

APHELECRINUS, A NEW INADUNATE CRINOID GENUS FROM THE UPPER MISSISSIPPIAN.

EDWIN KIRK.¹

ABSTRACT. A new crinoid genus, *Aphelecrinus*, is described. The genus has a long stratigraphic range, from the St. Louis to the high Chester. It also has a wide geographic range. One species from the upper Mississippian of Scotland is referred to the genus.

APHELECRINUS, new genus.

Genotype.—*Aphelecrinus elegans*, new species.

Crown. Moderately high, compact.

Dorsal cup. Turbinate to narrowly campanulate.

IBB. Large, forming an appreciable part of the wall of the cup.

BB. Large.

RR. Wider than high, large. Facet full width of *R*, linear. Suture gaping.

IBr. One in each ray, high, stout, constricted slightly medially.

Arms. Of medium length, moderately stout. Typically one isotomous division above the *Iax*. Among the described species no further division has been seen, but in one described and one undescribed species there are one or more sporadic divisions distad. The division above the main dichotomy is high up, at from one-third to one-half the height of the arms. The *Brr* have slightly sloping faces in the earlier species, becoming cuneate in later forms. In one species the *Brr* in some cases fail to extend to the far side of the ramus. The pinnules are long and moderately stout. The *IIBrr*₁ are conspicuously long and in some cases, at least, bear pinnules.

Post IR. *RA* large, not penetrating deeply between *post* and *r post BB*. *X* large, extending well above the plane of the *RR*. *RT* smaller than anal *X*, the greater portion of the plate being above the plane of the *RR*.

Ventral sac. Extending to about one-half to two-thirds

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the height of the arms. Reflexed and composed of numerous vertical rows of small, polygonal plates.

Column. Typically circular in section, with fairly well defined nodal and internodal series. One species referred to the genus has a subpentagonal column. The lumen is pentagonal to pentalobate.

Stratigraphic and geographic distribution.—*Aphelecrinus* has perhaps the widest stratigraphic and geographic range of any known upper Mississippian genus. In addition to the described species referred to the genus and the new forms here described, there are several undescribed species. Stratigraphically the genus ranges from the St. Louis to the high Chester. It is found throughout the Mississippi Valley areas of St. Louis and Chester and in Alabama and Kentucky. It is also identified in Scotland in beds correlated with the American Chester.

Relationships.—*Aphelecrinus* seems to be more nearly related to *Phacelocrinus* than any other described genus. It is interesting to note that the two genera are essentially coterminous as to their known stratigraphic and geographic ranges. The most obvious difference between the two genera lies in the structure of the arms. In *Aphelecrinus* there is a single primibrach that shows no signs of being compound. In *Phacelocrinus* there are two *IBrr*, and, even in later species where more or less complete anchylosis has taken place, the elements are recognizable. The arms of *Aphelecrinus* are relatively shorter and stouter than in *Phacelocrinus*. In *Aphelecrinus* there is an isotomous division of each ramus above the primaxil. In *Phacelocrinus* the rami typically do not bifurcate. In very late species of the genus an irregular sporadic branching of the arms is to be found in occasional rays. The column of *Aphelecrinus* is typically round, a subpentagonal section in the proximal portion of the column being seen in but one species. In *Phacelocrinus* the column is sharply pentagonal in section.

With the elimination of *Scaphiocrinus* of Wachsmuth and Springer (not Hall), all the species previously referred to *Scaphiocrinus* were supposed to be transferred to *Pachylocrinus*. *Pachylocrinus* is a well-defined genus. It has a depressed bowl-shaped dorsal cup, with the *IBB* within the basal depression. There are two *IBrr*. The arms in the earlier species have one or two isotomous divisions above the *IAx*. In the later and more typical species, however, there is devel-

oped an endotomous arm with several divisions. *Pachylocrinus* is a *Decadocrinus* with branching arms and no doubt is directly derived from that genus. There is no close relationship with such a genus as *Aphelecrinus*.

