	-0.02374	0.01349	0.00490	-0.00394	-0.02670	0.00656	-0.00492	0.00230	-0.02117
3	Forest 6	0.01090	-0.03225	0.02055	0.02271	-0.00081	-0.05196	-0.02431	-0.01396	-0.01801	-0.01482

839	Forest 7	0.00273	-0.09504	-0.03550	0.01522	-0.02247	-0.09883	0.00698	0.02352	-0.04205	-0.04142
840	Glyptocrinus	-0.00940	-0.11361	-0.02287	0.01472	0.05929	-0.00928	0.03711	0.01075	0.01694	-0.00461
841	Glyptocrinus charltoni	-0.00836	-0.11026	-0.01709	-0.00666	0.02501	-0.02541	0.00493	0.01715	0.06688	0.02556
842	*Glyptocrinus circumcarinatus*	0.00018	-0.09228	0.01710	0.02579	0.01093	-0.04827	0.04440	-0.00147	-0.00970	-0.02538
843	*Glyptocrinus decadactylus*	-0.00940	-0.11361	-0.02287	0.01472	0.05929	-0.00928	0.03711	0.01075	0.01694	-0.00461
844	*Glyptocrinus fornshelli*	-0.00385	-0.08490	0.02588	0.03902	0.02053	-0.02050	0.04525	0.01006	0.01338	-0.04102
845	Glyptocrinus pustulosis	-0.00311	-0.09454	0.01163	0.03468	0.03272	-0.00663	0.04744	-0.01475	0.00878	-0.02365
846	Glyptocrinus ramulosus	-0.00018	-0.09501	-0.01536	0.01591	0.01713	-0.02281	0.00267	0.02270	-0.00454	0.02195
847	Glyptocrinus tridactylus	0.01228	-0.09188	0.02216	0.03303	-0.02112	-0.05879	0.04566	0.02433	-0.01625	-0.04317
848	Ibanocrinus petalos	0.01173	-0.06357	0.00863	0.04493	-0.02348	0.00197	0.00208	0.00319	-0.00891	0.00976
849	Jovacrinus jugum	0.02128	-0.09693	0.04274	0.00459	0.08612	-0.01563	0.00861	-0.03897	-0.04448	0.01535
850	Jovacrinus spinosus	0.03651	-0.10397	0.05665	0.01289	0.07976	0.02297	-0.02636	-0.00972	-0.05179	0.04606
851	Krinocrinus inflatus	0.02595	-0.10511	-0.06202	0.02616	-0.02535	-0.01491	-0.02084	0.02732	0.00341	-0.03567
852	Kylixocrinus latus	0.03770	-0.08465	0.06671	-0.00312	0.01797	0.05526	0.01432	0.00672	-0.01825	-0.00361
853	Macrostylocrinus compressus	0.04831	-0.13605	-0.03972	-0.02504	-0.02165	0.00527	-0.02555	0.05570	-0.02049	-0.01804
854	Macrostylocrinus jordanensis	0.02687	-0.09517	0.03910	-0.00103	0.02231	0.03427	-0.01790	0.00096	0.00885	-0.00437
855	*Macrostylocrinus pristinus*	0.00413	-0.08379	-0.04173	0.01720	0.02619	-0.00445	-0.00155	-0.01419	0.01549	-0.01038
856	Macrostylocrinus sp. A.	0.04831	-0.13605	-0.03972	-0.02504	-0.02165	0.00527	-0.02555	0.05570	-0.02049	-0.01804

57	Macrostylocrinus sp. C	0.04372	-0.12358	-0.02796	-0.02193	-0.00540	0.00793	-0.02700	0.04509	-0.01806	-0.01031
58	Macrostylocrinus sp. D	0.03945	-0.12935	-0.02481	-0.02339	-0.00786	0.00485	-0.02874	0.04410	-0.02094	-0.00985
59	Macrostylocrinus sp. E.	0.04967	-0.13707	-0.04029	-0.02456	-0.02353	0.00465	-0.02444	0.05726	-0.02088	-0.01820
60	Macrostylocrinus vermiculatus	0.05775	-0.14729	-0.04233	-0.02136	-0.04427	0.00037	-0.00204	0.06467	-0.02141	0.01408
61	Macrostylocrinus wyomingensis	0.02750	-0.10545	-0.01774	-0.02044	0.02218	0.03054	-0.02498	0.01206	-0.00108	0.01805
62	Manticrinus exaitos	0.00548	-0.09171	-0.03897	0.03266	0.00902	0.02249	-0.02420	0.01280	0.01599	0.00897
63	Marsupiocrinus primaevus	0.01050	-0.11636	-0.05302	0.03528	0.00280	-0.03683	-0.01328	-0.01335	0.00857	-0.02828
64	Paiderocrinus asketos	0.02221	-0.08143	0.02978	-0.00508	0.01996	0.03206	-0.02029	-0.01702	0.00999	-0.00486
65	Paiderocrinus ochthos	0.03825	-0.07803	0.03539	-0.01172	0.00214	0.01423	-0.03254	0.00411	0.00261	-0.02587
66	Patelliocrinus planus	-0.00460	-0.08214	0.00866	0.04443	-0.00818	0.02965	-0.01187	-0.02001	-0.01094	0.00276
67	Perichocrinus sp. B	-0.00148	-0.11233	-0.05660	0.01964	-0.03395	-0.00642	-0.00633	0.02672	-0.00505	0.01768
68	periehocrinus incertae sedis	0.01117	-0.05350	0.01150	0.07573	0.02657	-0.01432	-0.03351	-0.06502	-0.00780	-0.01813
69	*Periglyptocrinus billingsi*	0.00020	-0.09714	0.00531	0.04063	0.01018	-0.01895	0.02102	-0.03523	-0.00921	-0.02395
70	*Periglyptocrinus priscus*	0.00878	-0.05637	0.04142	0.04841	-0.01032	-0.04360	0.03524	-0.03102	0.00134	-0.01364
71	Periglyptocrinus spinuliferus	-0.00723	-0.11159	-0.04797	0.05557	0.03190	-0.02074	0.04723	-0.02298	-0.03345	0.03117
72	Phrygilocrinus batheri	0.03092	-0.06200	0.00025	0.04106	-0.02111	0.01640	-0.03420	-0.00641	-0.01458	-0.02351
73	Pycnocrinus dyeri	-0.00792	-0.10259	-0.01764	0.01612	0.02514	-0.04383	0.03770	0.01778	0.00060	-0.00002
74	Pycnocrinus multibrachialis	-0.00711	-0.10001	-0.02655	0.01040	0.05216	-0.05204	0.03580	0.02865	0.00702	-0.00515
7	Pycnocrinus	-0.00018	-0.09501	-0.01536	0.01591	0.01713	-0.02281	0.00267	0.02270	-0.00454	0.02195

