

# AMERICAN MUSEUM *Novitates*

PUBLISHED BY  
THE AMERICAN MUSEUM  
OF NATURAL HISTORY

CENTRAL PARK WEST AT 79TH STREET  
NEW YORK, N.Y. 10024 U.S.A.

NUMBER 2557

OCTOBER 24, 1974

NILES ELDREDGE AND ROY E. PLOTNICK

Revision of the Pseudoniscine Merostome  
Genus *Cyamocephalus* Currie





Revision of the Pseudoniscine Merostome  
Genus *Cyamocephalus* Currie

NILES ELDREDGE

*Associate Curator, Department of Invertebrate Paleontology  
The American Museum of Natural History  
Adjunct Assistant Professor  
Department of Geology, Columbia University*

ROY E. PLOTNICK

*Undergraduate, Department of Geology  
Columbia University  
Assistant, Department of Invertebrate Paleontology  
The American Museum of Natural History*

AMERICAN MUSEUM NOVITATES

Number 2557, pp. 1-10, figs. 1, 2, table 1  
Issued October 24, 1974  
Copyright © The American Museum of Natural History 1974

ISSN 0003-0082  
Price. 85 cents



## ABSTRACT

We present an emended diagnosis for the monotypic genus *Cyamocephalus* Currie, 1927, based on examination of the holotype of *Cyamocephalus loganensis* and study of a second, very well-preserved specimen we attribute to *Cyamocephalus* cf. *C. loganensis*. Both specimens, which were collected from Upper Silurian rocks of Great Britain, are described in detail. The holotype specimen is remarkable in that a pair of dark stains, the possible remains of a portion of the dorsal longitudinal muscle system, are preserved within the cardiac lobe of the prosoma and the axial lobe of the opisthosoma.

The prosomal morphology of *Cyamocephalus* is similar to that of other pseudoniscids; as in other Pseudoniscidae, cardiophthalmic morphology is obscure but similar in general plan to that of other Limulina. There are 10 opisthosomal segments; the first (anterior) segment is greatly

reduced with very short pleura. Segments 2-10 have well-developed pleura, and segments 6 and 7 are fused into a solid tergite on which is developed a complex pattern of ridges and furrows. All other segments are freely articulated. The axial furrow system of segments 2-5 on the second specimen is also complex. The telson is styliform.

Although clearly pseudoniscine in character, the large overall size, the proportionally large size and rounded posterior outline of the opisthosoma, and the complexities of the furrows of the axis and on segments 6 and 7, readily differentiate this genus from *Pseudoniscus* and other related genera. Recently regarded as *incertae sedis* within the Merostomata (Eldredge, 1974), we now consider *Cyamocephalus* a valid genus, in some respects the most specialized (derived) member of the family Pseudoniscidae (*sensu* Eldredge, 1974).

## INTRODUCTION

*Cyamocephalus loganensis* was described by Currie in 1927 on the basis of a single part-and-counterpart specimen from the Upper Silurian Logan Water at Lesmahagow, Lanarkshire, Scotland. The specimen is poorly preserved, and though Currie's description is accurate in most respects, *Cyamocephalus* has remained poorly understood. Currie (1927, p. 155) furnished a drawing of one side of the specimen, which evidently served as the basis for the outline sketch presented by Størmer (1955), in which *Cyamocephalus* was referred to the Pseudoniscidae. In a recent revision of primitive Paleozoic Xiphosurida (Eldredge, 1974), *Cyamocephalus* was left *incertae sedis* within the Merostomata. Subsequent examination of the holotype has revealed enough morphological detail to allow definite placement of this genus within the Infraorder Pseudoniscina (*sensu* Eldredge, 1974). However, it is the discovery of a second and much better preserved specimen of *Cyamocephalus* (from rocks of Ludlow age near Shropshire, England), housed since 1881 in the collections of the British Museum (Natural History) (BMNH) that prompts this review. The two specimens are described separately in detail below; the new information has made possible an emended and more detailed diagnosis of the genus. In the final section we present arguments that *Cyamocephalus*

is, in some respects at least, the most specialized of the genera allocated to the Pseudoniscidae.

