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RECENT CYTHERACEAN OSTRACODES FROM McMURDO SOUND AND THE ROSS SEA, ANTARCTICA

By Richard H. Benson



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RECENT CYTHERACEAN OSTRACODES FROM
McMURDO SOUND AND THE ROSS SEA,
ANTARCTICA

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ABSTRACT

Five sediment samples collected from the east and west ends of the Ross Ice Shelf in the Ross Sea, at McMurdo Sound and near Edward VII Peninsula, have yielded specimens representing 13 species of Recent, marine, cytheracean ostracodes from a cold shallow shelf environment. Two new genera, *Loxoreticulatum* and *Australicythere*; one new species, *Copypus elongatus*; and one new subspecies, *Patagonacythere longiducta antarctica*, are described. Three additional forms are described, but for various reasons are not named; three forms have been found to have definite affinities with previously described species, *Pseudocythere caudata* Sars, *Semicytherura costellata* (BRADY), and *Hemicythere kerguelensis* (BRADY). Five species, previously described from other areas, have been identified from the Ross Sea region; *Paradoxostoma antarcticum* MÜLLER, *P. hypselum* MÜLLER, *Loxoreticulatum fallax* MÜLLER, *Australicythere polylyca* MÜLLER, and *Patagonacythere devexa* (MÜLLER).

The primary purpose of this study was the redescription, illustration, and classification of the common ben-

thonic cytheracean ostracodes of the Antarctic region, which became available through collections made by recent American expeditions. The fauna of this area has been unstudied for almost fifty years. Techniques and concepts have changed sufficiently to warrant reexamination of these forms in order to supplement the changing impressions of genera and families being described from farther north.

The fauna was abundantly represented in number of specimens, but poorly in number of species. The forms were large; some were delicately ornamented; all were beautifully preserved. The character and distribution of the species suggests an indigenous cold-water Southern Ocean fauna.

Added to the main portion of this study were the descriptions of two deep-sea ostracodes representing two cytheracean species, *Bradleya? dictyon* (BRADY) and *Echinocythereis dasyderma?* (BRADY), which were obtained from a core collected in a remote area of the southeastern Pacific, just northeast of the study area.

INTRODUCTION

The generic classifications of the several studies that have been made of the Antarctic fauna are outdated, and, with one possible exception, the illustrations of the relatively few specimens that have been collected are poor by modern standards. The purpose of this report is to illustrate some of the specimens collected by two recent American Antarctic expeditions, which represent some of the more interesting and important podocopid ostracode species living along the edges of the Antarctic continent. Wherever possible, attempts have been made to place these species into modern generic categories, and in the cases of two to create new genera.

The faunas of two separate areas of the Ross Sea are represented in this study; McMurdo Sound to the west, and the shallow waters around Edward VII Peninsula to the east. The one large grab sample from McMurdo Sound proved to be much more rewarding than the samples collected by a Phleger corer from the eastern Ross Sea. The majority of the forms discussed here were from this grab sample.

The McMurdo Sound sample was collected during a survey of the benthic invertebrates of this area in December of 1959 by a zoological research team

from Stanford University under the auspices of the National Science Foundation. Through a hole in the ice, used by seals, located to the south of Hut Point at the entrance to Winter Quarters Bay, an orange-peel dredge was lowered by hand to a depth of 57 meters to collect about one liter of sediment. This material was collected at Stanford Station "P" in "supercooled" waters of minus 2.1°C., which are covered by pack ice through at least ten months of the year.

The sediment was entirely organic, composed of siliceous sponge spicules, fine green algae, gastropod shells, fragments of the mollusk *Ligmatula hodgsoni*, bryozoans, arenaceous foraminifers (*Ehrenbergina*, *Haplophragmoides*, *Globobulimina*, and *Ceratobulimina*), and abundant calcareous foraminiferal tests and ostracode carapaces. No identifiable detrital rock material, sand, or clay were present in the sample. Apparently the organic debris had accumulated as a mat over the detrital substrate, which, if present, was not penetrated by the orange-peel dredge. The biomass productivity appeared to be high, as indicated by the large proportion of very recently dead remains in the sample. Many of the ostracode carapaces contained

soft parts. The sediment was anything but barren or depauperate as might be expected under an ice-covered bay. The presence of the green plant material was unexpected, as the surface pack-ice was about six feet thick at the time the sample was recovered.

The foraminiferal population had many arenaceous forms, though the larger portion was calcareous in spite of high solubility of calcium carbonate in the cold waters. The populations of foraminifers and ostracodes are about equal in number. The presence of a relatively large assemblage of ostracode carapaces is notable, and the presence of most of the instars indicates a stability in the fauna. The preservation of the tests, shells, and carapaces was excellent, allowing many features of the ostracodes to be studied that are not visible in many fossil forms. There was little evidence of agitation of the waters overlying the bottom. The spicules and bryozoan pieces exhibited no abrasion. Many of the ostracodes were delicate and glasslike, with most of the finer structures still intact. Fewer specimens than usual were etched or opaque.

I know less about the sediment of the area from which the ostracodes of the eastern Ross Sea were collected. The specimens were collected in 1961 with a Phleger corer and were sent to me already picked by the geologists working on the Operation Deep Freeze project. For this and reasons of paucity of fauna I have selected only those forms from these samples that were particularly interesting or taxonomically significant. This number represents about one third of the species present.

PREVIOUS STUDIES

The ostracodes of the Antarctic attracted considerable attention subsequent to the several national expeditions that took place just after the turn of the twentieth century (Fig. 1).

The earliest report, the one by BRADY (1907) on the ostracodes collected by the National Antarctic Expedition (1901-04) of Great Britain (Discovery Expedition), contains the descriptions of nine species. Only six specimens of podocopid ostracodes were found (*Xestoleberis reniformis*, n. sp., and *Linocheles vagans*, n. sp., n. gen.) in the samples obtained. The samples for the most part were plankton tows. Some of them apparently included floating weeds on which the benthonic ostracodes were living.

The most detailed and taxonomically complete report available on the ostracodes of the Antarctic is by

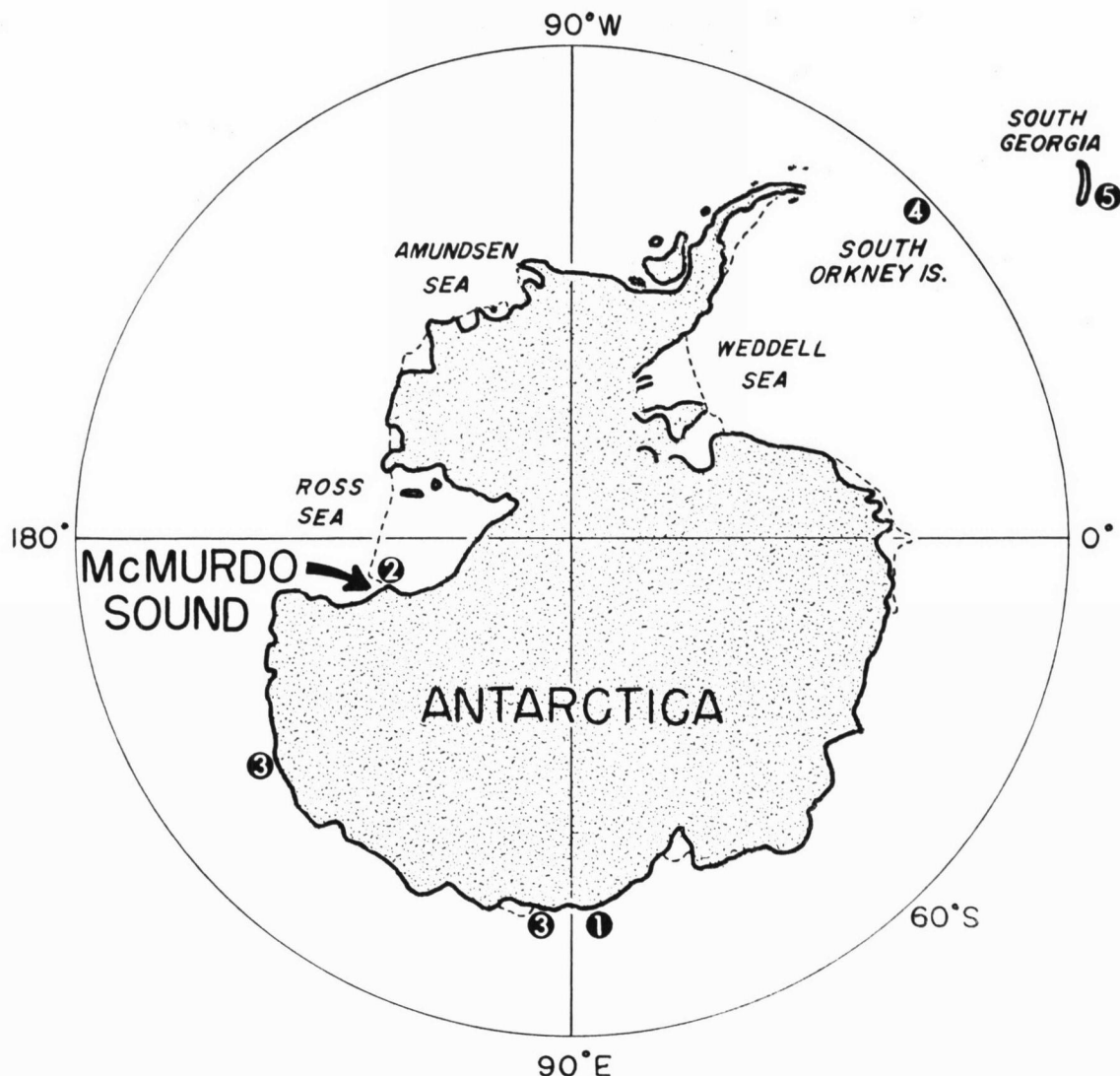
G. W. MÜLLER (1908) and includes the identifications and descriptions of 141 ostracode species collected by the German South Polar Expedition (1901-03, also called the Gauss Expedition). The sampling was concentrated in the Indian Ocean sector of the Antarctic shelf, particularly at one locality called the Gausstation (location, lat. 65°S., 90°E.). About 45 of the ostracode species identified and described were podocopids. Because of the high quality of this study and MÜLLER's careful illustrations I have been able to identify at least seven of his species in the present study.