Species referred to the genus:

- Aphelecrinus bayensis* (Meek and Worthen), new combination.
Poteriocrinus (*Scaphiocrinus*) *bayensis* Meek and Worthen
1865, p. 157. "Chester, Bay City, Pope County, Illinois."
Poteriocrinus (*Scaphiocrinus*) *bayensis* Meek and Worthen
1873, p. 55, Pl. 20, Fig. 2.
Poteriocrinus (*Decadocrinus*) *bayensis* (Meek and Worthen)
Wachsmuth and Springer 1880 p. 119 (344).

Scaphiocrinus bayensis Meek and Worthen was described as bearing undivided arms above the *I* Δ *x*, but the distal portions of the arms are poorly preserved, and the division may not have been recognized. Wachsmuth identified a typical undescribed species of *Aphelecrinus* from Kentucky as *bayensis*. As he and Worthen were quite intimate, it is probable that this was a joint identification.

APHELECRINUS CRASSUS KIRK, new species.

Plate 1, Fig. 11.

This species is represented by a single reasonably complete crown, weathered but in a fair state of preservation. It is described because of its large size and its apparently late evolutionary stage of development.

The crown has a height of about 80 millimeters, of which the dorsal cup takes up 12.5 millimeters. The crown is compact and is notable in the massive habit of the arms. With a height of 12.5 millimeters the dorsal cup has an estimated average diameter of about 16 millimeters. The cup is turbinate, without apparent outward flare at the level of the radials.

The *IBB* are wider than high and form a closely united circle approximately one-third the height of the cup. The *BB* average wider than high. The *RR* are large. On the articulating face the fulcral ridge extends the full width of the radial. The dorsal ligament fossa is narrow. The ligament pit is elongate, deep, and sharply defined. Owing to crushing, only *RA* is shown in the posterior interradius. The faces of the

plates preserved, however, show that the normal three-plate structure obtained.

The *IAx* is low and broad. The arms are long and unusually heavy. The second division of the arms comes at about one-fourth their height. The *IIBr*₁ is large. The next succeeding *Br* is much lower and is nearly rectangular in outline. Distad, the *Brr* are cuneate and in many cases fail to reach to the far side of the ramus.

Nothing is known of the ventral sac.

The column is circular in section, with well-developed nodals. The lumen is pentagonal in outline.

Horizon and locality.—The stratigraphic horizon of the specimen is unknown other than that it is Chester. The label merely reads: "Chester, Chester, Illinois."

Type.—The holotype is S 4439 in the Springer collection in the United States National Museum.

Relationships.—*A. crassus* most nearly resembles *A. okawensis* (Worthen). Both apparently come from the high Chester near Chester, Illinois. The figure of *A. okawensis* was made by Charles Worthen, who at best was an indifferent draftsman. However, it would seem that we are dealing with different species. In *A. okawensis* the dorsal cup has a decidedly convex outline as against the relatively narrow, straight-sided cup of *A. crassus*. In *A. okawensis* the *IBB* are relatively small and narrow. In *A. crassus* they are much larger and very broad. The arms of *A. crassus* are proportionally stouter than in *A. okawensis*. In *A. crassus* the brachials, particularly in the proximal portions of the arms, are high and tumid on the pinnule-bearing side, narrowing rapidly and in many cases not reaching the other side of the ramus. Nothing like this is shown in *A. okawensis*, though this could be explained as careless drawing.

Aphlecrinus dunlopi (Wright), new combination.

Pachylocrinus dunlopi Wright 1936, p. 401, Text-figs. 25-26, Pl. 8, Fig. 2.

Pachylocrinus dunlopi Wright 1939, p. 20, Text-fig. 12, Pl. 7, Figs. 1, 9.

In the Scottish upper Mississippian, Wright describes a crinoid that could well be referred to *Aphlecrinus*. This is his

Pachylocrinus dunlopi. The other species referred to *Pachylocrinus* by him are quite different types. *Aphelecrinus dunlopi* (Wright), new combination, has an irregular tertiary division of the arms. This structure, though not typical, would not exclude the species from the genus. It is a variant that should be anticipated and indeed occurs in at least one undescribed American species that I would refer to the genus.

APHELECRINUS ELEGANS KIRK, new species.

Plate 1, Figs. 6-8.