## Acknowledgments

We thank Mr. Samuel Morris for courtesies extended to Eldredge at the British Museum (Natural History) and for arranging the loan of the material. We are grateful for the sagacious comments of Mr. Daniel Fisher and the excellent photography of Mr. G. Robert Adlington.

## FAMILY PSEUDONISCIDAE PACKARD, 1886 GENUS CYAMOCEPHALUS CURRIE

*Cyamocephalus* Currie, 1927, p. 154, fig. 1.  
Størmer, 1955, p. P17, fig. 11(11).

*Emended Diagnosis.* Relatively large pseudoniscine with opisthosoma approximately 1.5-2 times longer (sagittally) than prosoma. Prosoma subcircular to spatulate, lacking an anterior median projection, and with large genal cornua. Cardiophthalmic morphology obscure; ophthalmic ridges arising near posterior prosomal border, curving anteromedially, becoming recurved anteriorly, merging at midline. Opisthosoma subovate in lateral and posterior profile, composed of 10 segments. First opisthosomal segment reduced, essentially confined to axial region, with very

short pleura; segments 2-10 with flat pleura terminating in flat edge pointed posterodistally (2-7) or tapering to a point (8-10), with pleural ridges (segments 2-7). Segments 2-4 of subequal sagittal length; segment 5 relatively short. Segments 6 and 7 fused; sixth segment short, seventh longitudinally hypertrophic. Segments 8-10 relatively small, with pleura directed more sharply posterodistally. Axial furrow system complex, with axial nodes (segments 2-5); axis apparently strongly constricted on tergite formed by fused segments 6 and 7, with subsidiary "axial" and transverse furrows present. Axial furrows of segments 8-10 simple and aligned with major furrows of segments 2-5. Telson styliform. Cuticular surface tuberculate.

*Type Species.* *Cyamocephalus loganensis* Currie, 1927, by original designation and by monotypy.

*Cyamocephalus loganensis* Currie, 1927

Figure 1

*Cyamocephalus loganensis* Currie, 1927, p. 154, fig. 1.

*Redescription of Holotype.* BMNH I 16521. The holotype of *Cyamocephalus loganensis* consists of a poorly preserved part-and-counterpart impression on a fine-grained gray siltstone. Many features are preserved as dark stains, more visible when wet; these stains are presumably organic, representing vestiges of cuticle and, possibly, internal musculature. The specimen has been flattened dorsoventrally into nearly a single plane.

*Prosoma.* The general outline of the prosoma is triangular ("spatulate"). The genal cornua are large and gently rounded posteriorly, extending as far back as the second opisthosomal segment. The lateral prosomal margins curve regularly anteroproximally, forming a rounded anterior margin with no anterior median projection.

The cardiac lobe is an indistinct, slightly elevated structure; it is defined on each side by a thin, black-stained line probably representing the cardiac furrow. These lines are inclined anteroproximally, and are more clearly developed in the posterior region of the prosoma, although they appear to converge and join the posteriorly reflected ophthalmic ridges at the midline anteriorly,

as is typical of all known Limulina. Posteriorly, the cardiac furrows (indicated by the dark stains) are reflected distally and are apparently confluent with the posterior ends of the ophthalmic ridges. No cardiac ridges or elements of a radiating ridge and furrow system on the inter-ophthalmic region have been definitely identified; however, disconnected dark stains running anterodistally in the posterior area of the right interophthalmic region may represent vestiges of this system.

The ophthalmic ridges are expressed as a dark stain (a form of preservation occasionally seen in related taxa, such as *Pseudoniscus*; see Eldredge, 1974). They attain some topographical relief anteriorly. The ophthalmic ridges are recurved slightly posteroproximally in the posterior region of the prosoma; they then curve gently anteriorly, concordant with, and quite near to, the lateral prosomal margin. There is a conspicuous thickening of approximately the anterior one-fourth of the ophthalmic ridge, reminiscent of the condition in, e.g., *Pseudoniscus roosevelti* (Eldredge, 1974). Anteriorly, the ophthalmic ridges are recurved posteroproximally and meet at the midline.