THOMAS SCOTT (1912) described the Entomostraca collected by the Scottish National Antarctic Expedition (1902-04). He included the descriptions of 14 podocopid ostracode species. All of these species were collected at Scotia Bay in the South Orkney Islands (lat. 60°43'42"S., long. 44°38'33"W.). I have not been able to examine the specimens studied by SCOTT but from his illustrations I believe he found at least one and possibly three of MÜLLER's species which he described as new, apparently being unaware of MÜLLER's 1908 study.

FREDERICK CHAPMAN published several short reports on the ostracodes of the Antarctic region (1916, 1919) both from the British Antarctic Expedition (1907-09, under E. H. Shackleton) and the Australasian Antarctic Expedition (1911-14, under Douglas Mawson). The first of these collections contained fossil ostracodes obtained from deposits 160 feet up the slopes of Mount Erebus in McMurdo Sound. This fauna included eight species, of which four may have been found living in McMurdo Sound during the present study. Also included in the report of this expedition were the identifications and descriptions of ten species collected from Recent muds of the Ross Sea. At least two of these forms were found in the present study.

In 1919 CHAPMAN published the identifications made from material collected on cruises of the *S. Y. Aurora*, the ship of the Australasian Antarctic Expedition. A large number of species were found on several cruises to the Davis Sea south of the Kerguelen-Gaussberg Ridge and to the Subantarctic regions south of Tasmania. This report is primarily a faunal list with few descriptions of the forms themselves.

The next report of consequence dealing with the benthonic ostracodes of the Southern Ocean was published by SKOGSBERG (1928). In this comparatively long report, he described a number of hemicytherid and trachyleberid species from South Georgia, Falk-



TEXT-FIG. 1. Locations of study areas in Antarctica. Previous study localities are indicated: 1, MÜLLER, 1908; 2, CHAPMAN, 1916; 3, CHAPMAN, 1919; 4, SCOTT, 1912; 5, SKOGSBERG, 1928.

land Islands, and regions near the southern tip of South America. These specimens were collected during the Swedish Magellan Expedition (1896) or by the Swedish Expedition (1901-03). In this paper by SKOGSBERG, which is well known to ostracode workers, he attempted to classify the *Cythereis*-like ostracodes on the basis of soft parts. His excellent carapace illustrations have aided me in making meaningful comparisons of his forms with those of McMurDO Sound.

Interest has slackened in the South Polar ostracodes since the collections made in the early 1900's were described. The present report represents the first material to be collected and described from this area in more than fifty years.

LOCATION AND DESCRIPTION OF THE STUDY AREAS

McMURDO SOUND

Nine of the species of this report were collected from one locality in McMurDO Sound. The station data are as follows:

Date collected: 11 December, 1959

Collector: JOHN H. DEARBORN, U.S. Antarctic Research Program

Station: Sta. "P" (Stanford Univ. benthic invertebrate program designation)

Depth: 57 meters (=187.1 feet)

Location: South of Hut Point at entrance to Winter Quarters Bay, McMurdo Sound, Ross Sea
 Bottom: Siliceous sponge complex

McMurdo Sound is a small embayment located on the western edge of the Ross Sea in Antarctica at the juncture of Ross Ice Shelf and Victoria Land (Fig. 2). For short intervals of time each year it represents one of the more accessible penetrations of open water into the continent of Antarctica. The Ross Sea faces the western sector of the Pacific, and the closest major land area away from the Antarctic continent is New Zealand.

The sample was obtained from just off a large southward-jutting peninsula of Ross Island, which is the largest island located at the edge of the permanent ice front just to the east of Victoria Land. Hut Point and Cape Armitage, which mark the terminus of this peninsula, protect a very small tongue of Erebus Bay, called Winter Quarters Bay. Erebus Bay is a large embayment of McMurdo Sound formed by Ross Island and the permanent ice front. The bottom of the sea in this area plunges rapidly to the north and west from a depth of from ten and fifteen fathoms to more than three hundred fathoms. The steeply sloping bottom is covered for the most part by a sponge spicule mat with a sporadic admixture of volcanic ash.

To the north of Hut Point and Cape Armitage from where the ostracodes were found lies Ross Island proper, which is a glaciated volcanic island formed by Mount Erebus, probably the only active volcano in the Antarctic. To the west lies Victoria Land, part of the continent of Antarctica. From this area numerous active glaciers emerge from a higher ice plateau jutting between headlands of the Royal Society Range. Peaks of this range reach altitudes of 9,000 feet at Mount Discovery to almost 13,000 feet at Mount Lister. This western border of McMurdo Sound is formed by a glacially scoured and ice-covered horst whose flanking front trends in a general north-south direction along the shoreline. The horst, which is topographically the Royal Society Range, is composed primarily of granites and metamorphics (FERRAR, 1907) capped by the late Paleozoic Beacon Sandstone. To the south lies the grounded western edge of the Ross Ice Shelf, which in this area is composed of massive tabular ice at least 500 feet thick. Old lateral moraines of the Koettlitz Glacier trending north-south cover the surface of the ice. These moraines, which are now removed from the mother glacier, are relic. Apparently glaciers have

not fed continent-derived sediments to the Sound and Bay areas for some time.

EASTERN ROSS SEA

In addition to the prolific sample from McMurdo Sound, I obtained the ostracodes found in four small Phleger cores taken in the northeastern part of the Ross Sea. These samples were collected during Operation Deep Freeze in 1961. Only 10 to 15 specimens were found in each of these cores representing seven or eight species. Three of the more significant species are described here. At least two species found at McMurdo Sound were also found in these samples. The locations of the sample collecting stations are as follows:

Stat. 1 Lat. 77°16'S., long. 152°22'W.; depth 210 meters.
 Stat. 2 Lat. 77°33'S., long. 158°34'W.; depth 247 meters.
 Stat. 3 Lat. 77°31'S., long. 160°34'W.; depth 448 meters.
 Stat. 4-5 Lat. 76°30'S., long. 151°39'W.; depth 274 meters.

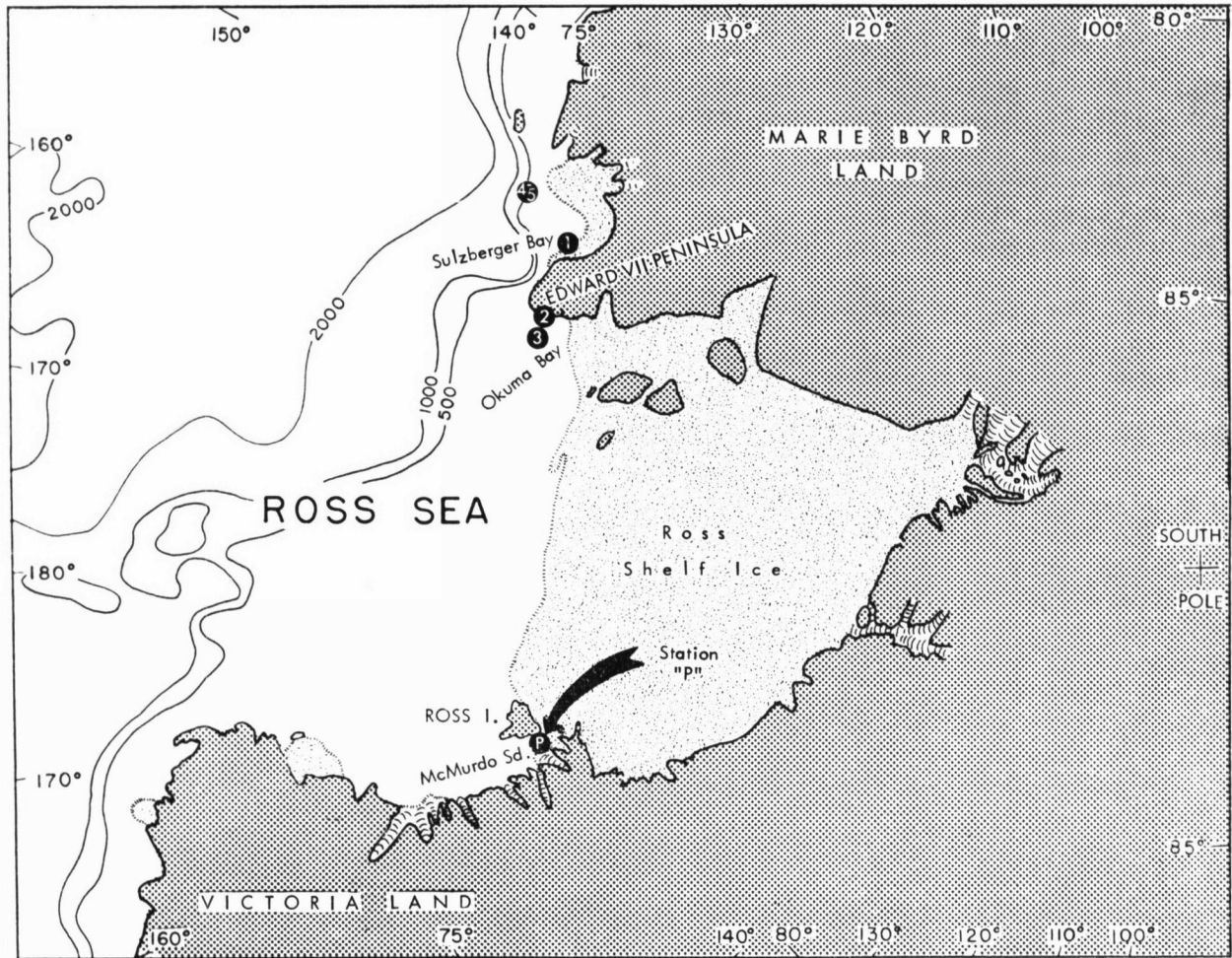
These stations were located on either side of Edward VII Peninsula in Okuna Bay (Stat. 2 and 3) and near Sulzberger Bay (Stat. 1 and 4-5). Edward VII Peninsula is a major promontory formed by a north-west extension of the Edsel Ford Ranges called the Rockefeller Mountains. All of these physiographic elements are part of Marie Byrd Land.

The localities represented by the species described in this report lie at either end of the Ross Ice Shelf with McMurdo Sound on the west and the above stations on the extreme east. The sample from McMurdo Sound was collected on the shallower part of the shelf. Those from the eastern Ross Sea were collected from much deeper water out on the edge of the continental shelf and on the continental slope. The differences in depth of these stations may partially account for the differences in numbers of ostracodes and kinds represented.

