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Additional Crinoid Specimens from the Shellrock Formation (Upper Devonian) of Iowa

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Well preserved crinoids from the Shellrock Formation (Upper Devonian) of Iowa are extremely rare. Several well preserved specimens collected by one of us (Levorson) have led to new generic assignments of the species originally described as *Nas-*

soviocrinus goldringae Belanski, 1928, to *Glossocrinus goldringae*, n. comb., and of *Hexacrinus springeri* Thomas to *Cerasmocrinus springeri*, n. comb. The latter is the type species of *Cerasmocrinus*, new genus.

INDEX DESCRIPTORS: Iowa Devonian Crinoids; Shellrock Formation Crinoids; *Glossocrinus goldringae*; *Cerasmocrinus springeri*; *Hexacrinus springeri*.

Strimple and Levorson, 1969, in a study of Upper Devonian crinoids of Iowa, assigned the species *Nassoviocrinus goldringae* Belanski, 1928, to the genus *Quantoxocrinus* Webby, 1965. At that time, only two specimens (holotype CHB 1981, now SUI 71981, and paratype CHB 1983, now SUI 71983) were known. Subsequently several specimens of the species, in excellent preservation and including the hitherto unknown anal sac, have been collected by one of us (Levorson), which has led to a reconsideration of the species. The species is now thought to belong with *Glossocrinus* Goldring, 1923, and is here referred to as *Glossocrinus goldringae* (Belanski), new combination.

The species *Hexacrinus springeri* Thomas, 1924, was proposed with "the type specimen," designated here as the holotype by monotypy, and disarticulated plates. Thomas (ibid., pl. 42, fig. 2) showed an illustration of U.I.C. 3722 (SUI 3722), which he considered to be an arm with pinnules belonging to *H. springeri* and used as a basis for stating (ibid., p. 461) the arms were "apparently uniserial." The specimen is actually the median, longitudinal line of sac plates flanked on either side by a row of sac plates which have numerous thin folds, and belongs with *Glossocrinus goldringae*. Strimple, 1963, recognized that *Hexacrinites springeri* (Thomas) was atypical of *Hexacrinites* and referred the species to *Desmidocrinus springeri* (Thomas). Subsequent study of *D. pentadactylus* Angelin, 1878, type species of the genus, has led us to conclude that *D. springeri* is not congeneric, but represents a form with characters shared by *Desmidocrinus* and *Arthroacantha* Williams, 1883. *Cerasmocrinus* Strimple and Levorson, new genus, is proposed, with *Hexacrinus springeri* Thomas as the type species of the genus. A hypotype of *C. springeri* found by one of us (Levorson) is illustrated herein.

Presently considered specimens were found at Belanski Station No. 155, that is, in low cliffs along the south bank of the Shell Rock River in the NE¼, NW¼, sec. 4, T. 95 N., R. 18 W., near Nora Springs in northcentral Iowa. The horizon is Bed 5, "Hexacrinus" zone, Eatonian Zonule of Belanski (1928), Mason City Member, Shellrock Formation, Upper Devonian.

SYSTEMATIC PALEONTOLOGY

Subclass INADUNATA Wachsmuth & Springer, 1855

Order CLADIDA Moore & Laudon, 1943

Suborder POTERIOCRININA Jaekel, 1918

Superfamily RHENOCRINACEA Jaekel, 1918

Family RHENOCRINIDAE Jaekel, 1918

Genus GLOSSOCRINUS Goldring, 1923

GLOSSOCRINUS GOLDRINGAE (Belanski),

Strimple and Levorson, new combination

Plate 1, figures 7, 8.

Synonymy. *Nassoviocrinus goldringae* Belanski, 1928; *Quantoxocrinus goldringae* Strimple and Levorson, 1969.

Diagnosis. Crown elongate, slender, arms do not adjoin when closed. Cup tall, conical, evenly expanded; infrabasals readily visible in side view of cup; radiating folds which extend from plate to plate are weak, with rays represented mainly by depressions at plate corners; radial articular facets do not completely fill distal faces (penepenary); three anal plates in normal (primitive) arrangement. Anal sac tall, slender, median ridge formed by thick plates starting at tertan (RX) and extending length of sac, flanked by thin narrowly plicated plates on each side with plications perpendicular to axis of tube. Arms slender, uniserial, pinnular, with each brachial bearing a stout pinnule on alternating sides; one bifurcation usually takes place high in the arms with primibrachs 7-9. Proximal columnals pentalobate, alternately expanded.