5	ramulosus										
76	Pycnocrinus sardesoni	-0.00918	-0.12250	-0.04083	0.01527	0.03082	-0.01113	0.04752	-0.02072	-0.01228	-0.00307
77	Pycnocrinus shafferi	0.01567	-0.06188	-0.00404	0.00873	0.05376	-0.04751	-0.01795	0.00754	-0.00947	0.00228
78	*Schizocrinus nodosus*	0.00533	-0.07434	-0.01437	0.00361	0.02762	-0.00315	-0.00591	0.04446	0.02462	-0.00721
79	*Schizocrinus striatus*	0.03628	-0.03429	0.01807	0.03705	0.01461	-0.00842	-0.04568	0.00438	-0.00021	0.01364
80	Theleproktocrinus davidsoni	0.01932	-0.08215	-0.05712	0.03311	-0.02626	0.00477	-0.01969	0.01671	-0.03235	-0.00855
81	Thomasocrinus cylindrica	0.03581	-0.09288	-0.04646	0.03322	-0.00640	-0.00318	-0.04963	0.03597	-0.00284	-0.01238
82	Tirocrinus trochos	-0.01567	-0.09951	0.02110	0.05974	0.01890	0.01192	0.00004	-0.01750	0.05963	0.04626
83	Typannocrinus strombos	0.00499	-0.10857	-0.01969	-0.01874	0.03751	-0.00653	-0.00496	-0.02256	-0.00402	-0.00511
84	Xenocrinus baeri	-0.01842	-0.09449	-0.04562	0.06029	0.01246	0.01079	-0.00645	0.00047	0.00951	0.04228
85	Xenocrinus penicillus	-0.02418	-0.10459	-0.02862	0.01748	-0.00711	0.00884	-0.00067	0.00387	0.00926	0.04119
86	Xenocrinus rubus	0.00333	-0.06268	0.01580	0.02639	0.01110	0.04056	-0.00184	-0.01440	0.00769	-0.00408
87	Zirocrinus litos	0.00907	-0.10642	0.03251	0.00843	0.03141	-0.01521	0.04191	-0.03463	-0.01083	0.01903

	Protocrinoids	PCO 1	PCO 2	PCO 3	PCO 4	PCO 5	PCO 6	PCO 7	PCO 8	PCO 9	PCO 10
1	*Eknomocrinus wahwahensis*	0.00049	-0.04905	-0.04466	-0.01267	-0.04108	-0.05780	-0.03722	-0.03163	-0.01831	0.04853
2	*Glenocrinus globularis*	-0.12554	0.03395	-0.06462	0.00815	-0.04616	-0.06194	-0.09329	-0.00290	-0.03241	0.04365
3	*Titanocrinus sumralli*	-0.15543	-0.00595	-0.07670	-0.00559	-0.03778	-0.11138	-0.01412	-0.04347	-0.04218	0.04945

APPENDIX 11

Biofacies descriptions

The location, species, and number of species and specimens for each of the biofacies examined in Chapter 3. Biofacies specimen totals that are based on relative abundance are denoted with a star. References are given from which morphologic, geographic, stratigraphic, and abundance data were taken.