No definite traces of lensar structures were observed. However, the cuticle appears to have been covered by relatively coarse tubercles and they seem to be more highly organized (into short vertical files) in places along the ophthalmic ridges. These may represent the lensar structures as described, for example, in the synziphosuran *Legrandella lombardii* (Eldredge, 1974). The prosomal border consists, in places, of a dark stain probably representing the double thickness of the dorsal cuticle adpressed to the ventral prosomal doublure.

*Opisthosoma.* The opisthosoma consists of 10 segments, with well-defined axial and pleural regions. The axis is broad anteriorly, roughly as wide as the region between the posterior margins of the ophthalmic ridges of the prosoma; the axis tapers regularly posteriorly through segment 5 (counting posteriorly); on fused segments 6 and 7 the axial furrows appear to be reflected sharply medially, forming a very narrow axis wide enough only to accommodate the "dorsal longitudinal musculature" (described and discussed below). The exact nature of the "axial furrow"





FIG. 1. *Cyamocephalus loganensis* Currie. Holotype, part (A) and counterpart (B), BMNH I 16521.  $\times 2$ . Specimens photographed under water.

on this fused tergite is obscure, but seems similar to the condition described below for *Cyamocephalus* cf. *C. loganensis*. The axial furrows of segments 8-10 resume the normal course as projected from segment 5.

Pleura are ill-defined throughout the opisthosoma; their general shape and distal terminations as well as possible sculpture (pleural ridges and grooves) are all obscure. Anteriorly, the pleura appear to extend from the axis at only a slight posterodistal inclination, but are progressively more sharply inclined posterodistally in the more posterior segments. Pleura do not appear to di-

minish in width as rapidly posteriorly as in *Pseudoniscus*, so that the lateral and posterior outline of the opisthosoma is more oval than sharply triangular in profile.

Segments 1-5 and 8-10 are freely articulated with a thin articulating half-ring. The first opisthosomal segment is small, being both short (sagittally) and narrow (transversely); apparently lacking pleura, it is largely confined to the axial region. Segments 2-4 are subequal in sagittal length, and segment 5 is relatively short. There is a faint transverse furrow across the axis of fused segments 6 and 7, possibly representing the for-

TABLE 1  
MEASUREMENTS (IN MILLIMETERS) OF *CYAMOCEPHALUS*  
(All lengths are measured sagittally.)

	Holotype (positive) BMNH I 16521	Ludlow Specimen BMNH I 25
Prosomal length	19.4	12.3
Maximum prosomal width	26.6	20.7
Opisthosomal length	31.2	24.9
Axial width of opisthosomal segment 2	13.6	9.6

mer line of articulation (there is no trace of an articulating half-ring or gap between these segments, hence the conclusion that they are fused). If this transverse furrow is interpreted correctly, segment 6 was originally about as short (sagittally) as segment 5, and segment 7 was about as long as the axial regions of segments 2, 3, and 4. Segments 8-10, although shorter (sagittally) and narrower than the anterior segments, also possess pleura; thus no preabdominal or postabdominal moieties of the opisthosoma may be recognized. There is no telson associated with the specimen. Measurements of this specimen are given in table 1.

*"Musculature."* Two broad parallel dark stains run the entire length of the axis of the opisthosoma, and extend into the posterior one-third of the cardiac region. The markings are equally distinct on both the positive and negative sides of the specimen. Although possibly attributable to some artifact of preservation suffered in diagenesis, these marks may represent some form of axial color ornamentation. But, especially in view of their presence in the same form and in equal strength on both sides of the specimen, it seems more likely that they are the vestiges of a (paired) longitudinal dorsal muscle system. Several lines of evidence seem to support this last interpretation, foremost of which is the simple observation that the stains correspond fairly closely in position and extent both to what would be expected in an arthropod with a flexible body, and particularly to what is known about the longitudinal muscle system of *Limulus polyphemus* (see Benham, 1885). The entapophyses (apodemes) in the posterior region of the prosomal cardiac furrow in *Limulus* serve in part as attachment bases for a portion of the dorsal