Discussion. *Glossocrinus naplesensis* Goldring, 1923, type species of the genus from the Upper Devonian of New York, has pronounced radiating ridges or folds on the cup plates,

Figure 1.

1-6. *Cerasmocrinus springeri* (Thomas, 1924).

1-3. Holotype (SUI 3722) calyx viewed from posterior (C-D interray), DE interray and BC interray, X2.5.

4-6. Hypotype (SUI 80010) calyx viewed from CD interray. E ray and BC interray, X2.5.

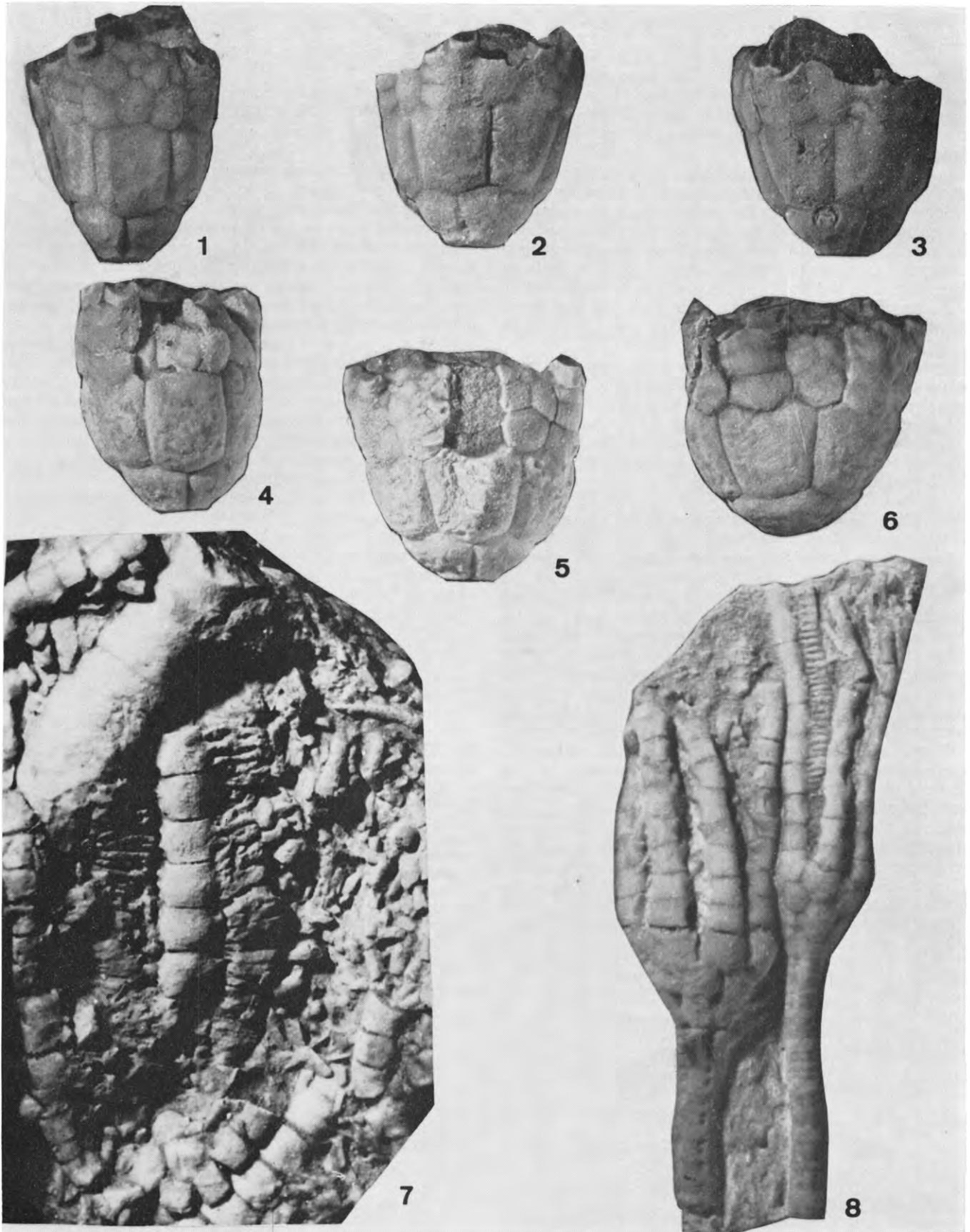
7-8. *Glossocrinus goldringae* (Belanski, 1928).