LABORATORY METHODS

The preservation of the specimens was excellent. The sediment in which they were found was loose and required no special treatment for their removal. Soft parts in many specimens were still intact and have been illustrated for at least one species.

The drawings in this report were prepared by projecting the image of the transparent carapace or soft parts through drawing paper, using a compound binocular microscope and a 1000-watt slide projector mounted under a glass-top table. The details of surface ornamentation, hinge, and marginal area were



TEXT-FIG. 2. The Ross Sea area showing the collecting stations in McMurdo Sound (station "P") and near the Edward VII Peninsula (stations 1-5).

traced with considerable fidelity by this method. Use of a 16-mm. objective having a shallow depth of field allowed the contours of the carapace to be followed at successively higher levels in a manner analogous to mapping topographic irregularities from aerial photographs. After the features were accurately placed, stippled shading was added to the final drawing while examining the stained specimen with a binocular microscope ($\times 200$). The silver nitrate stain revealed many fine details in surface structure and texture that could not be otherwise seen. Staining was routinely used as an aid in the study of the carapace as well as for drawing and photography.

The photographs were made with a Leitz Aristophot 35-mm. apparatus employing a 32-mm. microscope objective with an external diaphragm held on by a friction cap. The diaphragm consisted of a standard machine washer oxidized with a blow torch.

The specimens were stained with silver nitrate, heated to oxidize the silver, immersed in glycerol, and lighted with three standard microscope lights.

All type-specimens are deposited at the Smithsonian Institution in Washington, D.C.

GENERAL COMMENTS ON THE OSTRACODE FAUNA

As this is primarily a taxonomic report, most of the comments relevant to particular species can be found within the remarks of the following systematic section. Nevertheless, it is proper to make known a few general observations about the fauna examined as a whole.

The membership of species within the fauna is small compared with the large number of species found living together in warmer waters. Usually fewer

than a dozen species are ever reported from one locality. The populations of the member species are large and the average size of the adults is large. Ostracodes represent a conspicuous element in the benthonic microfauna.

From the limited collections which thus far represent our sampling of the ostracodes of the Southern Ocean, the species seem widespread in their distribution. Many of the same forms are found on opposite sides of the Antarctic continent. They possibly can be traced to the deeper waters of the southern flanks of Tasmania (MacQuarie Swell) and to the islands of the Scotia Arc, spanning latitudes of from 75°S. northward to 55°S. Related forms can be traced farther northward at least to 50°S. at Kerguelen Island and perhaps even farther to the southern tips of South America, Africa, and Australia. Noticeable changes take place in the individual species and species assemblages this far northward. The effects

of warmer currents and invasions of more temperate faunas are evident.

These characteristics are common in polar invertebrate marine faunas, but they have not been examined very thoroughly in benthonic ostracodes. The study of their distribution is still superficial, but a pattern does seem to be developing.

ACKNOWLEDGMENTS

I would like to acknowledge JOHN H. DEARBORN of the Department of Biological Sciences of Stanford University, who supplied the grab-sample and environmental data from McMurdo Sound; the many individuals of Operation Deep Freeze, who made it possible to study the ostracodes of the Phleger cores from the eastern Ross Sea; ERNEST E. ANGINO and EDWARD J. ZELLER, who interceded to obtain the McMurdo Sound samples for me; ROSALIE F. MADDOCKS, who helped with the photomicrography; and ALICE PAINTER, who helped with preparation of many of the drawings. I thank RUSSELL B. MERRILL for aid to the Editor in my absence by careful checking of proofs.

SYSTEMATIC DESCRIPTIONS AND DISCUSSIONS

Subclass OSTRACODA Latreille, 1806

Order PODOCOPIDA Müller, 1894

Suborder PODOCOPINA Sars, 1866

Superfamily CYTHERACEA Baird, 1850

Family PARADOXOSTOMATIDAE Brady & Norman, 1889

Subfamily PARADOXOSTOMATINAE Brady & Norman, 1889

Genus PARADOXOSTOMA Fischer, 1855

Paradoxostoma FISCHER, 1855, p. 654; VAN MORKHOVEN, 1963, p. 429.

Type-species. *Cythere variabilis* BAIRD, 1835, p. 98, figs. 7a-b.

Diagnosis. Distinguished from other members of the subfamily Paradoxostomatinae by its elongate, ovate shape with the greatest height posterior. The anterior is acutely and obliquely rounded, and the posterior is upturned and caudate. Normal-pore canals are small and sparse. The adductor muscle scars are usually four in number but individual scars may be subdivided (as is the case with the two species presented here). *Miocene to Recent; Marine.*

PARADOXOSTOMA ANTARCTICUM Müller, 1908

Plate 1, Figures 1, 2, 4, 5, 9; Text-Figures 3, 4.

Paradoxostoma antarcticum MÜLLER, 1908, p. 121, figs. 1-4 on p. 121; ———, 1912, p. 287.

Diagnosis. According to MÜLLER the curvature and projection of the posterior margin is characteristic of this species. *Recent.*

Description of the carapace. Carapace long, thin fragile. Outline in lateral view, elongate, flexuous, subsigmoid, swung broadly in the posteroventral region; dorsal margin broadly arched, continuous from end to end; ventral margin sinuate, with posterior broadly swung, slight ventral sinuation; anterior end narrowly rounded, oriented downward; posterior end slightly drawn out and upturned, produced to a small beak; greatest height just posterior to mid-line. Compressed in dorsal view, lenticular, greatest width central. End view disc-shaped.

Surface polished, smooth with no ornamentation; normal-pore canals sparse, few in number.

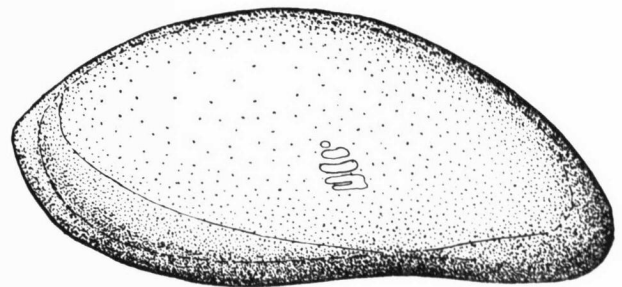
Hinge adont. Marginal area broad in the postero-venter and anteroventer, narrowing in the region of the ventral sinuation. Radial-pore canals short and widely spaced; 7 or 8 in the posterior end and none visible in the anterior. Vestibule very wide and well developed. Adductor muscle scars a vertical row of four scars with one small additional scar on top; the lower three are elongate, and the upper scar approaches being equidimensional, the lower two scars were fused at one end in the specimens examined (Text-fig. 4).

Dimensions. Length of male adult specimens 0.80-0.86 mm.; height 0.37-0.42 mm.; width 0.29-0.37 mm.

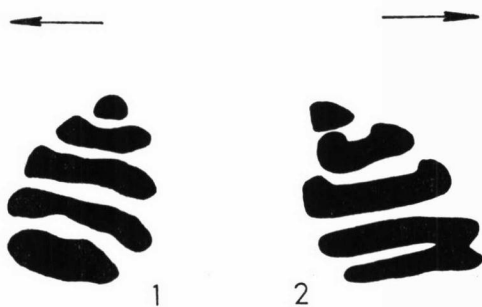
Material. Specimens examined 10, of which 3 had both valves intact.

Remarks. MÜLLER refers to the similarity between *P. antarcticum* and *P. simile* MÜLLER, 1894 (p. 318, pl. 23, figs. 2, 27) suggesting there is a slight difference in shape of the posterior of the carapace as well as the shape of the penis. I found it difficult to distinguish significant differences in the shape of the carapace from MÜLLER's drawings.

Occurrence. *Paradoxostoma antarcticum* has been reported from the Gaussstation from 385 meters depth and from McMurdo Sound, Antarctica.



TEXT-FIG. 3. *Paradoxostoma antarcticum* MÜLLER, 1908. Exterior of right valve showing elongate subsigmoid outline, upturned caudal extension, and general shape of muscle-scar pattern ($\times 100$).



TEXT-FIG. 4. Adductor muscle scars of; 1, *Paradoxostoma hypselum* MÜLLER, 1908 ($\times 400$); and 2, *Paradoxostoma antarcticum* MÜLLER, 1908 ($\times 470$) showing the five vertically arranged scars in an ovate pattern.

PARADOXOSTOMA HYPSELUM Müller, 1908

Plate 1, Figure 2; Text-Figures 4, 5.

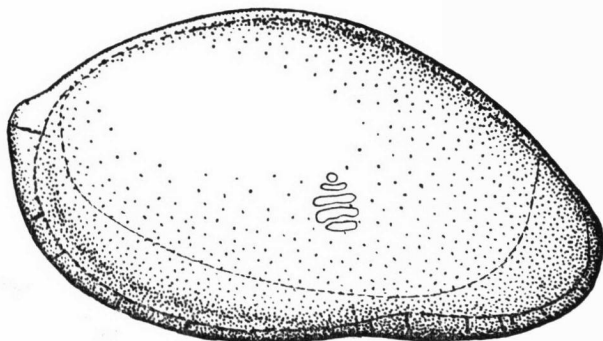
Paradoxostoma hypselum MÜLLER, 1908, p. 118, text-figs. on p. 119; —, 1912, p. 287.

Diagnosis. According to MÜLLER the carapace of this species is distinguished by its short, highly arched carapace, broad marginal area and vestibule, and the distinct upturned posterior end. The cordate muscle-scar pattern composed of five scars may be characteristic (see text-fig. 4). **Recent.**

Description of carapace. Carapace short, thin, spatulate. Outline in lateral view, foreshortened with inflated, high posterior; upturned caudal extension; broadly arched dorsum; narrowly and obliquely rounded anterior; venter broadly swung toward posterior, slight ventral sinuation. Compressed in dorsal view; greatest width central. End view disc-shaped.

Surface polished, smooth, with no ornamentation; a very few scattered normal-pore canals are present.

Hinge adont. Marginal area broad, particularly in



TEXT-FIG. 5. *Paradoxostoma hypselum* MÜLLER, 1908. Exterior view of right valve showing the foreshortened, subsigmoid shape, sharply upturned caudal extension, and general shape of muscle-scar pattern ($\times 100$).

anterior and posteroventer. Vestibule deep and continuous. Radial-pore canals short, simple and widely spaced, some are false, emerging from exterior of shell before reaching the margin; 6 or 7 in posterior, 6 in the anteroventer. Five adductor muscle scars in spade-shaped pattern (Text-fig. 4).