longitudinal muscle system. Such apodemes are apparently lacking in the holotype specimen of *Cyamocephalus*; they are also unknown in any other Pseudoniscina or other primitive Xiphosurida. The prosomal insertions of these "muscle bands" in *Cyamocephalus* seem rather to be a round patch on the lateral areas of the cardiac lobe (where some elements of the longitudinal system in *Limulus* also attach). In opisthosomal segments 1-4, similar paired, round patches occur in the lateral regions of the axis, suggesting attachment to the tergites at these points. From segment 5 on (posteriorly) the bands become finer, and are composed of a number of thin individual strands, suggestive of separate fibers. The bands are contracted to fit within the smaller axial width of the tergite formed of fused segments 6 and 7; no definite insertion sites are apparent in segments 5-9. There is a pair of dark stains in the anterior axial region of the tenth segment. Two thin, dark lines project posteroproximally from each stain. These stains may represent insertion areas for the musculature of the telson. These bands are continuous over intersegmental lines, further suggesting that they are not a feature of the external dorsal or ventral cuticular surface. The presence of these muscle bands, if that is indeed what they are, is remarkable, particularly in view of the otherwise poor quality of preservation of the specimen.

*Remarks.* This description differs from Currie's in only a few important points. Currie (1927, p. 154) claimed that no axial region is found in the prosoma of this specimen, whereas we have described a faint cardiac lobe and possible traces of some of its internal musculature. The line Currie (p. 155) took to be the "facial suture" may be the left cardiac furrow, according



to our interpretation. Also, ophthalmic ridges are present and, most importantly, are recurved anteriorly and meet at the midline—a feature Currie did not discuss, and one which Eldredge (1974) found extremely useful in diagnosing the *Limulina*. (Currie had noted the presence of a “semilunar elevation” that he took to be a compound eye; this is the “conspicuous thickening” on the ophthalmic ridge described above.) Finally, although structures appearing to be macerated organic remains do appear on either side of the specimen, none can be convincingly shown to belong to the specimen, much less represent appendages, as Currie suggested. The structures opposite the right pleura of segments 4 and 5 on the positive specimen slab may be distal pleural spines, but these structures are exceedingly faint and not even definitely attributable to the specimen.

*Cyamocephalus* cf. *Cyamocephalus loganensis*  
Figure 2

**Description of Specimen, BMNH I 25.** The specimen is preserved as an internal or, possibly, a composite mold of the dorsal exoskeleton, on a small slab of tan siltstone. It is dorsoventrally compacted, although otherwise relatively undistorted; a portion of the right side of the prosoma, the posterior regions of the genal cornua, and the distal portions of the pleura of opisthosomal segments 2-9 have all been destroyed.

**Prosoma.** The general outline of the prosoma is subovate, with a concave posterior border and gently curving lateral margins, culminating in a rounded anterior margin lacking (insofar as can be determined) an anterior medial projection. The genal cornua are large and broken off posteriorly, giving the appearance of being double. The cardiac “lobe” is not present as a distinct topographical feature. However, faint ridges—possibly the cardiac ridges—arise just proximal to the posterior margins of the ophthalmic ridges, and run obliquely anteroproximally, converging at the point where the ophthalmic ridges recurve and meet at the anterior midline. Distal to these ridges, especially on the right side, are faint traces of the interophthalmic radiating ridge and furrow system.