This form is one of the smallest and stratigraphically perhaps the earliest known species of the genus. It is, however, from a well-known horizon and is represented by 15 or more adequate specimens in the collections of the United States National Museum alone. For these reasons, and as it shows all the characteristic structures of the genus, it has been chosen as genotype rather than one of the later, larger species.

The series of specimens available for study shows a considerable range in size. As large collections have been made from this horizon over a long period of years, it is probable that the largest specimen represented, the holotype, is of about maximum size for the species. It is from this specimen that the measurements given hereafter have been made. The measurements are intended merely to give relative proportions and sizes of structural units and naturally vary among different individuals.

The crown of the largest specimen has a height of 33 millimeters. When not crushed the crown is of compact habit. The dorsal cup has a height of 4.4 millimeters and a maximum breadth at the arm-bases of approximately 6 millimeters. The cup is campanulate in shape, with a slight but well-defined outward flare at the level of the *RR*.

The *IBB* have an average height of 1.2 millimeters and a maximum breadth of 1.3 millimeters. The *BB* have an average height of 2.2 millimeters and a maximum breadth of 2.6 millimeters. The *RR* have an average height of 1.7 millimeters and a maximum breadth of 3 millimeters. In the *post IR*, *RA* is large, resting unequally on *post* and *r post BB*, with the larger face on *post B*. *RA* reaches to about one-half the height of *r post R*. Anal *X* is proportionally very large, fully half the plate extending above the facet of *l post R*. The *rT* is somewhat smaller than *X*.

The ventral sac is long and relatively slender. It is reflexed, and though the opening has not been seen, it probably lies at about half the height of the sac on the anterior side. The sac is somewhat flattened on the posterior side and reaches its greatest breadth at the apex. As the sac turns downward it becomes smaller, which gives the doubled portion of the sac a subtriangular cross section. At the base of the sac, on the posterior side, are at least two pairs of large tube plates. Distad there are four vertical series of plates. The tube plates are indented at their angles.

The arms are relatively short and stout. There is a single *I*Br, which is axillary. It is relatively large, having a height of 2.6 millimeters. Although somewhat constricted medially, it shows no signs of being compound. The *IIBrr*, as a rule, range from 8 to 10 in number. The first *IIBr* is large and clearly differentiated from the higher *Brr*. Distad the *Brr* have sloping faces and bear pinnules from the second *IIBr* onward. The pinnules are long and stout.

The column is circular in section, with a pentagonal lumen. The nodals are relatively high and wide, with rounded edges, clearly differentiating them from the internodal series.

Horizon and locality.—The principal locality for the species is about seven miles south of Huntsville, near Whitesburg, Alabama, on the ridge east of the road. The same horizon that has yielded abundant crinoids in the past is also found at the south end of the ridge west of the road. The horizon is called Ste. Genevieve in the Alabama State Geological Survey reports, but this age assignment is far from certain.

Types.—The holotype, S 4435a, and paratype, S 4435b, are in the Springer collection in the United States National Museum. The collectors of the types were Bernhardina and Charles Wachsmuth. The holotype is the specimen figured in Plate 1, Figs. 7 to 8.

Relationships.—*A. elegans* bears no close resemblance to any known species of the genus. It is the smallest known species of the genus excepting *A. scoparius*. From *A. scoparius* it differs in the campanulate cup, with outward-flaring radials, and the stout arms. In the shape of the dorsal cup it most nearly resembles *A. mundus*, from a much higher stratigraphic horizon. In the case of *A. mundus* we have a pentagonal column, hourglass-shaped *IAx*, and the second divisions of the rami fairly high up. *A. elegans* has a round column, *IAx*

slightly constricted medially, and the ramus division at a lower level.

APHELECRINUS LIMATUS KIRK, new species.

Plate 1, Fig. 10.

The specimen chosen as holotype of this species was figured by Springer (1926, p. 67, Pl. 16, Fig. 2) as *Pachylocrinus scoparius* (Hall). The species is described partly in order to rectify this error of identification and partly in order to illustrate an interesting variant in the structure of the ventral sac. Three other specimens have tentatively been assigned to this species. All are weathered, and accurate identification is not possible.