Dimensions. Length of largest specimen 0.78 mm.; height 44 mm.; width 40 mm. (estimated).

Material. Specimens examined 4; none had both valves intact.

Occurrence. *Paradoxostoma hypselum* has been reported from the Gaussstation and from McMurdo Sound, Antarctica.

Remarks. MÜLLER states that *P. hypselum* is similar to *P. maculatum* MÜLLER, 1894. The latter species is higher in proportion to length; the posteroventer of *hypselum* is more up-swung; the caudal projection is oriented posterodorsally on *hypselum*, and directed posteriorly on *maculatum*.

Family XESTOLEBERIDIDAE Sars, 1928

Genus XESTOLEBERIS Sars, 1866

Xestoleberis Sars, 1866, p. 66; VAN MORKHOVEN, 1963, p. 449-443.

Type-species. *Cythere aurantia* BAIRD, 1838, p. 143, pl. 5, fig. 26. [SD by BRADY & ROBERTSON, 1889].

XESTOLEBERIS sp.

Plate 1, Figures 3, 6, 7; Plate 4, Figure 8; Text-Figure 6

Description. Carapace small, fragile, tumid; flattened to slightly depressed on venter. Reniform in lateral view; dorsal margin broadly rounded; ventral margin straight to slightly convex; anterior margin narrowly and obliquely rounded, much smaller than the posterior end; the two broad arcs of the ventral and posterior margins converge to form a slight angle at the posteroventer; greatest height median. Ovate in dorsal view, greatest width just posterior of median. Subtriangular in end view with inflated sides and depressed venter. Left valve slightly larger than right, with overlap along the dorsal margin, particularly at the anterodorsum; contact around the remainder of the free margin is even.

Surface smooth, becoming mottled with many centers of rosette recalcification, mostly coincident with location of normal-pore canals. This mottling appears to be the result of replacement of the original clear material with an opaque substance of recrystallization, producing a slightly splotchy appearance. The normal-pore canals are simple, moderately densely spaced; best seen on the interior of the valves. Valves milky except for marginal areas and eye spots.

Hinge hemimerodont. Marginal area broad in the

anterior, narrower in the posterior where it is broadest along the posteroventer. The vestibule is well developed. The radial-pore canals are funnel-shaped, forming a scalloped line of concrescence; there are about 10 in the anterior, obscure in the posterior. The selvage forms the hinge teeth at the dorsum, continues around the marginal area, is incurved at the ventral sinuation, and separated from the margin in the anteroventral region by the development of a small flange. The closure of the venter is simple. In ventral view, the radial-pore canals appear short and simple, not complicated as in many other species of *Xestoleberis*. Muscle-scar pattern consists of four adductor scars in a ventral row, a "V"-shaped antennal scar, mandibular scars not visible. The eye scar is elongate, sausage-shaped. Dimorphism between male and female pronounced with the female being longer, larger in the posterior to allow for the carrying of the young.

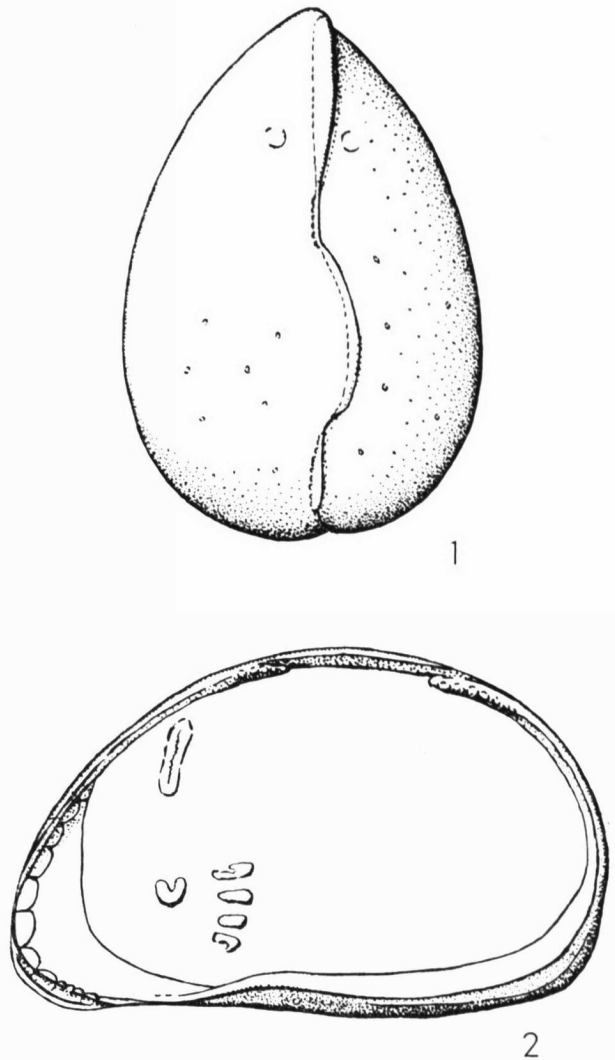
Dimensions. Length 0.56-0.64 mm.; width 0.31-0.40 mm., height 0.28-0.41 mm.

Material. More than 120 specimens were examined.

Remarks. This species could not be identified with any of the others previously described from Antarctica on the basis of shape or configuration of the marginal areas or muscle-scar patterns. It is my judgment that many of the species of *Xestoleberis*, particularly those known from the southern hemisphere, are poorly founded on minor differences in carapace morphology. Rather than to contribute another such species I have elected just to call attention to the existence of this form and await further information on its internal anatomy before trying to compare it formally with other xestoleberid species.

In examining and opening many valves, while looking for soft parts, I found a female with 13 young inside her sealed carapace. As can be seen in the photograph (Pl. 4, fig. 8) the space required for the young is nearly 3/4 of the internal volume of the mother. There was no trace of the soft parts of the female and it might be surmised that she was eaten by her young after entombment, before their own demise. It was also interesting to notice how similar in shape the valves were to much more mature instars. Because of their size and well-formed appearance, I wondered whether these forms were not more than the first instar in their development. Unfortunately, there was not sufficient representation of intervening instars to estimate statistically their growth stage.

Occurrence. This form was found in McMurdo Sound at Station "P" in 57 meters of water. Other species of *Xestoleberis* have been found to be common



TEXT-FIG. 6. *Xestoleberis* sp.—1. Dorsal view of female.—2. Interior lateral view of female showing the hinge, the broad anterior vestibule with funnel-shaped radial-pore canals, the narrow posteroventral marginal area, and the muscle-scar pattern ($\times 130$).

in the Antarctic by MÜLLER (1908) and CHAPMAN (1916, 1919). BRADY (1907) even found a specimen of *X. reniformis* in a plankton tow collected by the British National Antarctic Expedition of 1901-04 along with flocculent diatomaceous material.

Family BYTHOCYTHERIDAE Sars, 1925

Genus PSEUDOCYTHERE Sars, 1866

Pseudocythere Sars, 1866, p. 87; VAN MORKHOVEN, 1963, p. 423-426.

Type-species. *Pseudocythere caudata* Sars, 1866, p. 88.

PSEUDOCYTHERE sp. aff. *P. CAUDATA* Sars, 1866

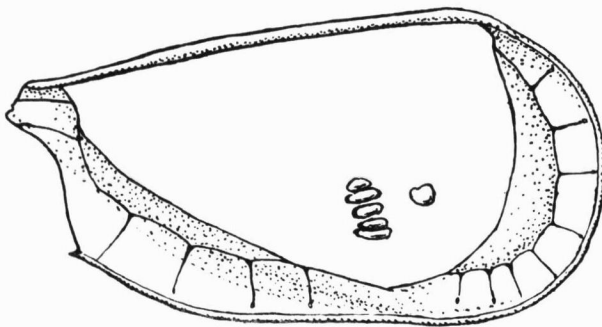
Plate 1, Figure 8; Text-Figure 7.

Pseudocythere caudata Sars, 1866, p. 88; —, 1926, p. 239, pl. 109, fig. 2; ELOFSON, 1941, p. 336 (see for complete synonymy)

of works written prior to 1941); ?MÜLLER, 1894, p. 285; ?WAGNER, 1957, p. 35, pl. 12.
Pseudocythere similis MÜLLER, 1908, p. 106, pl. 10, fig. 13.

A diagnosis is not given for the reasons brought out in the *Remarks*. There is still some uncertainty, at least in my mind, as to the significant characteristics of this species.

Description. Carapace small, fragile, thin, spatulate. Lateral outline lobate, terminating in a short high caudal extension; dorsal margin straight and simple; ventral margin straight to slightly undulate, subparallel with dorsum, abruptly interrupted and punctuated by a small spine at posteroventral angle of a ventrally directed, broad flange; anterior margin broadly rounded, gradational with the dorsum and venter; posterior margin rises abruptly from the spine-terminated venter to a high, short caudal extension merging with the dorsum; greatest height anterior. Dorsal outline elongate, compressed, greatest width at mid-length. End view disc-shaped. Valves apparently equal in size although no whole individuals were found.



TEXT-FIG. 7. *Pseudocythere* sp. aff. *P. caudata* SARS, 1866. Interior view of left valve showing characteristic lateral outline and marginal area, and five-part adductor muscle scar ($\times 115$).

Surface smooth; a few very fine normal-pore canals were visible. Ornamentation consists of a very broad posteroventral flange formed from the fusion of the duplicature and outer lamellae, grading continuously and smoothly from the domicilium.

Hinge adont, possibly very finely lophodont. Marginal area very broad in the anterior and the posteroventral regions, continuing into the caudal extension. Eight or nine radial-pore canals present in anterior; straight, long, and broadly spaced; five or six are present in the posteroventer, with two more in the caudal process. Duplicature is very broad, forming a wide vestibule in the anterior and a narrower one in the posteroventral region. Selvage is continuous from the hinge anteriorly around the free margin, terminating at the posteroventral spine. Adductor muscle-scar pattern composed of a row of five elongate closely packed scars, with a single anterior antennal scar.

Sexual dimorphism produces a smaller male with a straight to slightly convex dorsum and a larger female with a straight to slightly concave dorsum.