Biofacies	Location	Time bin(s)	Species	Specimens
Fillmore Fm. and Wah Wah Fm.	UT	1,2	4	6

Species	Abundance
Glenocrinus globularis	1
Titanocrinus sumralli	3
Eknomocrinus wahwahensis	1
undescribed Iocrinid 1b	1

Biofacies	Location	Time bin(s)	Species	Specimens
Garden City Fm.	ID	2	11	19

Species	Abundance
Forest ?	1
Forest 13 cladid	2
Forest 15	1
Forest 18	1
Forest 2	1
Forest 3	3
Forest 4 cleicrinid	3
Forest 5 Cam	1
Forest 6	1
Forest 7	3
Forest 9 Disparid	2

Biofacies	Location	Time bin(s)	Species	Specimens
Lower Fillmore Fm.	UT	3	3	7*

Species	Abundance
Gnemocrinus fillmorensis	4
Pogoniporinus antiquus	2
undescribed Hybocrinus	1

Biofacies	Location	Time bin(s)	Species	Specimens
Upper Fillmore Fm. 2	UT	3	7	7

Species	Abundance
Adelpicrinus fortuitus	~1
Habrotecrinus ibexensis	~1
undescribed iocrinid I	1
undescribed big disparid I	1
undescribed cladid I1	1
undescribed cladid I2	1
undescribed hybocrinid	1

Biofacies	Location	Time bin(s)	Species	Specimens
Benbolt Fm.	TN, VI	9	25	422

Species	Abundance
Acolocrinus hydraulicus	8
Agostocrinus xenus	2
Apodasmocrinus punctatus	6
Archaeocrinus peculiaris	35
Carabocrinus cf. treadwelli	2
Carabocrinus micropunctatus	3
Carabocrinus stellifer	6
Cremacrinus latus	1
Diabolocrinus n. sp.	2
Diabolocrinus vesperalus	200
Difficilicrinus coneyi	2
Geraocrinus sculptus	1
Hybocrinus perperamnominatus	1
Hybocrinus punctatocritatus	99
Hybocrinus punctatus	13
Isotomocrinus n. sp.	1
Palaeocrinus avondalensis	1
Palaeocrinus planobasalis	30
Paradiabolocrinus irregularis	3
Paradiabolocrinus sinuorugosus	1
Pararchaeocrinus convexus	1
Rhaphanocrinus simplex	1
Ristnacrinus altobasalis	1
Triboloporus cryptoplicatus	1
Wilsonicrinus culmeninuosus	1

Biofacies	Location	Time bin(s)	Species	Specimens
Cobourg Mbr., Ottawa Fm.	Ontario	12	6	na

Species	Abundance
Archaeocrinus ottawaensis	2
Eopatelliocrinus ornatus	?
Pycnocrinus ramulosus	?
Cincinnaticrinus varibrachialus	?
Ectenocrinus simplex	?
Iocrinus similis	1

Biofacies	Location	Time bin(s)	Species	Specimens
Curdsville Mbr., Hermitage Fm	KY	10, 11	20	113*

Species	Abundance
Archaeocrinus microbasalis	21
Carabocrinus huronensis	1
Carabocrinus radiatus	~3
Carabocrinus treadwelli	~3
Carabocrinus vancortlandi	~1
Cleicrinus sculptus	2
Cremacrinus articulosus v1	1
Cremacrinus kentuckyensis	2
Cupulocrinus humilis	4
Cupulocrinus jewetti	53
Dendrocrinus aculidatylus	5
Hybocrinus conicus	4
Hybocystis problematicus	2
Hybocystites eldonensis	2
Palaeocrinus angulatus	2
Peniculocrinus milleri	1
Periglyptocrinus priscus	2
Porocrinus kentuckyensis	1
Porocrinus smithi	1
Reteocrinus alveolatus	2

Biofacies	Location	Time bin(s)	Species	Specimens
Cynthiana Fm	KY	12	5	129*

Species	Abundance
Simplococrinus persculptus	3
Ectenocrinus geniculatus	~5
Ectenocrinus simplex	~100
Ohiocrinus exilis	1
Plicodendrocrinus	~20

Biofacies	Location	Time bin(s)	Species	Specimens
Decorah Subgroup	IL, WI, MN	10, 11	13	95

Species	Abundance
Carabocrinus dicyclicus	5
Carabocrinus magnificus	1
Cremacrinus punctatus	50
Cupulocrinus canaliculatus	7
Cupulocrinus jewetti	13
Glyptocrinus tridactylus	1
Grenprisia billingsi	3
Isotomocrinus tenuis	1
Palaeocrinus angulatus	4
Periglyptocrinus spinuliferus	3
Porocrinus pentagonius	3
Pycnocrinus multibrachialis	1
Pycnocrinus sardesoni	3

Biofacies	Location	Time bin(s)	Species	Specimens
Dryden Ls.	VA	9	5	na

Species	Abundance
Paradiabolocrinus sinuorugosus	?
Hybocrinus punctatocristatus	?
Carabocrinus micropunctatus	?
Carabocrinus cf. tradwelli	?
Palaeocrinus planobasalis	?