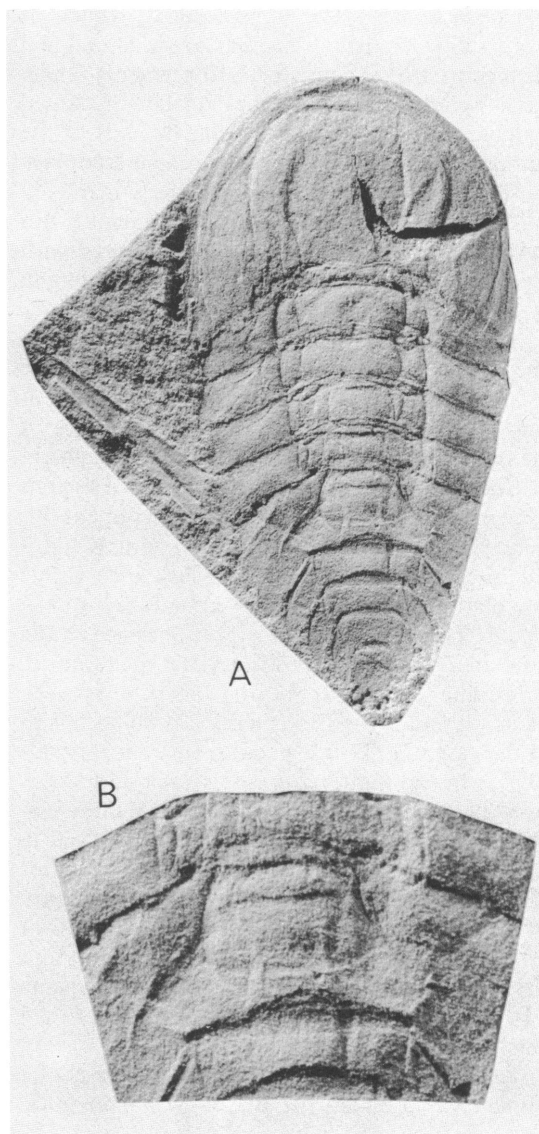


FIG. 2. *Cyamocephalus* cf. *C. loganensis*, BMNH I 25. A. Dorsal view.  $\times 2$ . B. Opisthosomal segments 5-8, showing details of axial region of (fused) segments 6 and 7.  $\times 4$ .

The ophthalmic ridges arise near the posterior margin of the prosoma and are crescentic. For most of their course, they are broad, conspicuous structures with considerable relief. They become narrower and fainter anteriorly and are recurved, meeting the midline in typical limuline fashion.

*Opisthosoma.* The opisthosoma, which is more subovate than triangular in its lateral and posterior outline, consists of 10 segments. There are a well-defined axial lobe and lateral pleural regions. The pleura project from the axis of the anterior segments at only a slight inclination posterodistally; this inclination increases markedly in the posterior segments. Each segment (with the exception of segment 7, which is fused with segment 6) is articulated to the preceding tergite by a short (sagittally) articulating half-ring.

The first opisthosomal segment is greatly reduced in length and width, occupying mainly the area equivalent to the axis of the second segment and the area between the posterior margins of the ophthalmic ridges on the prosoma. The pleura of this segment are very short. The axial regions of segments 2-4 are of subequal size; segment 5 is somewhat shorter (sagittally). Segments 6 and 7 are fused, as evidenced by the lack of a visible articulating half-ring and the clear fusion of the pleura. There are two transverse lines across the axial area of this composite tergite; the more anterior line is taken to be the juncture between the sixth and seventh segments; assuming this to be the case, the sixth segment is very short (sagittally), whereas the seventh is sagittally quite long, possibly "hypertrophic." (The pleura show evidence that only two segments were involved in the formation of this tergite; the more posterior of the two transverse axial lines of this tergite seems to be related to the peculiar condition of the "axial furrow system." See description and discussion below.) The axial regions of segments 8-10 are also subequal in length and shorter than the more anterior segments.

The axis of each of segments 2-7 consists of a number of lobes set off by ex-sagittal furrows. There is a simple, lightly impressed "axial furrow" on segment 1. Segments 2 and 3 have a deep distally convex furrow (probably the "true" axial furrow), and a slightly less deeply impressed furrow (also distally convex) proximal to the axial furrow, setting off a low "axial node" on each side. In addition, each node is bounded anteriorly and posteriorly by a short transverse furrow, creating narrow anterior and posterior raised edges. These axial nodes are also present in progressively smaller sizes on segments 4, 5, and 6 (because the furrows of the proximal set progres-

sively converge on those of the distal set in these segments), but in addition a third pair of furrows, proximal to the first pair, is also present on these segments. These furrows, especially the third pair, may be (but in our opinion, probably are not) compressional features; in the third set, the furrows are more or less straight, inclined anteromedially, and aligned intersegmentally on both sides of the specimen. This third set of furrows intersects the "axial furrows" precisely at the juncture of (fused) segments 6 and 7. This third pair of furrows is the dominant "axial" furrow feature of this fused tergite (which accounts for the apparent abrupt change in the course of the axial furrows described above for the holotype). Midway down the length of this fused tergite (6 + 7) this furrow diverges, with one branch extending a short way obliquely posterodistally onto the pleural field, and the other abruptly swinging posteroproximally and continuing across the axial lobe as the second transverse line described above. The axial furrows are simple and rather weakly impressed in segments 8-10 (although axial nodes are faintly set off on segment 8) and are more or less aligned with the outer ("true") axial furrows as last expressed on segment 5.