Dimensions. Length of adult male 0.7 mm.; height 0.55 mm.

Material. Ten specimens were examined; none had both valves intact.

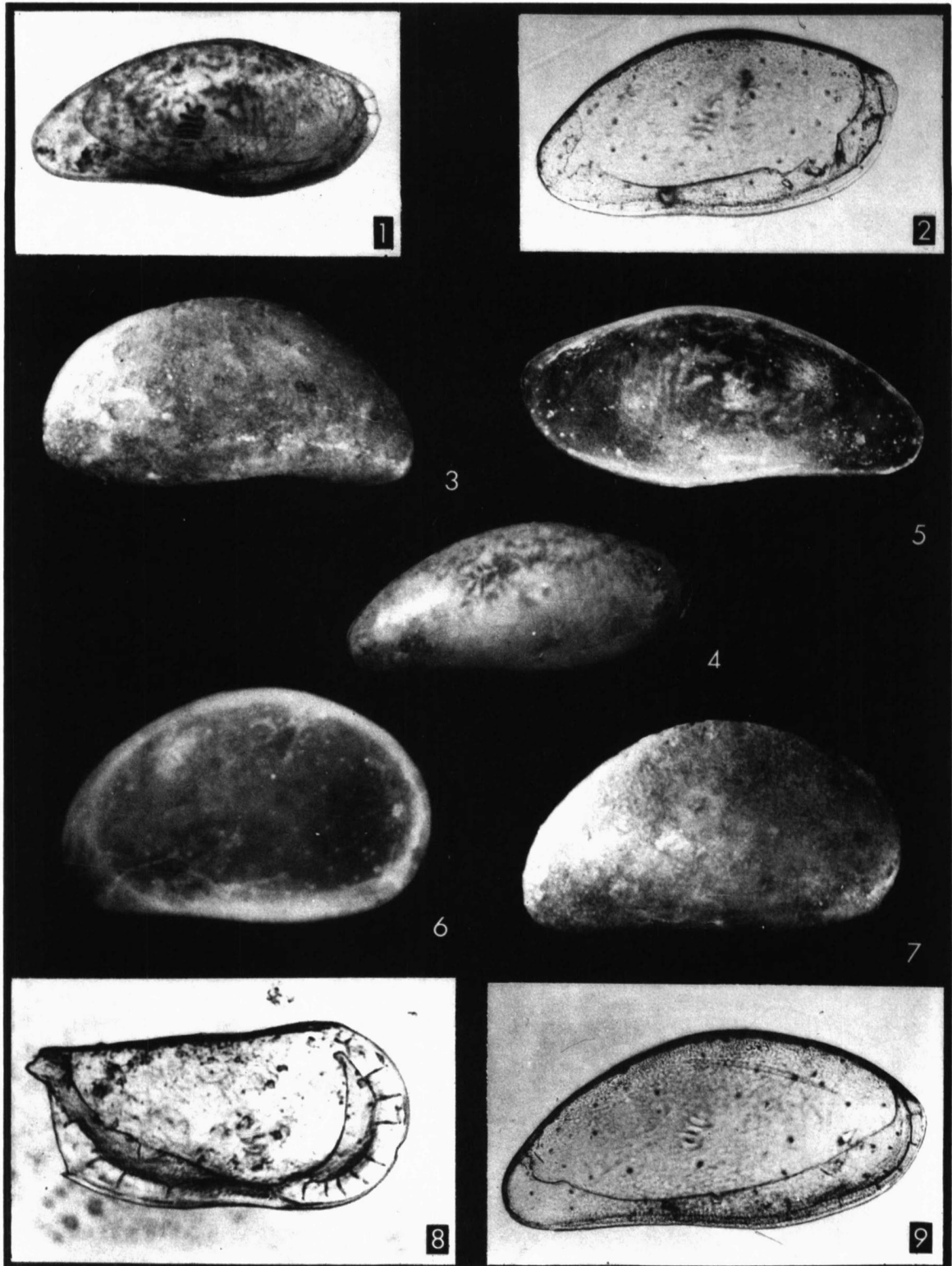
Remarks. It seems unlikely that one species of ostracodes could be distributed as broadly both ecologically and geographically as *Pseudocythere caudata* SARS has been reported to be, and still be as rarely found in number of specimens as it is in any given collection of samples. One would immediately expect either that the observation of ostracode taxonomists had not been keen enough to recognize the separate and probable geographically isolated species; or that *P. caudata* is truly a stasiogenetic form and a few

EXPLANATION OF PLATE 1

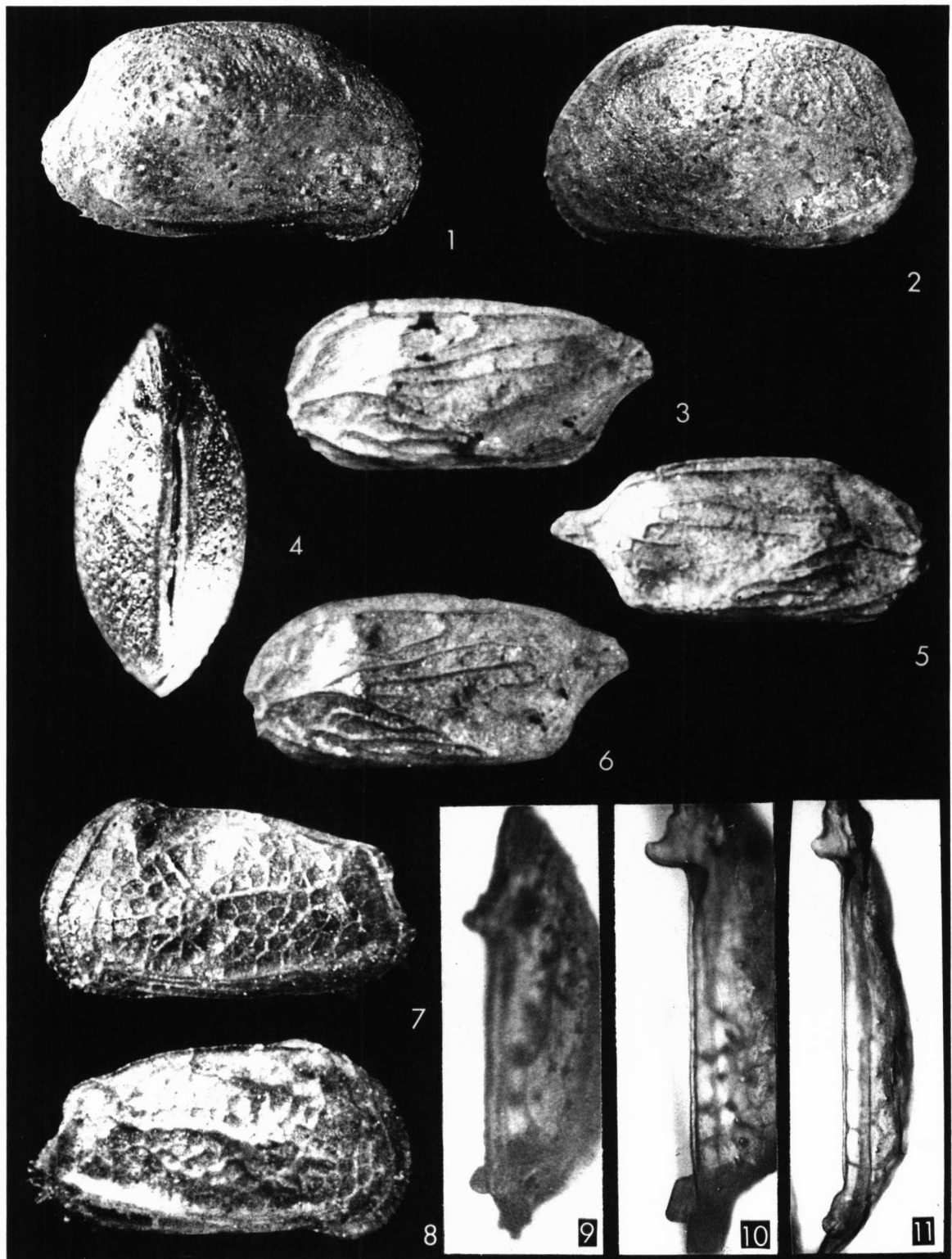
PARADOXOSTOMA, XESTOLEBERIS, PSEUDOCY THERE

(All illustrated forms are from McMurdo Sound, Antarctica)

FIGURE	PAGE		
1, 4, 5, 9.		<i>Paradoxostoma antarcticum</i> MÜLLER; 1, lateral exterior view of left valve (transmitted light), $\times 70$; 4, lateral view of left valve (same specimen as fig. 1), $\times 70$; 5, dark field photograph of exterior view of right valve, $\times 80$; 9, interior view of right valve (transmitted light), $\times 80$.	11
2.....		<i>Paradoxostoma hypselum</i> MÜLLER; lateral interior view of right valve with parts of the inner margin broken (transmitted light), $\times 80$.	12
3, 6, 7.....		<i>Xestoleberis</i> sp.; 3, lateral view of right valve of female, $\times 100$; 6, lateral exterior view of left valve of immature instar, $\times 300$ (approximate); 7, lateral exterior view of left valve of male, $\times 90$.	12
8.....		<i>Pseudocythere</i> sp. aff. <i>P. caudata</i> SARS; interior view of left valve showing marginal features, $\times 80$.	13



BENSON — Recent Ostracodes, McMurdo Sound, Antarctica



BENSON — Recent Ostracodes, McMurdo Sound, Antarctica

relic representative populations are all that presently remain. The latter hypothesis may be premature, however, it does seem worthwhile to examine the taxonomic problems represented by this interesting species in light of these possibilities.

Pseudocythere caudata has been reported from many parts of the world, but it has been best documented taxonomically by the studies of SARS (1866, 1926), MÜLLER (1894), ELOFSON (1941) and WAGNER (1957). As pointed out to me by JOHN NEALE (personal communication) and previously suggested in the literature by ELOFSON (1941) and later by VAN MORKHOVEN (1963), *P. caudata* (*sensu* MÜLLER, 1894, Bay of Naples) may not be the same species as *P. caudata* SARS (*sensu stricto*) or *P. caudata* (*sensu* WAGNER, 1957). ELOFSON (1941, p. 337) makes a distinction between the forms identified by SARS and MÜLLER on the basis of a difference in the shape of the penis. Another difference appears from the illustrations to be in the shape of the radial-pore canals and the possible presence of false pore canals in MÜLLER's forms.