Biofacies	Location	Time bin(s)	Species	Specimens
Dunlieth Fm., Galena Group	IL, WI, MN	10	10	136*

Species	Abundance
Calceocrinus gossmani	3
Caleidocrinus (Huxleyocrinus) gerki	1
Carabocrinus oogyi	3
Cleiocrinus regius	~2
Cotylacrinna sandra	~100
Cremacrinus gerki	1
Eopatelliocrinus ornatus	9
Hybocrinus conicus	~2
Isotomocrinus tenuis	~2
Ohiocrinus levorsoni	13

Biofacies	Location	Time bin(s)	Species	Specimens
Upper Fort Atkinson Fm.	IA, IO	12, 13	5	28*

Species	Abundance
Calceocrinus leversoni	13
Carabocrinus slocomi	3
Cupulocrinus latibrachiatus?	~1
Porocrinus fayettensis	9
Sygcaulocrinus typus	2

Biofacies	Location	Time bin(s)	Species	Specimens
Grand Detour Fm.	IL, WI	10, 11	9	38

Species	Abundance
Abludoglyptocrinus charltoni	7
Abludoglyptocrinus pustulosus	1
Cremacrinus forrestonesis	1
Cupulocrinus plattevillensis	8
Isotomocrinus minutus	3
Porocrinus sp. Sf. P. smithi	10
Quinquecaudex springeri	5
Reteocrinus mahlburgi	1
Rhaphanocrinus buckleyi	2

Biofacies	Location	Time bin(s)	Species	Specimens
Guttenberg Fm.	IL, WI	10, 11	4	12

Species	Abundance
Reteocrinus rocktnensis	2
Reteocrinus spinosus	1
Cremacrinus guttenbergensis	3
Cupulocrinus levorsoni	6

Biofacies	Location	Time bin(s)	Species	Specimens
Heiskell Fm.	TN	9	3	na

Species	Abundance
Archaeocrinus peculiaris	?
Diablocrinus perplexus	?
Diablocrinus vesperalis	?

Biofacies	Location	Time bin(s)	Species	Specimens
Hull Mbr., Ottawa Fm.	Ontario	10, 11	39	938*

Species	Abundance
Archaeocrinus lacunosus	~12
Archaeocrinus microbasalis	~20
Carabocrinus radiatus	27
Cincinnaticrinus varibrachialus	60
Cleiocrinus magnificus	20
Cleiocrinus regius	20
Cremacrinus articulosus	5
Cupulocrinus cylindricus	~20
Cupulocrinus humilis	~20
Cupulocrinus jewetti	~400
Daedalocrinus bellevillensis	10
Daedalocrinus kirki	10
Dendrocrinus aculidactylus	~10
Ectenocrinus simplex	20
Eopatelliocrinus ornatus	5
Eustenocrinus springeri	5
Glaucocrinus falconeri	1
Glyptocrinus circumcarinatus	2
Glyptocrinus ramulosus	60
Grenprisia billingsi	4
Grenprisia springeri	4
Hybocrinus conicus	3
Hybocystites eldonensis	100
Hybocystites problematicus	1
Isotomocrinus typus	10
Ottawacrinus typus	10

Palaeocrinus angulatus	5
Palaeocrinus pulchellus	5
Palaeocrinus rhombiferus	5
Periglyptocrinus billingsi	10
Plicodendrocrinus proboscidiatus	5
Porocrinus conicus	2
Porocrinus smithi	2
Praecupulocrinus conjugans	15
Protaxocrinus elegans	3
Protaxocrinus laevis	2
Reteocrinus alveolatus	10
Reteocrinus stellaris	15

Biofacies	Location	Time bin(s)	Species	Specimens
Kimmswick Ls.	MO	10, 11	4	6

Species	Abundance	References
Porocrinus petersenae	1	
Carabocrinus sp.	2	
Paleocrinus sp.	2	
Iocrinid	1	

Biofacies	Location	Time bin(s)	Species	Specimens
Lebanon Ls.	TN	9	26	187

Species	Abundance
Abludoglyptocrinus charltoni	13
Anomalocrinus antiquus	1
Apodasmocrinus sp. cf. *A. daubei*	1
Archaeocrinus snyderi	1
Balacrinus	1
Carabocrinus	8
Cleiocrinus laevis	1
Cleiocrinus springeri	1
Cleiocrinus tessellatus	21
Columbicrinus crassus	16
Cremacrinus	2
Cupulocrinus species cf. *C. gracilis*	2
Diablocrinus	4
Doliocrinus monilicaulis	1
Gustabilocrinus latomium	2
Gustabilocrinus plektanikaulos	25
Hybocrinus bilateralis	14
Porocrinus lebanonensis	4
Quinquecaudex species A	2
Reteocrinus fenestratus	5
Reteocrinus polki	9
Reteocrinus variabilicaulis	12
Reterocrinus sp.	1
Tornatilicrinus longicaudis	2
Tryssocrinus endotomous	37
Undescribed cladid 1	1

Biofacies	Location	Time bin(s)	Species	Specimens
Lincolnshire Fm.	TN, VA	9	7	44

Species	Abundance
Apodasmocrinus punctatus	6
Rhaphanocrinus simplex	1
Wilsonicrinus culmensinuosus	1
Carabocrinus micropunctatus	3
Carabocrinus cf. treadwelli	2
Palaeocrinus avondalensis	1
Palaeocrinus planobasalis	30

Biofacies	Location	Time bin(s)	Species	Specimens
Mifflin Fm.	IL	9	3	48

Species	Abundance
Abludoglyptocrinus charltoni	7
Cupulocrinus gracilis	40
Merocrinus britonensis	1

Biofacies	Location	Time bin(s)	Species	Specimens
Mountain Lake Mbr., Bromide Fm.	OK	9	20	4471