The holotype is a fairly young individual and still shows some juvenile characters. The crown of the holotype has a height of 40 millimeters, with a dorsal cup 5 millimeters in height and 7 millimeters in diameter. The largest crown referred to this species has a height of 75 millimeters. The crown is compact and unusually tall and slender.

The dorsal cup is turbinate, not showing the campanulate form so commonly found in the genus. The *IBB* are relatively small. The *BB* and *RR* are of approximately equal height. The plates of the *post IR* have the usual arrangement for the genus.

The *IAxx* of the holotype are proportionally large, a juvenile character. In any case the *IAx* is heavy and but slightly constricted medially. The first *IIBr* is large and bears a pinnule. This is probably true in other species as well but has not been seen clearly. The higher *Brr* are subcuneate to cuneate. The pinnules are long and stout. The arms are long and relatively slender. The second division takes place at about two-thirds the height of the arms in the holotype, as seen in two rays.

The ventral sac is reflexed and relatively short, being but approximately one-half the height of the arms in the holotype and much less in older specimens. As seen in lateral view the sac is very broad in its distal, redoubled half. In most species the sac seems to be more club-shaped. The sac is composed of numerous vertical series of small plicate plates. At the distal end are some subspinous plates.

The column is circular in section and composed of well-defined nodal and internodal series.

Horizon and locality.—The holotype and one other specimen

referred to the species were collected by Sidney S. Lyon at Grayson Springs, Kentucky. A third specimen bears a Lyon catalogue number that identifies it as from the Falls of the Rough. Lyon's pasted numbers came off readily in later years and, in the case of many specimens, are definitely misplaced. In the present case the lithology of the rock is very like that of Grayson Springs and very unlike any known specimens from the Falls of the Rough.

Types.—The holotype is S 2618 in the Springer collection in the United States National Museum.

Relationships.—*A. limatus* most nearly resembles *A. mundus*. *A. mundus* has a pentagonal column as against the round column of *A. limatus*. The dorsal cup of *A. limatus* has a smoothly convex outline as against the campanulate cup, with outward-flaring radials, of *A. mundus*. The *IAx* in *A. mundus* is sharply constricted medially. There is a very slight constriction in the case of *A. limatus*.

APHELECRINUS MUNDUS KIRK, new species.

Plate 1, Fig. 9.

This species is based on a single well-preserved crown. The species is of somewhat less than medium size for the Chester forms. The crown measures 46 millimeters in height, with a dorsal cup 5 millimeters in height and with a maximum diameter at the arm bases of 8.5 millimeters.

The dorsal cup is campanulate, with a marked outward flare at the level of the *RR*. The *RR* are convex, giving the cup a distinctly pentalobate outline. The *IBB* have a height approximately one-third that of the cup. The *BB* and *RR* are of approximately equal height. The *RR* are relatively narrow. The *post IR* is concealed except for the *RA*.

The *IAx* is high, narrow, and deeply constricted medially. The *IAxx* of the *r post* and *ant RR* are notably longer than in the *r* and *l ant RR*. Though not seen, the *IAx* of the *l post R* would, of course, fall with the group having the greater length. There is an undescribed species from the Chester of Kentucky in which the *IAxx* have even greater disproportionate sizes. The higher brachials are for the most part cuneate in outline. Dorsad, each brachial is nodose, giving the arms a somewhat rugose appearance. The rami divide at varying heights. In the *ant R* the bifurcation takes place at above

one-half the height of the arm and in the *r ant R* at less than one-half its height. The arms of the *r post R* are not preserved to the division, but they carry on undivided to a height almost as great as that seen in the *ant R*. The pinnules are long and relatively stout.

Nothing is known of the ventral sac.

The small portion of the column preserved has been abraded. By grinding the distal end of the column a small portion embedded in the rock can be seen. This shows the column to be pentagonal in section.

Horizon and locality.—This specimen was collected by Sidney S. Lyon in the 1850's and bears his catalogue number 217. It came from the old locality at Grayson Springs, Kentucky. This horizon has been identified as Glen Dean, but this is open to question.

Type.—The holotype, S 4437, is in the Springer collection in the United States National Museum.