The form described and illustrated by WAGNER (1957, p. 35; supposedly the generotype) is noticeably different from either of those illustrated by SARS or MÜLLER, which are similar by comparison. It seems much higher throughout most of its length, has as many as 13 anterior radial-pore canals (other forms seldom have more than nine), and lacks the short posteriorly directed posteroventral marginal spine reportedly characteristic of both *P. caudata* and *P. similis* MÜLLER (1908, from Antarctica). Only four adductor muscle scars are present in WAGNER's illustration (pl. 12), as pointed out by VAN MORKHOVEN. The specimens of this genus found by MÜLLER (1894, 1908), VAN MORKHOVEN, and myself generally have

five adductor scars. It must be considered, however, that WAGNER may simply have missed seeing this fifth (and small) scar.

In his original description and discussion of *P. similis* MÜLLER compares this new Antarctic species with *P. caudata* and states that the posterior margin between the sharply formed posteroventer and the dorsal margin of *similis* is slightly larger than the one of *caudata*, and that the radial-pore canals of the welded zone of the posterior half of *similis* are fewer in number than those of *caudata*. It is not known whether or not MÜLLER had access to SARS' type specimens; he did not have the benefit of SARS' later illustrations (1926). If one compares the drawings of the carapace by SARS (1926, pl. 109, fig. 2, male) with the photograph of my present report (pl. 1, fig. 8) and with that of MÜLLER (1908, pl. 10, fig. 13), one can see little difference in the lateral outline or the configuration of the inner margin. Possibly the soft parts may show minor differences, but this is yet to be demonstrated.

There is a difference between the elongate, partially subdivided adductor muscle scars shown by MÜLLER for *similis* and those of the specimens found in McMurdo Sound. However, I do not believe this feature can be relied upon as a significant difference. MÜLLER's drawings of muscle scars in several of the other Antarctic forms have proven to be incomplete by today's standards.

MÜLLER contends there are minor distinctions inherent in the shape of the penis of *similis* and bristles on the furca. The specimens I studied had no soft parts. *P. similis* is not paleontologically distinguishable from *P. caudata*.

I have therefore suggested a specific affinity between SARS' type and the form described in this study

EXPLANATION OF PLATE 2

HEMICYTHERE, SEMICYTHERURA, PATAGONACYTHERE, AUSTRALICYTHERE

(All illustrated forms are from McMurdo Sound, Antarctica)

FIGURE	PAGE		PAGE
1, 2, 4. <i>Hemicythere</i> sp. aff. <i>H. kerguelenensis</i> (BRADY); 1, lateral exterior view of right valve showing faint concentric submarginal ridges and coarse pitting in posterior, ×50; 2, lateral exterior view of left valve, ×50; 4, dorsal view of complete specimen, ×50	21	×110; 6, lateral exterior view of left valve, ×110.	17
3, 5, 6. <i>Semicytherura</i> sp. aff. <i>S. costellata</i> (BRADY); 3, lateral exterior view of left valve showing pattern of fine ridges, ×110; 5, lateral exterior view of right valve showing surface ridge, posteroventral depression, and flange,		7-9..... <i>Patagonacythere longiducta antarctica</i> BENSON, n. subsp.; 7, lateral exterior view of left valve, ×70; 8, lateral exterior view of right valve, ×70; 9, dorsal view of right valves showing hinge, ×50.	30
		10..... <i>Australicythere polylyca</i> (MÜLLER); dorsal view of right valve showing hinge, ×40.	24
		11..... <i>Patagonacythere devexa</i> (MÜLLER); dorsal view of right valve showing hinge, ×55.	27

in the belief that when the variability of the species *P. caudata* is known no significant difference will separate the two.

Occurrence. Reported from many localities around Europe (see ELOFSON, 1941), the Mediterranean (MÜLLER, 1894) the Gulf of Mexico (TRESSLER, 1954), the deep Atlantic (TRESSLER, 1942), and Kerguelen Island in the South Indian Ocean. These latter two identifications are questionable until verified by study of the actual specimens. It was reported by CHAPMAN (1915, 1916, 1919) from numerous localities from the Antarctic coast to Fiji at a depth of 1300 fathoms.

Family CYTHERIDEIDAE Sars, 1925

Subfamily KRITHINAE Mandelstam, in Bubikan, 1958

Genus KRITHE Brady, Crosskey & Robertson, 1874

Krithe BRADY, CROSSKEY & ROBERTSON, 1874, p. 183; VAN MORKHOVEN, 1963, p. 340-344.

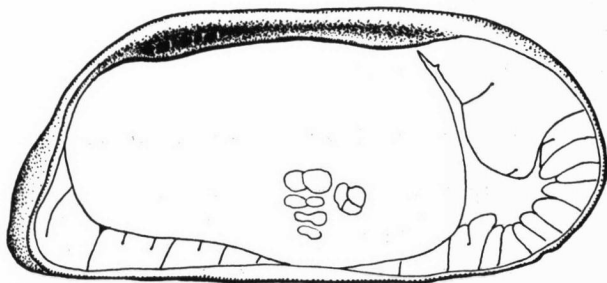
Parakrithella HANAI, 1959 (new name for *Neocyprideis* HANAI, 1957, p. 299; non APOSTOLESCU, 1956).

KRITHE sp.

Text-Figure 8.

Description. Elongate-ovate; simple, moderately small, and fragile. Oblong in lateral view with parallel straight dorsal and ventral margins, evenly and broadly rounded anterior end, truncated and indented posterior end. Ovate in dorsal view; greatest thickness in subcentral to posterior regions; subcylindrical in end view. Surface smooth and polished.

Hinge adont, but with crenulate posterior segment in both groove (left valve) and bar (right valve); "parakrithellid." Broad anterior duplicature with irregular vestibule, more narrow posterodorsal margin with no vestibule. Radial-pore canals radiate from anterior vestibule; a few widely spaced canals are present in posterior. Muscle-scar pattern consists of



TEXT-FIG. 8. *Krithe* sp. Interior view of left valve showing the "parakrithellid" hinge, the indented posterior, and the irregular, narrow vestibule with radiating radial-pore canals ($\times 90$).

four vertically arranged adductor scars with one aggregate antennal scar; two inclined mandibular scars are present anteroventrally.

Dimensions. Length of adult specimen 0.90-0.92 mm., height 0.45 mm., thickness 0.22 mm.

Material. One whole specimen was found.

Remarks. Attention is directed at this specimen as it represents a krithid species with the partially crenulate adont hinge which HANAI (1959) thought was characteristic of his new genus *Parakrithella*; however, this specimen has the posterior incision which should be lacking in HANAI's genus. The presence of these two characteristics in one species tends to support VAN MORKHOVEN's (1963, p. 343) contention that the characters given by HANAI as being of generic importance are not as constant as he had suspected and that each is probably only significant on the species level.

Occurrence. Found in the Southern Ocean off of Edward VII Peninsula in Sulzberger Bay at Station 4-5 ($76^{\circ}30'S$, $151^{\circ}39'W$.), in water 274 meters deep in a core about 26 cm. below the top.

Subfamily NEOCYTHERIDEIDINAE Puri, 1957

Genus COPYTUS Skogsberg, 1939

Copypus SKOGSBERG, 1939, p. 416; VAN MORKHOVEN, 1963, p. 335-337.

Type-species. *Copypus caligula* SKOGSBERG, 1939, p. 418, fig. 1-13.

Diagnosis. Carapace elongate-cylindrical, ends rounded; surface smooth, polished; hinge adont, large terminal vestibules with radiating pore canals; adductor scar a cluster of four. *Recent; Southern Ocean.*

COPYTUS ELONGATUS Benson, n.sp.

Text-Figure 9.

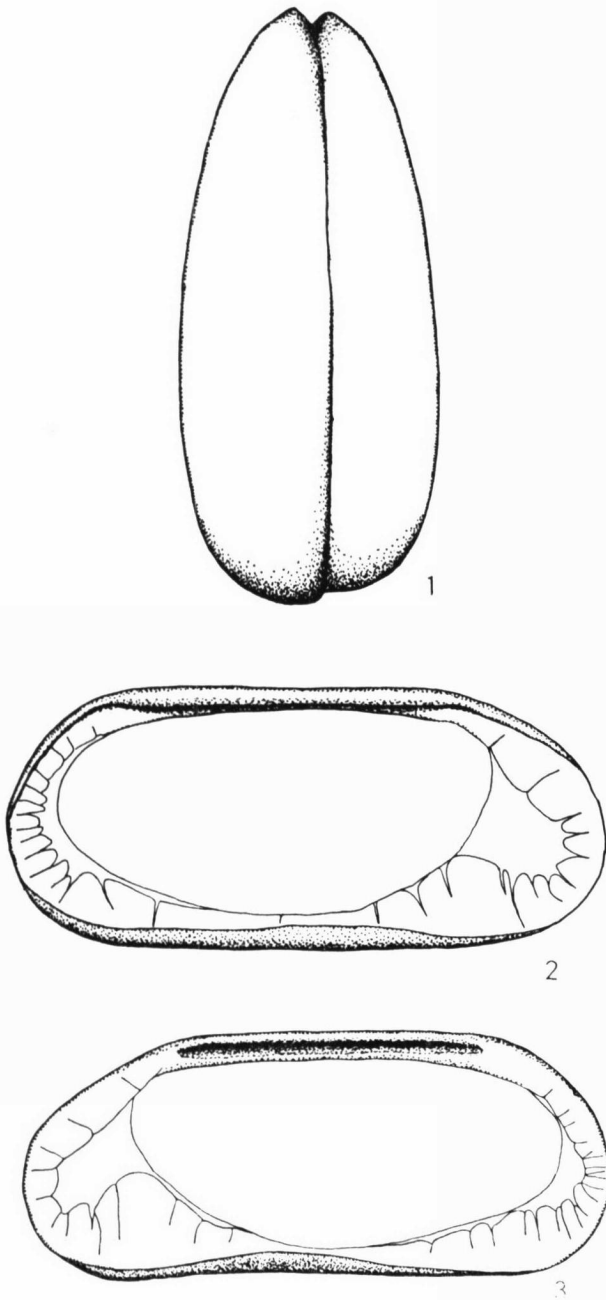
Type-locality. Sulzberger Bay, Antarctica.

