CYMBIDIUM, A NEW GENUS OF SILURIAN PENTAMEROID BRACHIOPODS FROM ALASKA

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In the paleontologic collections made in Southeastern Alaska the upper Silurian pentameroid brachiopods have proved of special interest. Typical *Conchidium* is abundant at various horizons, but of the remaining pentameroids all have been found to represent new genera. I have already described two of these genera—*Brooksina* and *Harpidium*. In the present paper I shall describe another genus *Cymbidium*. Of the pentameroids at present ascribed to *Conchidium* there are one or two aberrant types which it may not be possible to place under that genus and for which it may be necessary to create new generic names. The unusual number of new genera, particularly in such a widely distributed group as the pentameroids, is surprising. It is necessary to bear in mind, however, that we are dealing with a boreal fauna which is inadequately known. Furthermore, all these new forms occur at a stratigraphic horizon scarcely known in areas where extensive paleontologic collections have been made in the past.

In addition to their biologic interest these pentameroids, owing to their diverse forms and considerable differentiation, have proved of the utmost value in stratigraphic correlations. It is mainly for their use in stratigraphic studies that the forms are being described. It is to be hoped that more extensive collections of these upper Silurian faunas will be made that will permit an adequate treatment of the faunas as a whole.

The faunal sequence in Southeastern Alaska is closely similar to that of England. The lowest Silurian series of which we can be certain at present is characterized in part by graptolite-bearing slates and graywackes which probably correlate closely with the lower Ludlow. These are followed by a great sequence of clastics and thick limestones. In the limestone series the lowest fauna is characterized by a great abundance of *Conchidium* of the type of *knighti*, if indeed *knighti* itself may not be present. This horizon probably approxi-

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mates closely to the Aymestry limestone of the middle Ludlow. In England the upper Ludlow and Downtonian apparently do not carry large normal marine faunas. In Alaska, however, these higher limestones are richly fossiliferous, and it is from them that these new pentameroid genera have been collected. In the interior of North America we can find a stratigraphically comparable fauna perhaps only in the Monroe group of Michigan. This group has been ascribed in part to the Devonian by some geologists. For the present it would appear that the Monroe should be retained in the Silurian. The so-called Devonian elements in the upper Monroe fauna are far from convincing. In the boreal upper Silurian are many fossils that judged by eastern American standards would be considered Devonian. It is indeed a matter of considerable difficulty at times accurately to separate upper Silurian and Middle Devonian faunas from Alaska when small collections of fossils are available. This applies particularly to the corals. Even in the case of crinoids, however, which are unusually diagnostic, I have found such European Devonian forms as *Hexacrinus* and *Codiacrinus* in the *Brooksina* zone of the upper Silurian of Southeastern Alaska. To be sure, dorsal cups alone represent these genera, and if complete specimens were available they might prove generically distinct from their Devonian relatives. Again, in the Ural Mountains we apparently have an admixture of Silurian and Devonian types. *Conchidium* is supposed to range upward into the Devonian. I think that here again we have to deal with boreal Silurian faunas, certain constituents of which are mainly known to us in eastern America and western Europe only in Devonian time. The solution of the problem will probably be had only when the boreal faunas are recognized as such, their sequence established, and their southward invasions recognized.

CYMBIDIUM, new genus

This genus is represented by two known species from the upper Silurian of Southeastern Alaska. *Cymbidium acutum*, new species, which has been chosen as the type, is fairly abundant in the limestones to the east of Edna Bay, on the south shore of Kosciusko Island. In a couple of hours' collecting one specimen with both valves preserved and a dozen or more dissociated valves were found. Near this locality and from a lower horizon, associated with *Brooksina alaskensis* Kirk, another species was found.

Superficially *Cymbidium*, though clearly a pentameroid, strongly suggests the general habit of an orthoid. In the type species the valves are almost equally convex, though the produced beak of the pedicle valve makes this the larger. The shell is wider than long, and the hinge line is about one-half the maximum breadth of the shell. In size *Cymbidium* falls with *Gypidula* and the allied genera.

The surface of the valves is marked by strong plications that multiply by simple dichotomy. There are also fine wavy concentric growth lines. The shell substance is fibrous, the fibers being intricately twisted and contorted.

The pedicle valve is smoothly convex or flattened and has a broad, slightly elevated median fold. The beak is somewhat everted and shows slight tendency toward incurving. The delthyrium is large and when freed from the matrix the shallow spondylium is clearly seen. Bordering the delthyrium are narrow deltidial plates.