Relationships.—*A. mundus* most nearly resembles *A. limatus*. A comparison of the two is given under *A. limatus*.

Aphelecrinus okawensis (Worthen), new combination.

Poteriocrinus okawensis Worthen 1882, p. 24.

"Chester limestone; Okaw River above Chester, Randolph County, Illinois."

Poteriocrinus okawensis Worthen 1883, p. 296, Pl. 29, Fig. 2.

Scaphiocrinus okawensis (Worthen). Wachsmuth and Springer 1886, p. 236 (160).

APHELECRINUS OWENI KIRK, new species.

This species is based on a complete crown of an individual of medium size, the crown of a larger specimen with a partial set of arms, a partial set of arms showing the distal portion of the ventral sac, and seven dorsal cups of various sizes, some with a few brachials attached.

The crown is of moderate height, the cup being approximately one-sixth the height of the crown in a specimen of medium size.

The dorsal cup is turbinate, with a maximum breadth somewhat greater than the height. The surface of the plates is papillose. The *IBB* form an appreciable part of the cup wall. The *BB* are large. *Post B* supports *RA* and *X* and extends upward to about one-half the height of *l post R*. *R post B*

supports *RA* in its upper left shoulder. The *RR* have a height somewhat less than that of the *BB*. The *RR* are strongly convex in their vertical axes, giving the cup a somewhat petaloid aspect when viewed from below or above. The radial facets are linear and extend practically the full width of the *RR*. The suture is slightly gaping. *RA* is large, reaching upward to above half the height of *r post R*. *X* is large, extending upward well above the level of *l post R*. *RT* is large, the greater part of the plate extending above the cup proper.

The rami are slender in younger specimens, becoming relatively stout in older individuals. The *Brr* have sloping faces in all stages, becoming sharply cuneate in later ontogeny. There seems to have been incompetent union between the *Brr*, for *IAx* is usually partially dissociated and shifted from its seat on *R*, and similar dissociation is to be noted as between consecutive *Brr* higher in the rami.

There is a single *IBr* in each radius. The *IAx* is proportionally stout and in medium- to large-sized specimens is slightly constricted medially. The *IIBr*₁ is conspicuously long, and the pair in each ray is in close contact laterally. The number of *IIBrr* seems to range from 10 to 12. No division of the ramus has been seen above *IIAx*. The pinnules are borne alternately by the *Brr* from *IIBr*₁, distad. The pinnules are relatively long and fairly stout.

The ventral sac is stout and composed of numerous vertical rows of strongly carinate tube plates. These plates in older specimens are marked by high carinae normal to the faces. The sac is reflexed. The ventral sac extends approximately to two-thirds the height of the arms.

In one specimen two columnals are preserved. These are pentagonal in outline, but it is probable that the column was circular in section distad.

The specific name is given in honor of David Dale Owen, pioneer in the geological explorations of Kentucky, as well as other regions, and an early student of the Crinoidea.

Horizon and locality.—Sidney S. Lyon collected the specimens in the 1850's from a locality known as Falls of Rough Creek, which lies on the boundary between Grayson and Breckinridge Counties, Kentucky. The locality is described and a section given by Owen (1856, p. 173). The specimens, judging by the lithology of the matrix and preservation, were collected on one horizon. The horizon is uncertain at present, but

it probably lies in the upper Chester. The horizon can be established easily when field work is done in the area.

Types.—The holotype, S 4436a, and paratype, S 4436b, are in the Springer collection in the United States National Museum. The specimens were originally in the Lyon collection as No. 190. As holotype I have chosen the specimen shown as Plate 11, Fig. 2.

Relationships. *A. oweni* bears some resemblance to *A. mundus*. *A. oweni* is a much larger species. The sides of the dorsal cup of *A. oweni* diverge more rapidly than in *A. mundus*, and the radials do not have the decided outward flare of the latter species. The *Iax* of *A. oweni* is slightly constricted medially, as against the hourglass shape of *A. mundus*.

Aphelecrinus randolphensis (Worthen), new combination.

Poteriocrinites (*Scaphiocrinus*) *randolphensis* Worthen 1873 in F. B. Meek and A. H. Worthen, p. 551, Pl. 21, Fig. 14.