Diagnosis. Recognized by its deep, narrow, anterior vestibule and shallow, posterior vestibule.

Description. Carapace small, oblong, cylindrical, moderately strong. Subrectangular in lateral view with long parallel dorsal and ventral margins; anterior end obliquely but broadly rounded; posterior end more narrowly rounded. Ovate in dorsal view; greatest thickness in posterior. Subcircular in end view.

Surface smooth, polished, with sparse, scattered normal-pore canals.

Hinge robustly adont with pronounced groove in right valve to accommodate flange of left valve. Wide marginal area in anterior, narrower in posteroventer, narrowest in posterior end and mid-venter. Deep,



TEXT-FIG. 9. *Copytus elongatus* BENSON, n.sp.—1. Dorsal view.—2,3. Interior views of left and right valves showing the elongate, subparallel shape of the lateral outline, the adductor hinge, and the narrow anterior vestibule. (all $\times 100$)

long, narrow vestibule in anterior end with radiating radial-pore canals, about 8 in anterior, more numerous in posterior end; several false pore canals. Wide vestibule in posterior end. Adductor muscle-scar pattern a small cluster of several scars and somewhat obscure.

Dimensions. Length of carapace 0.83 mm., height 0.34-0.38 mm., thickness 0.14-0.21 mm.

Material. Five specimens were examined.

Remarks. Usually I would hesitate to name a new species from so few specimens as were available from this collection of Antarctic shelf ostracodes. *Copytus* is poorly known as a genus and the features of the carapace of its type-species *C. caligula* SKOGSBERG are poorly documented; nevertheless, it seems prudent to recognize this unusual form in order to enlarge on and give more meaning to an otherwise monotypic genus.

From comparison with drawings by SKOGSBERG (1939) of the type-species, this new species can be recognized by its narrower-mouthed, deep, anterior vestibule and shallower posterior vestibule. Both forms have very small clustered adductor muscle-scars. The antennal scar was not recognizable in this new species.

Occurrence. Found at two places in the same core from the single Deep-Freeze Station 4-5 in Sulzberger Bay (lat. $76^{\circ}30'S$, long. $151^{\circ}39'W$.; depth 274 meters (at the top of the core and at a sediment depth of 26-33 cm.)). The type-species was described from South Georgia.

Family CYTHERURIDAE G. W. Müller, 1894

Genus SEMICYTHERURA Wagner, 1957

Semicytherura WAGNER, 1957, p. 80; VAN MORKHOVEN, 1963, p. 346-349.

Type-species. *Cythere nigrescens* BAIRD, 1838, p. 143, pl. 5, fig. 27.

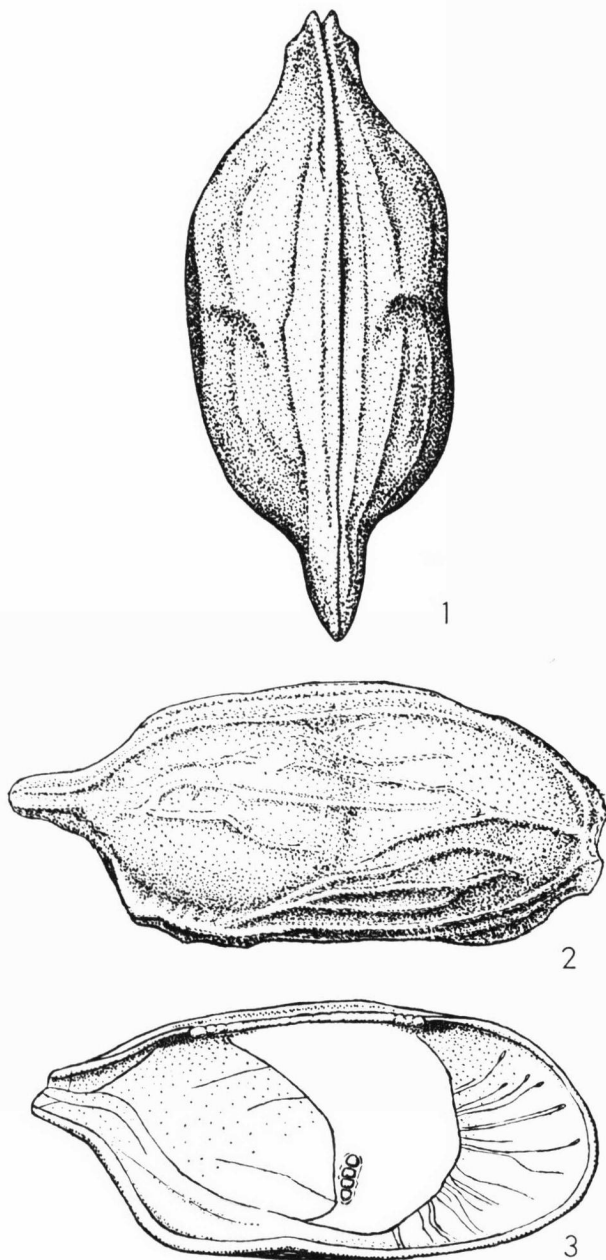
SEMICYTHERURA sp. aff. *S. COSTELLATA* (Brady), 1880

Plate 2, Figures 3, 5, 6; Text-Figure 10.

Cytherura costellata BRADY, 1880, p. 134, pl. 32, figs. 7a-d; MÜLLER, 1912, p. 267; CHAPMAN, 1916, p. 51.

Diagnosis. Distinguished by its elongate subrectangular shape, produced caudal process, and characteristic finely ridged surface ornament composed of a distinct submarginal ridge, a group of posteroventral ridges that converge posteroventrally to form a pronounced posteroventral flange, and at least two dorso-lateral ridges with faint interconnecting vertical ridges.

Description. Carapace small, fragile. Elongate subrectangular in lateral view; produced caudate posterior; dorsal margin straight; ventral margin nearly straight, slightly flexuous; anterior margin broadly rounded with equilateral curvature; posterior end with prominent caudal extension drawn out above the mid-line; dorsal and ventral margins parallel. Dorsal view ovate with a shallow median sulcus, carapace compressed and drawn out at the anterior and posterior, inflated in anterior and posterior halves; greatest width just anterior of median. End view sub-circular with flattened to flared venter and attenuated dorsum. Left and right valves equal in size.



TEXT-FIG. 10. *Semicytherura* sp. aff. *S. costellata* (BRADY), 1880.—1. Dorsal view of male.—2. Lateral exterior view of right valve of male showing surface ridges and posteroventral flange, and caudal extension.—3. Interior of left valve showing deltaic posterior inner margin and broad anterior marginal area. (all $\times 150$)

Surface smooth to subreticulate between prominent thin horizontal ridges. Two or three horizontal ridges are spaced evenly over the dorsal part of the posterior inflation, converging and sloping downward toward the anterior. Another set of 5 ridges originate together at the anteroventral margin to spread over the

ventral part of the anterior inflation, reconverging in the posterior to form a posteroventral flange. A flange originating at the caudal extension runs parallel to the dorsum and anterior, and ventral to the margins terminating and converging at the caudal extension.

Hinge cytherurine, right valve with crenulate teeth formed at the proximal dorsal ends of the selvage, separated by a gap where in other types of hinges there is a median element. An accommodation groove separates these elements vertically from an overlying ridge formed by the flange. The hinge of the left valve is complementarily formed from the dorsal margin into a terminally denticulate bar, without overlying flange. Very broad duplicature, which is deltaic in posterior, no vestibule. Radial-pore canals long, numerous in anterior (about 15), fewer in posterior (4 or 5), varying in length; many do not go completely to the outer margin. The soft body wall of the animal or chitinous inner lamella seems to be fastened in a very narrow zone within the line of concrescence or between the inner margins of the calcareous inner lamella. The chitinous inner lamella was found remaining over this narrow zone in a number of specimens. The selvage is present continuously around the margin except at the termination of the caudal extension and at the gap in the hinge. Muscle-scar pattern a vertical row of four adductor scars; traces of the antennal scar visible, but not seen well enough to describe.

Dimensions. Length 0.53-0.57 mm., width 0.24-0.26 mm., height 0.24-0.27 mm.

Material. 24 specimens, all from Station "P" in McMurdo Sound.

Remarks. The specimens from McMurdo Sound differ from the one of *Cytherura costellata* BRADY that I examined in the Challenger collection at the British Museum in that the Balfour Bay specimen is smaller, the carapace wall is thicker, and the lateral ridges have more relief. The ridges, however, are located in the same positions. Therefore, the difference is minor and one of proportion, not a major species difference. For this reason an affinity is implied as the single specimen identified by BRADY is probably a variant within the species.

Semicytherura costellata (BRADY) is similar in shape to *Semicytherura sella* (SARS), but lacks the reticulation that is formed with the system of ridges; the posterior end of *S. sella* is blunter. It is less robust than *S. undata* (SARS), more elongate and less severely ridged than *S. acuticostata* (SARS). One species of *Cytherura* was reported and described from the Antarctic by MÜLLER (1908). This was *C. notalis* (p. 106,

pl. 18, fig. 4) which should now correctly be assigned to *Semicytherura*. This is a finely reticulated species, which does not closely resemble *S. costellata*.

CHAPMAN (1919) reported *Cytherura lilljeborgi* BRADY and *C. obliqua* BRADY from off the coast of Princess Elizabeth Land near MÜLLER's Gausstation localities. Both of these species were originally described from the Challenger collections obtained from Kerguelen Island and elsewhere. Neither of these species is now likely to be considered to be taxonomically close to *Semicytherura costellata*.

MÜLLER (1912, p. 267) compared this species with *Cytherura clausi* BRADY which was originally described (BRADY, 1880) from Simons Bay, South Africa. *C. clausi* is heavily reticulated and more rotund than *S. costellata*.

Occurrence. *Semicytherura costellata* has been reported from Recent sediments Kerguelen Island and from opposite sides of the Antarctic continent. CHAPMAN (1916) found a single valve in the elevated Pleistocene? deposits on the slopes of Mount Erebus, on Ross Island within McMurdo Sound. It has also been identified from samples taken from 1100 fathoms depth south of Tasmania. It was found in the McMurdo Sound station during the present study.

Genus LOXORETICULATUM Benson, n.gen.