The opisthosomal pleura are rather simple, terminating abruptly in a flat edge with a sharply pointed posterior margin. Segments 2-7 have a thin ridge arising near the anteroproximal border of the pleura and running obliquely posterodistally before becoming obscure near the posterodistal margin of each pleuron. These pleural ridges are actually raised lines marking a break in slope of the pleural surface; anterior to the ridge, the pleural surface slopes anteroventrally (to allow enrollment), whereas the posterior region is more nearly horizontal. There are two such ridges developed on the pleural region of the fused tergite, but there is only a single line (slight ridge) in the position that would indicate it to be a line of fusion ("interpleural ridge"). The interpleural ridge occurs between the two pleural ridges, leading to the conclusion that only two segments are involved in this fused tergite. The pleura of segments 8-10 taper to a point, are flat, and lack pleural ridges and grooves.

*Telson.* There is a short terminal piece without pleura articulated to the tenth segment. Its

posterior edge is uneven, suggesting that it was broken from a larger piece, rather than that it forms a distinct eleventh opisthosomal segment. A styliiform telson, 16.8 mm. long and broken at the proximal end, lies to the left of the anterior region of the opisthosoma. Its width at the proximal end is 1.6 mm., as is the width of the broken terminal piece. We conclude that the "terminal piece" is actually a portion of the telson. A groove down the center of the telson indicates that it was originally triangular in cross-sectional outline. Some basic measurements of this specimen are given in table 1. No ornamental features were observed on either the opisthosoma or telson.

#### COMPARISON OF THE TWO SPECIMENS

These two specimens are larger by far than known specimens attributed to *Pseudoniscus*, *Bunaia*, and *Neolimulus*, the other genera of the Pseudoniscidae (Eldredge, 1974; admittedly, the whole lot is known from probably fewer than 50 specimens). Aside from size, the features that ally these two specimens are to be found in the opisthosoma. The general shape of the opisthosoma is more rounded laterally and posteriorly than in any other known taxon possessing 10 or more opisthosomal segments with pleura on all segments. And, unlike related taxa, the opisthosoma in both specimens is considerably longer than the prosoma. Of paramount importance is the conformation of the fused sixth and seventh segments; insofar as the morphology of the holotype can be determined, there are at least two derived character states of this tergite shared by these specimens: (1) the axis is highly constricted by deep "axial" furrows, and (2) the sixth segment is very short (sagittally), whereas the seventh is quite long, or hypertrophic. Other details seen on the Ludlow specimen (BMNH I 25) cannot be seen with assurance on the holotype, but do not at any rate conflict with the pattern discernible on the holotype. In addition, the relative sizes of all 10 opisthosomal segments are rather similar in the two specimens.

Aside from the difference in shape of the genal cornua (caused presumably entirely by distortion and breakage in preservation of both specimens), the only major differences between

the two specimens are overall size and expression of the ophthalmic ridges. Only the latter difference merits attention as a possible argument against referring these specimens to the same species, or even to the same genus. Preservation of the ophthalmic ridges is notoriously variable in the Pseudoniscina in general (Eldredge, 1974) and again, although width, height, and position (relative to the lateral prosomal margins) of these structures in the two specimens do differ, it is impossible to assess how different (if at all) they actually were prior to compaction.

We conclude that the opisthosomal morphology, particularly of the fused tergite composed of opisthosomal segments 6 and 7, is so similar in these two specimens that the Ludlow specimen should be referred to the genus *Cyamocephalus*. The few differences, all debatable, between these two specimens warrant some doubt in the specific allocation of the Ludlow specimen; hence we prefer the designation *Cyamocephalus* cf. *Cyamocephalus loganensis* for it.

#### RELATIONSHIPS OF *CYAMOCEPHALUS*

Prosomal morphology of *Cyamocephalus* is quite similar to that of *Pseudoniscus*. *Cyamocephalus* lacks an anterior median projection (this is probably the primitive condition), as do *Bunaia* and *Neolimulus* and, in contrast, this feature is present in all known species of *Pseudoniscus*. *Cyamocephalus* also agrees with other Pseudoniscidae in having obscure (reduced) cardiophthalmic morphology.