Species	Abundance
Acolocrinus arbucklensis	2
Agostocrinus xenus	1
Apodasmocrinus daubei	39
Archaeocrinus buckhornensis	10
Archaeocrinus conicus	26
Bromidocrinus nodosus	2
Carabocrinus treadwelli	196
Colpodecrinus quadrifidus	2
Columbicrinus sulphurensis	1
Dendrocrinus villosus	1
Diabolocrinus arbucklensis	108
Diabolocrinus constrictus	1
Doliocrinus pustulatus	5
Eopinnacrinus pinnulatus	14
Hybocrinus nitidus	3447
Palaeocrinus hudsoni	513
Palaeocrinus sp. cf. *P. planobasalis*	1
Paracremacrinus laticardinalis	99
Paradiabolocrinus stellatus	1
Reteocrinus depressus	2

Biofacies	Location	Time bin(s)	Species	Specimens
Ottosee Sh.	TN	9	8	25*

Species	Abundance
Archeocrinus sp.	~1
Carabocrinus cf. treadwelli	2
Carabocrinus stellifer	6
Cleiocrinus magnificus	1
Diabolocrinus perplexus	8
Geraocrinus sculptus	1
Palaeocrinus planobasalis	5
Paradiabolocrinus sinuorugosus	1

Biofacies	Location	Time bin(s)	Species	Specimens
Platteville Group	IL, WI, MN	9	13	105

Species	Abundance
Anulocrinus forrestonensis	1
Cremacrinus arctus	17
Cupulocrinus gacilis	40
Cupulocrinus molanderi	6
Cupulocrinus plattevillensis	13
Glyptocrinus charltoni	7
Glyptocrinus pustulosis	1
Isotomocrinus minutus	3
Porocrinus cf. smithi	10
Porocrinus pentagonius	2
Reteocrinus spinosus	1
Rhaphanocrinus buckleyi	3
Traskocrinus mahlburgi	1

Biofacies	Location	Time bin(s)	Species	Specimens
Pooleville Mbr., Bromide Fm.	OK	9	18	469

Species	Abundance
Abludoglyptocrinus laticostatus	7
Acolocrinus crinerensis	1
Anthracocrinus primitivus	35
Archaeocrinus subovalis	180
Calceocrinus longifrons	15
Cleiocrinus bromidensis	12
Cleiocrinus ornatus	2
Cremacrinus ramifer	65
Crinerocrinus parvicostatus	1
Diabolocrinus oklahomensis	1
Diabolocrinus poolevillensis	41
Hybocrinus crinerensis	40
Merocrinus impressus	1
Parachaeocrinus decoratus	26
Peltacrinus sculptatus	18
Penicillicrinus parvus	2
Porocrinus bromidensis	21
Quinquecaudex glabellus	1

Biofacies	Location	Time bin(s)	Species	Specimens
Rivoli Mbr, Dunleith Fm.	IA, IL	10	3	na

Species	Abundance
Euptychocrinus skapaios	?
Abludoglyptocrinus charltoni	?
Ectenocrinus simplex	?

Biofacies	Location	Time bin(s)	Species	Specimens
Sherman Fall Mbr., Ottawa Fm.	Ontario	12	3	na

Species	Abundance
Glyptocrinus ramulosus	?
Cincinncaticrinus varibrachialus	?
Ectenocrinus simplex	?

Biofacies	Location	Time bin(s)	Species	Specimens
Sherwood Mbr., Dunleith Fm.	IA, IL	10	8	28

Species	Abundance
Calceocrinus grossmani	1
Caleidocrinus gerki	1
Cremacrinus gerki	2
Cremacrinus guttenbergensis	3
Ectenocrinus simplex	5
Eopatelliocrinus ornatus	10
Euptychocrinus skapaios	1
Hybocrinus conicus	~5

Biofacies	Location	Time bin(s)	Species	Specimens
Sinsinewa Mbr., Wisf Lake Fm.	IA, IL	11	6	na

Species	Abundance
Carabocrinus radiatus	3
Cremacrinus punctatus?	?
Ectenocrinus simplex	?
Porocrinus pentagonius	?
Praecupulocrinus conjugans	14
Quinquecaudex springeri	?

Biofacies	Location	Time bin(s)	Species	Specimens
Spechts Ferry Fm.	MN	9, 10	3	24

Species	Abundance
Cremacrinus punctatus	19
Carabocrinus conoideus	1
Carabocrinus dicyclicus	4

Biofacies	Location	Time bin(s)	Species	Specimens
Trenton Ls.	NY, Ontario, MI	10	17	303*

Species	Abundance
?*Ectenocrinus simplex*	87
Archaeocrinus desideratus	5
Calceocrinus barrandii	3
Cincinnaticrinus varibrachialus	~80
Cremacrinus guttenbergensis	~20
Cupulocrinus heterocostalis	5
Dendrocrinus alternatus	5
Dendrocrinus gracilis	5
Iocrinus trentonensis	73
Isotomocrinus tenuis	3
Merocrinus corroboratus	3
Merocrinus typus	3
Plicodendrocrinus proboscidiatus	3
Quinquecaudex springeri	3
Rhaphanocrinus subnodosus	1
Schizocrinus nodosus	2
Schizocrinus striatus	2

Biofacies	Location	Time bin(s)	Species	Specimens
Wardell Fm.	TN	9	3	34

Species	Abundance
Parachaeocrinus convexus	1
Paradiabolocrinus irregularis	3
Palaeocrinus planobasalis	30