"Chester; Chester, Illinois."

Poteriocrinus (*Scaphiocrinus*) *randolphensis* Worthen. Wachsmuth and Springer 1880, p. 113 (338).

Aphelecrinus scoparius (Hall), new combination.

Scaphiocrinus scoparius Hall 1858, p. 680, Text-fig. 108, Pl. 25, Figs. 3a, b.

"Kaskaskia limestone, Chester, Illinois." (St. Louis limestone *vide* Worthen, 1882 and 1883.)

Poteriocrinus (*Scaphiocrinus*) *scoparius* (Hall). Wachsmuth and Springer 1880, p. 113 (338).

Non Pachylocrinus scoparius (Hall). Springer 1926, p. 67, Pl. 16, Fig. 2. (= *Aphelecrinus limatus*, new species.)

I have not been able to find the holotype of this species. However, in the Springer collection are two casts of the specimen, one of plaster and one of sulphur. They are both of indifferent quality, and, considering the small size of the specimen, little information is to be had from them.

The general habit of the crinoid, the single long primibrach, and the divisions of the rami seem to warrant the assignment of the species to *Aphelecrinus*.

It is to be noted that Worthen (1882, p. 17; 1883, p. 286) in a footnote states that this species as well as *Scaphiocrinus decabrachiatatus*, *S. internodius*, and *Zeacrinus intermedius*, likewise described by Hall, were not from the Chester. He

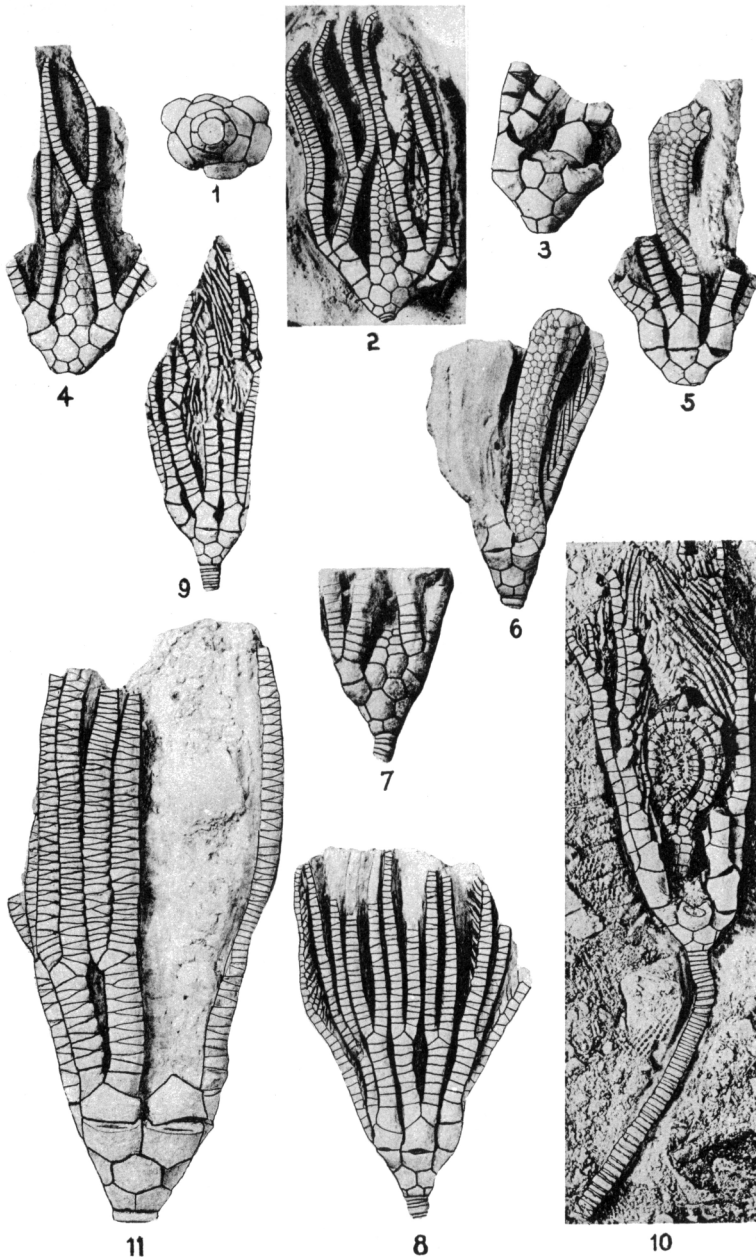


PLATE 1. APHELECRINUS

Figs. 1-3. *Aphelecrinus lyoni* Kirk, new species: 1, 3, basal and posterior views of paratype; 2, posterior view of holotype.