7. Highly magnified portion of hypotype (SUI 80007) showing median ray of anal sac flanked by thin narrowly plicated sac plates, X4.45.

8. Hypotype crowns (SUI 80007a-b), that to left (a) viewed from anterior, to the right (b) young specimen viewed from C ray, with three anal plates visible to the left (albeit secundanal [anal X] almost obscured) and right side of anal sac well exposed above, X4.0.

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a comparatively short cup, and first arm branching takes place about primibrachs 5-6. *G. goldringae* has a much taller cup, and the arms branch with primibrachs 7-9, both of which conditions are considered to be more primitive than *G. naplesensis*, *G. cornellianus* (Williams) is more closely related, in having a moderately tall cup and branching with primibrachs 8-9, but completely lacks radiating folds on cup plates.

As explained by Strimple and Levorson, 1969, *Nassovocrinus* typically has a quadrangular primanal (radial), resulting in two anal plates in the posterior interray, as opposed to a pentagonal primanal, resulting in three anal plates in the posterior interradius, but differs from *Quantoxocrinus* in having a strong median ridge composed of thick uniserial plates extending the length of the sac, which are flanked by thin narrowly plicated plates on each side. The anal sac of *Quantoxocrinus* is composed of equidimensional plates lacking plications.

Hypotypes. Collected by C. O. Levorson, deposited in the Levorson Collection, cat. SUI 80005, 80008, 80007, Geology Department, The University of Iowa, Iowa City.

Subclass CAMERATA Wachsmuth & Springer, 1855

Order MONOBATHRIDA Moore & Laudon, 1943

Suborder TANAOCRININA Moore, 1952

Superfamily DESMIDOCRINACEA Angelin, 1878

Family DESMIDOCRINIDAE Angelin, 1878

Genus CERASMOCRINUS Strimple & Levorson, new genus

Type species. *Hexacrinus springeri* Thomas, 1924.

Name. From Greek *Kerasma* for mixture, with reference to the uncertain (mixed) affinities of the genus.

Description. Calyx tall, cylindrical, with 3 tall basals prominent in side view. Primanal in line with radials, followed above by 3 plates and subsequently by 4 smaller plates. Interradials of moderate size, resting in strong notches in distal portion of radials, followed above by 2 or 3 plates and joined with fixed primibrachs 1 and 2. Secundibrachs 3 appear to be the last of the fixed brachials. Radial articular facets are narrow (angustary). Column is round.

Discussion. There is small likelihood that *Cerasmocrinus* evolved from the typically Silurian *Desmidocrinus*, because the basal plates are much more prominent in side view; however, there are many other characteristics indicating close relationship, such as the primanal followed by three plates, interradian area in calyx composed of few plates, and two fixed secundibrachs in each half ray. *Desmidocrinus* is more primitive in that interradianials are larger and are lower in the cup, and fixed tertibrachs are present in all species.

Primibrachs are not incorporated in the cup to form a

calyx in hexacrinitids, but they are commonly joined with interradianial tegmental plates. A trend toward this more advanced condition is indicated but not attained by *Cerasmocrinus*.

Occurrence. Upper Devonian, Iowa.

CERASMOCRINUS SPRINGERI (Thomas, 1924),

new combination

Plate 1, Figs. 1-6.

Synonymy. *Hexacrinus springeri* Thomas, 1924; *Desmidocrinus springeri* Strimple, 1963.

Description. Same as for genus.

Discussion. *Cerasmocrinus springeri* is closer to *Hexacrinites interscopularis* (Phillips, 1841), the type species of *Hexacrinites*, which is from Middle Devonian rocks of England, than to most American species assigned to the genus. However, interradianial plates of the hexacrinitids do not appreciably penetrate the interradianial area of the cup, which is considered as a definitive feature by Ubaghs (in press, Section T, Echinodermata, *Treatise on Invert. Paleo.*). The illustrated steinkern of *Arthroacantha granosa* Goldring (1923, pl. 37, fig. 12) shows an interradianial plate apparently firmly united with the radials, although it does not penetrate between the radials, as well as being joined with primibrachs 1 and 2. It appears that *A. granosa* does have fixed primibrachs, contrary to the familial definition.

Except for the tall basal circlet, *Cerasmocrinus springeri* appears to have closer affinities with the desmidocrinids than with the hexacrinitids, as has been previously discussed under the generic discussion.

Hypotype. Collected by C. O. Levorson, deposited in the Levorson Collection, cat. SUI 80010, Geology Department, The University of Iowa, Iowa City.

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