Biofacies	Location	Time bin(s)	Species	Specimens
Big Horn Dm.	MT	14, 15	4	10

Species	Abundance
Macrostylocrinus wyomingensis	2
Cupulocrinus sp.	4
Dendrocrinus sp.	3
Ectenocrinus sp.	1

Biofacies	Location	Time bin(s)	Species	Specimens
Cyrene Fm.	MO	16	3	7

Species	Abundance
Ptychocrinus insperatus	2
Ptychocrinus pentagonus	1
Calceocrinus alleni	4

Biofacies	Location	Time bin(s)	Species	Specimens
Correyville Fm.	OH, KY, IN	12, 13	9	49*

Species	Abundance
Anomalocrinus incurvus	~2
Cincinnaticrinus pentagonus	1
Dystactocrinus constrictus	1
Glptyocrinus decadactylus	1
Iocrinus subcrassus	17
Ptychocrinus parvus	~5
Pycnocrinus dyeri	16
Pycnocrinus shafferi	2
Quinquecaudex cincinnatiensis	4

Biofacies	Location	Time bin(s)	Species	Specimens
Fairview Fm.	OH, KY, IN	12, 13	11	677

Species	Abundance
Anomalocrinus incurvus	3
Cincinnaticrinus pentagonus	39
Cincinnaticrinus varibrachialis	1
Dystactocrinus constrictus	7
Ectenocrinus simplex	6
Glyptocrinus decadactylus	500
Iocrinus subcrassus	107
Ohiocrinus brauni	3
Ohiocrinus laxus	1
Ptychocrinus parvus	7
Quinquecaudex cincinnatiensis	3

Biofacies	Location	Time bin(s)	Species	Specimens
Girardeau Ls.	MO	16	15	196

Species	Abundance
Alisocrinus tetrarmatus	23
Alisocrinus? *heterodactylus*	7
Clidochirus serrulatus	1
Compsocrinus nodosus	2
Culicocrinus? *girardeauensis*	1
Dendrocrinus constrictus	1
Dendrocrinus curvijunctus	1
Dendrocrinus n. sp. aff. *navigiolum*	3
Eopatelliocrinus latibrachiatus	14
Eopatelliocrinus scyphogracilis	21
Euptychocrinus fimbriatus	52
Macrostylocrinus pristinus	20
Plicodendrocrinus casei	3
Protaxocrinus girardeau	2
Ptychocrinus splendens	45

Biofacies	Location	Time bin(s)	Species	Specimens
Kope Fm.	OH, KY, IN	11, 12	8	834*

Species	Abundance
Dendrocrinus navigiolum	~5
Merocrinus curtus	~10
Cincinnaticrinus varibrachialis	~300
Ectenocrinus geniculatus	~3
Ectenocrinus simplex	~500
Iocrinus subcrassus	~10
Tenuicrinus longibasalis	2
Glyptocrinus sp.	4

Biofacies	Location	Time bin(s)	Species	Specimens
Laframboise Mbr., Ellis Bay Fm.	Anticosti Island	16	5	46*

Species	Abundance
Xenocrinus rubus	~20
Dendrocrinus leptos	8
Euspirocrinus gagnoni	10
Charactocrinus billingsi	1
Protaxocrinus paraios	7

Biofacies	Location	Time bin(s)	Species	Specimens
La Vache Mbr., Vauréal Fm.	Anticosti Island	15	6	90

Species	Abundance
Gaurocrinus fimbriatus	60
Cupulocrinus latibrachiatus	20
Dendrocrinus minutus	1
Plicodendrocrinus observationensis	3
Plicodendrocrinus epinettensis	2
Eomyelocrinus sp.	4

Biofacies	Location	Time bin(s)	Species	Specimens
Liberty Fm.	OH, KY, IN	14, 15	5	57

Species	Abundance
Gaurocrinus nealli	5
Xenocrinus penicillus	43
Cupulocrinus polydactylus	4
Iocrinus subcrassus	1
Cincinnaticrinus pentagonus	4

Biofacies	Location	Time bin(s)	Species	Specimens
Lousy Cove Mbr., Ellis Bay Fm.	Anticosti Island	16	4	155

Species	Abundance
Astakocrinus teren	3
Xenocrinus rubus	140
Euspirocrinus gagnoni	10
Calceocrinus gamachicus	2

Biofacies	Location	Time bin(s)	Species	Specimens
Maquoketa Sh.	IA	14, 15	8	57*

Species	Abundance
Calceocrinus levorsoni	13
Carabocrinus slocomi	3
Clidocrinus anebo	1
Ectencrinus simplex	20
Plicodendrocrinus casei	8
Porocrinus fayettensis	9
Protaxocrinus girvanensis	1
Sygcaulocrinus typus	~2

Biofacies	Location	Time bin(s)	Species	Specimens
Waynesville Fm.	OH, KY, IN	14, 15	15	108

Species	Abundance
Canistrocrinus richardsoni	1
Canistrocrinus typus	5
Cincinnaticrinus pentagonus	5
Compsocrinus miamiensis	1
Cupulocrinus minimus	2
Cupulocrinus plolydactylus	8
Dendrocrinus cauduceus	17
Dendrocrinus posticus	3
Gaurocrinus nealli	14
Glyptocrinus fornshelli	20
Iocrinus subcrassus	5
Ohiocrinus	1
Plicodendrocrinus casei	18
Reteocrinus magnificus	4
Rhaphanocrinus sculptus	4