The spondylium is attached to the inner borders of the delthyrium, but so far as it has been possible to ascertain from sections it is not supported by a septum at any point. In this feature the genus differs from all other known pentameroids. It may be that in very early growth stages the spondylium is adherent to the inner surface of the pedicle valve or that a septum is present. If so, this condition obtained only in the extreme posterior portion of the valve, and the most careful sectioning has failed to show it.

The brachial valve has a broad shallow median sinus corresponding to the fold of the pedicle valve. Its apical portion is strongly incurved. The septa of the brachial valve are low, short, widely separated, and strongly divergent. They are inclined toward one another and bear inclined crural processes. In the figure given the processes have some adherent matter that somewhat obscures their exact outline in part.

There is no known pentameroid that closely approaches *Cymbidium* in structure. Superficially the form suggests a somewhat aberrant *Conchidium*, and as noted above it also suggests an orthoid in its general habit. Internally the spondylium of the pedicle valve most nearly resembles that of *Barrandella*, which is likewise free for the greater part of its length, and also has an incipient septum that does not reach the valve. The septa and crural processes of the brachial valve are not essentially different from those of *Conchidium* except for their shortness and wide divergence.

This genus so far is known only in the upper Silurian limestones of Southeastern Alaska.

Genotype.—Cymbidium acutum, new species.

CYMBIDIUM ACUTUM, new species

The only specimen preserving both valves has a small part of one side broken off, so exact measurements of width can not be given. This specimen has an approximate maximum width of 33 mm., a maximum height of 28 mm., and a maximum depth of 20 mm. The hinge line is approximately 22 mm. in length. The valves are almost equally convex, although the brachial valve is somewhat more so.

The pedicle valve with its projecting beak is, however, the larger. The maximum breadth falls in the anterior half of the valves.

The pedicle valve has a broad slightly elevated median fold that is scarcely to be detected except in an anterior view of the shell. The valve is deepest in its median anterior portion. From this median line the shell carries around the beak, breaking abruptly toward the delthyrium and forming a well defined but narrow, smooth cardinal area. The beak is acute, everted, and shows but a slight tendency towards incurving. The delthyrium is triangular in outline and is proportionately large. It is bordered on both sides by narrow deltidial plates, which rest in shallow grooves. The spondylium is attached to the inner margins of the delthyrium and then carries forward and dorsad into the brachial valve, where its free margins come in contact with the inner surfaces of the crural processes that are supported by the septa of the brachial valve. So far as seen the spondylium receives its sole support from the fusion of its posterior margins with the inner border of the delthyrium. Sections in the extreme apical portion of the valve show a secondary thickening of the valves and a filling of lime that would completely hide a union of septum and valve, if such were ever present, which seems doubtful anyway. The spondylium is known to be free and without sign of a septum within two millimeters of the tip of the valve.

The brachial valve has a broad shallow sinus, corresponding to the fold of the pedicle valve. The valve is deepest and most convex in its posterior portion. The apical portion is strongly incurved. The septa of the brachial valve are low and short, probably not having a length exceeding 8 mm. in the type specimen. They diverge sharply and widely from their points of inception. In section the septa are shown to be inclined toward one another. Supported by the septa are narrow inclined crural plates.

The shell substance is fibrous, the fibers running and twisting in all directions. The surface ornamentation consists of coarse plications and fine concentric growth lines. The plications are most pronounced in the median portion of the valves, becoming lower laterally and finally dying out near the delthyrium and hinge line. The plications increase by regular dichotomy.

This species is fairly abundant in the dark crystalline upper Silurian limestones northeast of Edna Bay on the south shore of Kosciusko Island, Southeastern Alaska. Collector, Edwin Kirk.

Holotype and paratypes.—Cat. No. 71036, U.S.N.M.

CYMBIDIUM RETRORSUM, new species

At a stratigraphically lower horizon and near the type locality of *Cymbidium acutum* a second species of the genus was found. Two

complete individuals were collected, one of which was sectioned for the study of internal structures.

The type specimen has a maximum width of 31 mm., maximum height of 25 mm., and a maximum depth of 18 mm. The hinge line has an approximate length of 23 mm. The ornamentation consists of fairly coarse longitudinal plications.

The pedicle valve is convex in cross section but nearly straight in longitudinal section. The result is to make this valve relatively small and to give the species a reversed appearance, closely simulating the genus *Brooksina* with which the form is associated. The beak is low, blunt, and everted. The delthyrium is short but unusually broad. The spondylium is shallow, as may be seen in the figure. The delthyrium is bordered by narrow deltidial plates. The cardinal areas are abruptly cut off from the remainder of the valve and are almost flat. There is but a slight indication of a broad median fold, and this is apparent only on the anterior margin.