Figs. 4, 5. *Aphelecrinus simplex* Kirk, new species: 4, posterior, and 5, anterior views of holotype.

Figs. 6-8. *Aphelecrinus elegans* Kirk, new species: 6, left posterior view of paratype; 7, 8, posterior and anterior views of holotype. All figures $\times 1\frac{1}{2}$.

Fig. 9. *Aphelecrinus mundus* Kirk, new species, anterior view of holotype.

Fig. 10. *Aphelecrinus limatus* Kirk, new species, anterior view of holotype, $\times 1\frac{1}{2}$.

Fig. 11. *Aphelecrinus crassus* Kirk, new species, right anterior view of holotype.

All figures $\times 1$ unless otherwise indicated.

states that he collected the specimens himself and that they were from the St. Louis limestone. It is impossible to resolve the problem at this time. Worthen was very accurate, and his statement should carry considerable weight. On the other hand, he may have been mistaken.

APHELECRINUS SIMPLEX KIRK, new species.

Plate 1, Figs. 4, 5.

This species is based on a single fairly well preserved crown. It is described because it shows a large part of the ventral sac and comes from a known locality in the Illinois Chester.

The crown is of medium size, with an overall height of 45 millimeters. The dorsal cup has a height of 5.5 millimeters and an estimated maximum diameter, uncrushed, of $10 \pm$ millimeters.

The dorsal cup is crushed, but its general shape can be estimated with a fair degree of accuracy. The cup is lower and broader than in most species of the genus, and there is a pronounced outward flare of the *RR*. The cup, owing to the convexity of the *RR*, is distinctly pentalobate at the level of the arm bases. The *IBB* are relatively small and inconspicuous. The *BB* are also relatively smaller than usual. The *RR* are large and convex. *RA* is large, extending up to two-thirds the height of *r post R*. *X* is large, one-half reaching above the level of the *RR*. *RT* is larger than *RA*.

The *IAxx* are short, stout, and slightly constricted medially. The *Brr* are subcuneate to cuneate but always extend the full width of the ramus. The higher divisions of the rami take place at varying heights as seen. In *l post R* the divisions take place at about one-fourth the height of the arms, while in the *r post R* the division is much higher, at about one-third the height of the arms.

The ventral sac is long, reaching to more than three-fourths the height of the arms. *X* supports a plate on its truncate distal face, a large tube plate on its left shoulder, and *rT* on its right shoulder. Following these three plates distad as far as seen are vertical rows of large plates. As seen from the anterior side the sac is made up of several vertical series of small, hexagonal, plicate plates. The distal end of the sac is composed of a number of nodose to subspinous, heavy plates.

Horizon and locality. The locality as given by Fred Braun,

the collector, is "4-3/4 miles south-west of Floraville near Marteen School on road fording creek south of Waters Creek." This locality is in Monroe County, Illinois. This is in the Waterloo quadrangle. According to Springer, presumably based on Stuart Weller's authority, the horizon is Renault in the Chester.

Type.—The holotype is S 4438 in the Springer collection in the United States National Museum.

Relationships.—*A. venustus* (Worthen) comes from the same general region as *A. simplex* but, of course, might have been collected from quite a different horizon. The two specimens figured by Worthen as *venustus* and *peculiaris* may be young individuals. Nevertheless, the present species does not seem to be conspecific. The cup of *A. simplex* is relatively lower and broader than in *venustus*, and there is an outward flare of the radials that is lacking in *A. venustus*. The arms in *A. simplex* are relatively stouter.

Aphelecrinus venustus (Worthen), new combination.