Biofacies	Location	Time bin(s)	Species	Specimens
Whitewater Fm.	OH, KY, IN	14, 15	5	40*

Species	Abundance
Xenocrinus baeri	10
Dendrocrinus caudeus	8
Cupulocrinus polydactylus	7
Plicodendrocrinus casei	10
Cincinnaticrinus pentagonus	~5

Biofacies	Location	Time bin(s)	Species	Specimens
Cabot Head Fm.	NY, Ontario	17	10	73

Species	Abundance
Calceocrinus tridactylus	3
Cataractocrinus clementi	10
Dendrocrinus parvus	8
Diaphorocrinus pleniramulus	3
Homocrinus diminutus	6
Kylixocrinus latus	16
Macrostylocrinus jordanensis	8
Nexocrinus delicatulus	4
Pariocrinus heterodactylus	11
Protaxocrinus cararactensis	4

Biofacies	Location	Time bin(s)	Species	Specimens
Fox Point Mbr., Becscie Fm.	Anticosti Island	17	5	29

Species	Abundance
Becsciecrinus adonis	16
Alopocrinus parvus	4
Eomyelodactylus sp.	1
Eustenocrinidae Indeterminate	1
Protaxocrinus paraios	7

Biofacies	Location	Time bin(s)	Species	Specimens
Chabot Mbr., Becscie Fm.	Anticosti Island	17	3	24

Species	Abundance
Apoarchaeocrinus anticostiensis	7
Becsciecrinus adonis	16
Dendrocrinus leptos	1

Biofacies	Location	Time bin(s)	Species	Specimens
Brassfield Fm.	OH	18	32	125

Species	Abundance
? Myelodacylus sp.	1
?Euspirocrinus sp	2
Acacocrinus anebos	1
Bikocrinus baios	2
Calceocrinus incertus	4
Clematocrinus ohioensis	5
Clidochirus americanus	9
Clidochirus ulrichi	1
Clidocrinus spirngeri	3
Dendrocrinus daytonensis	3
Eomyelodactylus rotundatus	1
Eoparisocrinus siluricus	3
Euspirocrinus heliktos	1
Ibanocrinus petalos	3
Kanabinocrinus thyaros	2
Kyreocrinus constellatus	3
Manticrinus exaitos	10
Paiderocrinus asketos	1
Paiderocrinus ochthos	5
Patelliocrinus planus	4
periehocrinus incertae sedis	4
Phrygilocrinus batheri	14
Rhachicrinus wrighti	5
Silfonocrinus siluricus	8
Stereoaster squamosus	15
Stibaraocrinus centervillensis	6
Tirocrinus trochos	1
Trypherocrinus brassfieldensis	2
Turbocrinus punctum	1
Typannocrinus strombos	1
Xysmacrinus greenensis	1
Zirocrinus litos	3

Biofacies	Location	Time bin(s)	Species	Specimens
East Point Mbr., Jupiter Fm.	Anticosti Island	18	4	62

Species	Abundance
Fibrocrinus phragmos	~50
Eomyelodactylus foerstei	~2
Hormocrinus quebecensis	2
Ladacrinus synaptos	8

Biofacies	Location	Time bin(s)	Species	Specimens
Goéland Mbr., Jupiter Fm.	Anticosti Island	18	6	51

Species	Abundance
Bucucrinus saccus	2
Cybelecrinus ladas	16
Eomyelodactylus sparteus	5
Eomyelodactylus forestei	~2
Eomyelodactylus springeri	2
Protaxocrinus sideros	24

Biofacies	Location	Time bin(s)	Species	Specimens
Hickory Corners Mbr. (basal portion), Reynales Fm.	NY	18	7	34

Species	Abundance
Dynamocrinus robustus	1
Eomyelodactylus ?plumosus	~1
Eomyelodactylus sparteus	5
Eomyelodactylus uniformis	3
Haptocrinus calvatus	14
Thaerocrinus crenatus	6
Prolixocrinus nodocaudis	4

Biofacies	Location	Time bin(s)	Species	Specimens
MacGilvray Mbr., Gun River Fm.	Anticosti Island	18	4	27

Species	Abundance
Stipatocrinus hulveri	1
Laurucrinus sandtopensis	14
Eomyelodactylus sparteus	5
Eomyelodactylus richardsoni	7

Biofacies	Location	Time bin(s)	Species	Specimens
Richardson Mbr., Jupiter Fm.	Anticosti Island	18	3	30

Species	Abundance
Fragucrinus bothros	1
Eomyelodactylus sparteus	5
Protaxocrinus sideros	24

Biofacies	Location	Time bin(s)	Species	Specimens
Wallington Mbr., Reynales Fm.	NY	18	3	32

Species	Abundance
Stipatocrinus hulveri	15
Eomyelodactylus uniformis	3
Haptocrinus calvatus	14

Biofacies	Location	Time bin(s)	Species	Specimens
Chicotte Fm.	Anticosti Island	19	10	39