*Pseudoniscus* has 10 opisthosomal segments, all but the first with distinct, flat posterodistally pointed pleura (segments 2-7) or tapered (segments 8-10) pleura bearing pleural ridges (segments 2-7); in some, but definitely not in all, specimens opisthosomal segments 6 and 7 appear fused. The axial furrows are invariably simple, however, and there is no complex differentiation or development of the sixth and seventh segments; segment 7, moreover, is only slightly larger than segment 6 in *Pseudoniscus*. In terms of the morphology of the fused tergite composed of segments 6 and 7, *Cyamocephalus* appears to be the most derived member of the Pseudoniscidae. In addition to its size, overall shape of the opisthosoma, and conformation of the fused ter-

gite (6 + 7), *Cyamocephalus* differs from other Pseudoniscidae (indeed, most other Xiphosurida) in having an opisthosoma distinctly longer (sagittally) than the prosoma. Although this condition is seen in Aglaspida, Eurypteridida, and Chasmataspida, and therefore is probably primitive for the Merostomata, we consider this condition to be derived (specialized) within the infraorder Pseudoniscina, inasmuch as the primitive condition for the order Xiphosurida (Suborders Synziphosurina and Limulina; see Eldredge, 1974) was almost certainly subequality in the length of the prosoma and opisthosoma. We find these differences sufficiently great to consider *Cyamocephalus* a distinct and valid genus within the Pseudoniscidae.

In Europe, *Pseudoniscus* is known from Upper Silurian sediments on the island of Oesel and in Great Britain (including the Logan Water of Lesmahagow where the holotype of *Cyamocephalus* was also collected). In North America, *Pseudoniscus* is known from the Upper Silurian of New York State. *Bunaia*, a possible junior synonym of *Pseudoniscus*, is also from the Upper Silurian of New York. The other two pseudoniscid genera, *Neolimulus* and *Cyamocephalus*, are known only from Great Britain. However, the higher diversity of pseudoniscid genera in Great Britain is probably more apparent than real: there is no doubt that Upper Silurian rocks of the appropriate facies have been scrutinized more intensely in England and Scotland than anywhere else. Although seemingly never really numerous, additional specimens of *Cyamocephalus* and perhaps other pseudoniscids may yet be collected elsewhere.

In a recent review of all known primitive Paleozoic Xiphosurida (Synziphosurina and Pseudoniscina), Eldredge (1974) stated that the Pseudoniscidae, although sharing derived characteris-

tics uniting them with the Limulicina into the suborder Limulina and separating them from Synziphosurina, are plesiomorphic in nearly all character states with respect to the Limulina as a whole (with the exception of the effacement of most prosomal morphology—a specialization of the Pseudoniscidae). The affinities among genera within the Pseudoniscidae, and of the Pseudoniscidae among the Limulina, are difficult to adduce. Although *Cyamocephalus* clearly falls within the diagnosis of the infraorder Pseudoniscina (which, under the scheme given by Eldredge, 1974, also contains primitive belinurids), these two specimens of *Cyamocephalus* shed no further light on the relationships among genera of the Pseudoniscina, or on the precise relationships of this group with other Limulina.

#### LITERATURE CITED

- Benham, W. B. S.  
1855. Part II. Description of the muscular and endoskeletal systems of *Limulus*. Trans. Zool. Soc. London, vol. 11, pp. 314-338.
- Currie, L. D.  
1927. On *Cyamocephalus*, a new synziphosuran from the Upper Silurian of Lesmahagow, Lanarkshire. Geol. Mag., vol. 64, pp. 153-157.
- Eldredge, Niles  
1974. A revision of the suborder Synziphosurina (Chelicerata, Merostomata), with remarks on merostome phylogeny. Amer. Mus. Novitates, no. 2543, pp. 1-41.
- Størmer, Leif  
1955. Merostomata. In Moore, R. C. (ed.), Treatise on invertebrate paleontology. Part P, Arthropoda 2. Lawrence, Geol. Soc. Amer. Univ. Kansas Press, pp. P4-P41.