Poteriocrinus venustus Worthen 1882, p. 24.

"Chester limestone; Monroe County, Illinois."

Poteriocrinus venustus Worthen 1883, p. 297, Pl. 29, Figs. 13a, b.

Scaphiocrinus venustus (Worthen). Wachsmuth and Springer 1886, p. 236 (160).

Synonymy.—

Aphelecrinus peculiaris (Worthen), new combination.

Poteriocrinus clytis Worthen 1882, p. 25 (*non P. clytis* Worthen 1882, p. 16).

"Chester limestone; Monroe County, Illinois."

Poteriocrinus peculiaris Worthen 1883, p. 298, Pl. 29, Fig. 10 (*nom. nov. pro P. clytis* Worthen 1882, p. 25, *non* p. 16).

Scaphiocrinus peculiaris (Worthen). Wachsmuth and Springer 1886, p. 236 (160) [cited as synonym of *S. venustus* (Worthen)].

BIBLIOGRAPHY.

Hall, James: 1858. Paleontology. Iowa Geol. Survey Rept., vol. 1, pt. 2, pp. 473-724, pls. 1-29.

———: 1860. Contributions to the palaeontology of Iowa; being descriptions of new species of Crinoidea and other fossils. Supplement to vol. 1, pt. 2, of the Geological Report of Iowa. (1859) 1860 or later. Title page, inserted unnumbered page, pp. 1-94, text figs., pls. 1-3.

- Kirk, Edwin: 1942. *Ampelocrinus*, a new crinoid genus from the upper Mississippian. Amer. Jour. Sci., vol. 240, pp. 22-28, pls. 1-2.
- Meek, F. B., and Worthen, A. H.: 1865. Descriptions of new Crinoidea, etc., from the Carboniferous rocks of Illinois and some of the adjoining States. Acad. Nat. Sci. Philadelphia Proc., vol. 17, pp. 155-166.
- . 1873. Descriptions of invertebrates from Carboniferous system. Illinois Geol. Survey, vol. 5, pt. 2, pp. 321-619, + pp. i-v, pls. 1-32.
- Owen, D. D.: 1856. Report of the geological survey in Kentucky, made during the years 1854 and 1855.
- Springer, Frank: 1926. Unusual forms of fossil crinoids. U. S. Nat. Mus. Proc., vol. 67, art. 9, no. 2581, pp. 1-137, pls. 1-26.
- Wachsmuth, Charles, and Springer, Frank: 1880. Revision of the Palaeocrinoidea. Pt. 1, pp. 1-153, pls. 1-3. Acad. Nat. Sci. Philadelphia Proc. 1879, pp. 226-376, pls. 15-17.
- : 1886. Revision of the Palaeocrinoidea. Pt. 3, sec. 2, pp. 139-302. (One unnumbered page inserted after p. 302. One inserted page "Note to page 255." The latter appeared in two different forms.) Index to pts. 1-3, pp. 303-334. Acad. Nat. Sci. Philadelphia Proc. 1886, pp. 64-226.
- Worthen, A. H., in Meek, F. B., and Worthen, A. H.: 1873. Descriptions of invertebrates from Carboniferous system. Illinois Geol. Survey, vol. 5, pt. 2, pp. 321-619, + pp. i-v, pls. 1-32.
- Worthen, A. H.: 1882. Descriptions of fifty-four new species of crinoids from the Lower Carboniferous limestones and Coal Measures of Illinois and Iowa. Illinois State Mus. Nat. History, Bull. 1, art. 1, pp. 3-38.
- : 1883. Description of fossil invertebrates. Illinois Geol. Survey, vol. 7, pt. 2, sec. 2, pp. 265-338, pls. 27-30.
- Wright, James: 1936. New Scottish Carboniferous crinoids. Geol. Mag., vol. 73, no. 867, pp. 385-412, pls. 7-10, text figs. 1-41.
- : 1939. The Scottish Carboniferous Crinoidea, pp. 1-78, pls. 1-12, 86 text figs. Roy Soc. Edinburgh Trans., vol. 60, pt. 1 (no. 1), 1939-40. "Issued separately Sept. 26, 1939."

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