Species	Abundance
Abacocrinus latus	17
Abacocrinus sp. A	9
Abacocrinus sp. B	5
Allozygocrinus exallos	1
Corvucrinus schucherti	1
Ladacrinus? Sp.	1
Levicyathocrinites sablensis	1
Myososcrinus chicottensis	2
Parapisocrinus quinquelobus	1
Salinocrinus conus	1

Biofacies	Location	Time bin(s)	Species	Specimens
Cybele Mbr., Jupiter Fm.	Anticosti Island	19	6	57*

Species	Abundance
Aetocrinus gracilus	9
Cybelecrinus ladas	16
Cybelecrinus nebros	1
Eomyelodactylus sparteus	5
Eomylodactylus forestei	~2
Protaxocrinus sideros	~24

Biofacies	Location	Time bin(s)	Species	Specimens
Middle Farmers Creek Mbr, Hopkinton Fm.	IA	19	13	552

Species	Abundance
Allocrinus sp. A. subglobosus	17
Archaeocalytpocrinus iowensis	6
Archaeocalytpocrinus nodosus	13
Bolicrinus deflatus	13
Bolicrinus globosus	100
Carpocrinus bodei	9
Krinocrinus inflatus	27
Macrostylocrinus sp. C	1
Macrostylocrinus sp. D	7
Macrostylocrinus sp. E	5
Marsupiocrinus (Amarsupiocrinus) primaevus	220
Theleproktocrinus davidsoni	117
Thomasocrinus sp.	17

Biofacies	Location	Time bin(s)	Species	Specimens
Lower and Middle Farmers Creek Mbr., Hopkinton Fm.	IA	19	7	1005

Species	Abundance
Allocrinus cf. A. sp. Subglobosus	17
Dimerocrinities hopkintonesis	88
Eucalyptocrinites depressus	15
Eucalyptocrinites sp. cf. ornatus	486
Marsupiocrinus primaevus	220
Pregazacrinus hemisphericus	7
Siphonocrinus nobilis	172

Biofacies	Location	Time bin(s)	Species	Specimens
Ferrum Mbr., Jupiter Fm.	Anticosti Island	19	7	108*

Species	Abundance
Chenocrinus canadaensis	3
Cybelecrinus ladas	16
Dimerocrinites elegans	30
Eomyelodactylus forestei	~2
Jovacrinus jugum	5
Jovacrinus spinosus	28
Protaxocrinus sideros	~24

Biofacies	Location	Time bin(s)	Species	Specimens
Scotch Grove Fm., *Caryocrinites* sp. B Assn.	IA	19	3	681

Species	Abundance
Siphonocrinus nobilis	172
Calliocrinus longispinus	23
Eucalyptocrinus sp. Cf. E. ornatus	486

Biofacies	Location	Time bin(s)	Species	Specimens
Scotch Grove Fm.;*Siphonocrinus nobilis* and *Petalocrinus* n. sp. Assn	IA	19	5	825

Species	Abundance
Dimerocrinites sculptus	125
Siphonocrinus nobilis	172
Calliocrinus longispinus	23
Eucalyptocrinites sp. Cf. E. ornatus	486
Macrostylocrinus sp. A.	19

Biofacies	Location	Time bin(s)	Species	Specimens
Welton Mbr., Scotch Grove Fm., *Dimerocrinites sculptus* and *Callocystites* - *Lysocystis* Assn.	IA	19	10	881

Species	Abundance
Allocrinus cf. A. sp. Subglobosus	17
Dimerocrinites scuptus	124
Dimerocrinites sp.	20
Eucalyptocrinites depressus	15
Eucalyptocrinites proboscidalis	2
Eucalyptocrinites sp. E. ornatus	486
Macrostylocrinus compressus	31
Macrostylocrinus vermiculatus	4
Perichocrinus sp. B	10
Siphonocrinus nobilis	172

Biofacies	Location	Time bin(s)	Species	Specimens
Lower Welton Mbr. to Johns Creek Quarry Mbr., Scotch Grove Fm.	IA	19	6	769

Species	Abundance
Dimerocrinites sp.	20
Eucalyptocrinites depressus	15
Eucalyptocrinites sp. Cf. E. ornatus	486
Luxocrinus simplex	11
Marsupiocrinus primaevus	220
Thomasocrinus cylindrica	17

Biofacies	Location	Time bin(s)	Species	Specimens
Lower Welton Mbr., Scotch Grove Fm., *Hagnocrinus* - *Luxocrinus* Assn.	IA	19	10	1170

Species	Abundance
Allozygocrinus dubuquensis	2
Dimerocrinites hopkintonesis	88
Dimerocrinites sculptus	125
Eucalyptocrinities sp .cf. E. ornatus	486
Luxocrinus simplex	11
Macrostylocrinus compressus	51
Macrostylocrinus sp. E.	5
Marsupiocrinus primaevus	220
Periechocrinus sp. B	10
Siphonocrinus nobilis	172

Biofacies	Location	Time bin(s)	Species	Specimens
Wolcott Ls.	NY	19	9	56

Species	Abundance
Aclistocrinus arctus	1
Callistocrinus tesselatus	1
Dendrocrinus abactronodusus	1
Dendrocrinus aphelos	2
Euspirocrinus wolcottense	13
Kryphosocrinus tetreaulti	15
Myelodactylus linae	2
Scapanocrinus muricatus	4
Tormosocrinus furberi	17