The grachial valve is uniformly convex. The beak is not prominent but is strongly incurved. The anterior margin of the valve is slightly sinuous, giving an indication of the presence of a median depressed area that scarcely shows on the surface of the valve, however.

The brachial valve is uniformly convex. The beak is not promi- the slight development of a sinus and fold on the brachial and pedicle valves, its flattened pedicle valve, and the less elevated, everted beak of the pedicle valve.

The species was found associated with *Brooksina alaskensis* Kirk at its type locality about one-fourth mile inland and about 3 miles northeast of Edna Bay on the south side of Kosciusko Island, Southeastern Alaska. Collector, Edwin Kirk.

Holotype.—Cat. No. 71037, U.S.N.M.

EXPLANATION OF PLATE

FIGS. 1–4. *Cymbidium retrorsum*, new species. Ventral, profile, dorsal, and posterior views of the type specimen.

5–9. *Cymbidium acutum*, new species. Dorsal, ventral, posterior, profile, and anterior views of the type specimen.

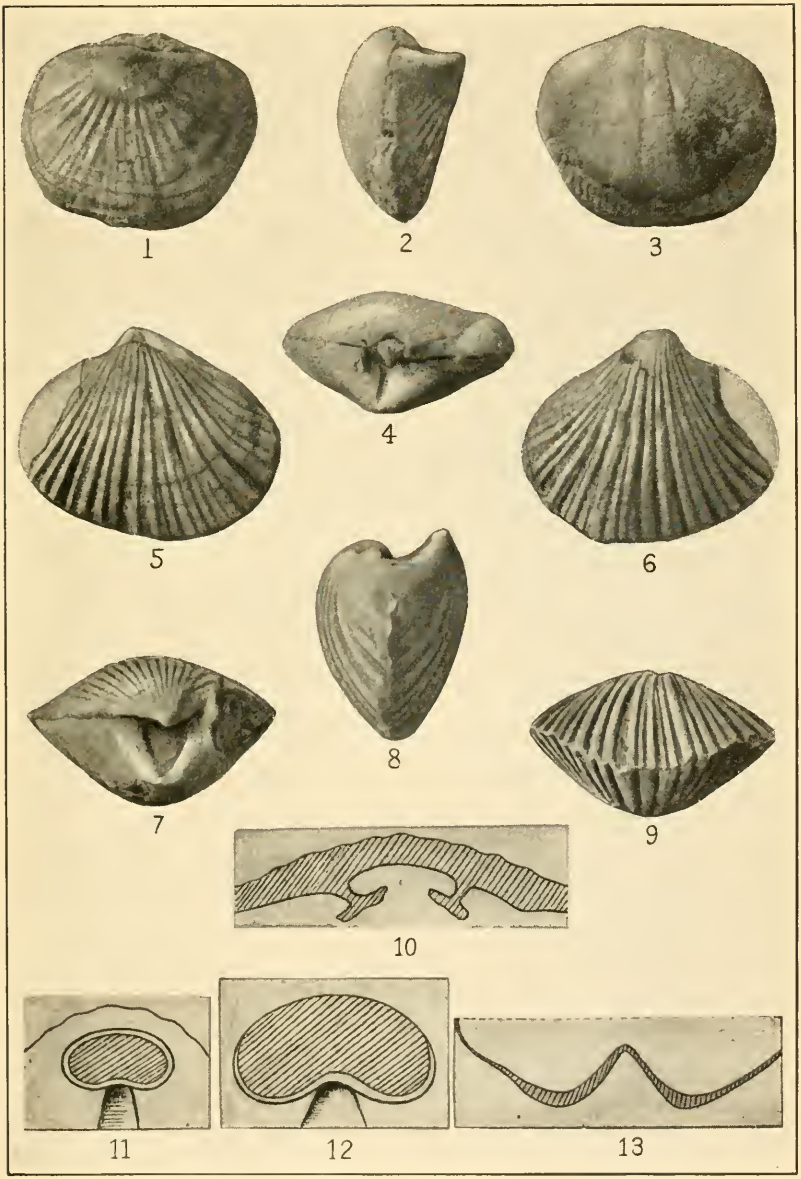
10–13. *Cymbidium acutum*, new species.

10. Section of brachial valve showing septa and inclined crural processes. The latter are somewhat thickened and obscured by secondary deposits. x 3.

11. Section of pedicle valve near the apex, showing the shallow unsupported spondylium. x 3.

12. Section of pedicle valve anterior to fig. 11. x 3.

13. Section of pedicle valve still farther forward. x 3.



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