Type-species. *Cytheropteron fallax* MÜLLER, 1908, p. 107, pl. 18, figs. 5, 6, 10, text-figs. on p. 108.

Etymology. *Loxas* (Greek); *reticulatus* (Latin); slanting and netted, two characteristics of the named group. The first part of the name is also used because of the superficial resemblance of this group to many species that have been assigned to the loxoconchids.

Diagnosis. This genus can be distinguished by its rectangular lateral outline, reticulated surface, *Cytheropteron*-like hinge, and the lack of a prominent ventrolateral extension or grossly inflated venter.

Remarks. *Loxoreticulatum* includes those species that have a reticulated loxoconchid exterior and a *Cytheropteron*-like marginal area and hinge. The phyletic significance of the hinge is not yet known. At first glance it might seem possible that this form is an offshoot of the family Loxoconchidae with parallelism in the development of the hinge having taken place in both the loxoconchid and cytheropteron groups. The appendages are cytheropteron in character as was pointed out by MÜLLER (1908, p. 109). ELOFSON (1941) also later considered this character to be taxonomically significant. I have assumed parallelism in the development of the surface ornamentation rather than in the hinge.

The hinge of forms of this genus consists in the

right valve of crenulate, dorsal, proximal ends of the selvage forming teeth that fit into complementary loculate sockets formed under the dorsal proximal ends of the selvage of the left valve. The median element of the left valve consists of a depressed row of widely spaced teeth, forming intermediate loculi to receive the elevated, grossly crenulate or toothed median element of the left valve. The dorsal flange in the right valve is modified to form a ridge that overlies the entire hinge and is separated from it by a groove. The groove evidently accommodates the dorsal margin of the left valve and the overlying ridge prohibits excessive opening of the valves.

Loxoconchid species with gongyodont hinges, such as *Loxoconcha grateloupina* (BOSQUET), illustrated by KEIJ (1957, pl. 22, figs. 9-11), *L. subovata* (VON MUNSTER), also illustrated by KEIJ (1957, pl. 22, figs. 15, 16) and *L. littoralis*, MÜLLER (1894, pl. 29, fig. 1) represent just a few of a group of species outside of the Cytheruridae with external morphology similar to *Loxoreticulatum fallax*. The internal morphology of some of these species is not yet sufficiently known to determine whether in fact they should not be classified with *Loxoreticulatum*.

With the exception of *Cythere foveolata* BRADY, 1880, I have not yet found species other than *L. fallax* (MÜLLER) to place in this new genus. There are aberrant species in both the Cytheruridae and the Loxoconchidae that need to be more carefully examined, which may grade in character between these two groups. The fact that MÜLLER chose the name *fallax* (false; Latin) indicates he recognized how different this species is from the typical *Cytheropteron* species.

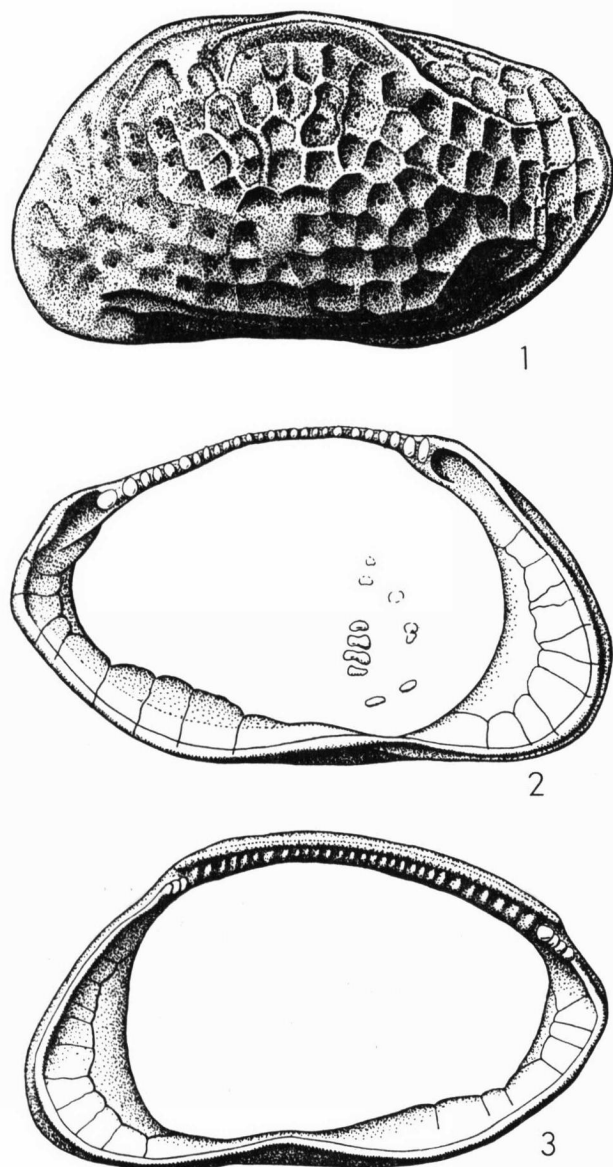
Justification for the erection of a new taxon can also be found in the great variation extant in the present genus *Cytheropteron*, which contains such robust forms as *C. sawanense* HANAI (1957, pl. 4, figs. 2a-c), and smaller, delicate forms like *C. alatum* SARS. I agree with VAN MORKHOVEN (1963, p. 385) that studies of the distribution and ecology of this and other related groups might best be served by formal recognition of clustered morphologic types.

LOXORETICULATUM FALLAX (Müller), 1908, Benson (n. comb.)

Plate 3, Figures 1, 2, 3, 6; Text-Figures 11, 12.

Cythere foveolata Brady, CHAPMAN, 1916, p. 38, pl. 4, fig. 2.

Diagnosis. Distinguished by its subrhomboidal moderately inflated carapace with reticulated surface, wide anterior vestibule, cytheropteron hinge, subdued ventrolateral ridge, and two very fine ridges (a dorso-lateral and a posteroventral ridge).



TEXT-FIG. 11. *Loxoreticulatum fallax* (MÜLLER), 1908.—1. Lateral exterior view of left valve of male showing the reticulated surface, the dorsal and ventrolateral ridges and subrhomboidal lateral outline.—2. Interior of left valve of male showing the cytheropteron hinge.—3. Interior of right valve of female showing hinge and marginal area ($\times 125$).

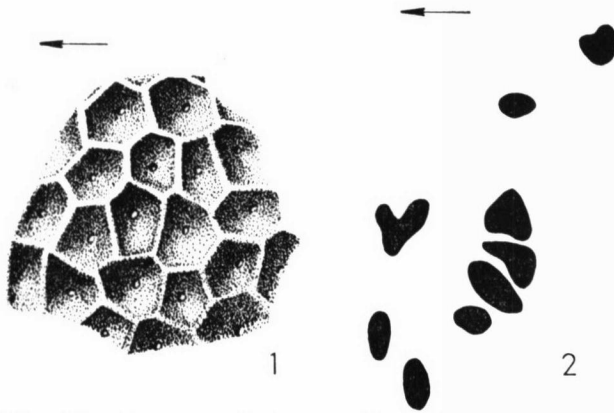
Description. Carapace small to moderate in size and strength. Shape inclined subrectangular in males, inclined subquadrate in females; moderately inflated, more in females than in males. In lateral view, the dorsal margin is very broadly arched in females to almost straight in males, slightly curved near posterior, merges with anterior margin to form cardinal angle at the subdued eye tubercle; ventral margin almost straight to slightly sigmoid; posterior margin

is broadly swung dorsally from venter above to the mid-line forming a rounded to blunt posterior. Greatest height at anterior cardinal angle, greatest width subcentrally just posterior to mid-length. Subovate in dorsal view with females noticeably shorter and broader than males. End view subcordate.

Surface moderately reticulate, with polygonal fossae having rounded, depressed floors. A subdued eye tubercle is located in the anterodorsal region, from which a posterior ridge extends along the dorsum, then descends downward toward the caudal extension. A pronounced ventrolateral ridge is developed toward the posterior, turning dorsally in the last one-third of the carapace length. Three reticular ridges are emphasized, one from the ventrolateral ridge arching posterodorsally, another along side of and just behind the first, the last running horizontally along the dorso-lateral region. Simple, straight normal-pore canals located in center of funnel-shaped excavations between reticular ridges.

Hinge antimerodont (?), with abbreviated denticulate or loculate terminal elements. An accommodation groove in the right valve separates the hinge and dorsal flange. The terminal parts of the crenulate median ridge in the left valve show a tendency to become more grossly denticulate and emphasized in some forms. This ridge is formed by the dorsal union of selvage and list, which are widely separate before and behind the ridge to form the superjacent and subjacent confining parts of the terminal sockets. In the hinge of the opposite or right valve, the selvage terminates proximally as short denticulate tooth plates at the dorsum as in *Cytherura* and is vertically separated from an overlying ridge, formed from the dorsal extension of the flange, by a groove into which fits the ridge of the left valve; thereby strengthening the hinge and limiting the opening of the valves. This form is somewhat transitional between the two types of hinges described by HANAI (1957, p. 12-14). The flange is strong. The groove separates it only slightly but distinctly from the inner extensions of the selvage. The terminal elements continue as a median crenulate groove without a lower bar closing (the homologue of the list is absent).

Duplicature broad, particularly in the anterior and along the posteroventer. Very shallow posterior vestibule in extreme end, broader anterior vestibule of moderate size. Radial-pore canals sparse (about 8 in posterior, 10 in anterior) widely spaced, irregular in anterior. Selvage subdued except along posteroventer. Muscle-scar pattern consists of a vertical row of four adductor scars, two oblique mandibular scars, and the



TEXT-FIG. 12. *Loxoreticulatum fallax* (MÜLLER), 1908.—1. Detail of surface reticulation showing rounded polygonal excavation and normal-pore canals ($\times 190$). —2. Muscle-scar pattern ($\times 340$).

antennal scar, which is V-shaped or divided. At least one other scar was found dorsal to the main group.

Dimensions. Size range; length of adult specimens 0.63-0.66 mm., width 0.30-0.38 mm., height 0.33-0.38 mm.

Material. 35 specimens were examined, 7 had both valves intact. No soft parts were found in the united valves that were examined.

Remarks. *Cytheropteron fallax* MÜLLER, 1908 is herein designated as the type-species of the new genus *Loxoreticulatum* BENSON. One other species that bears close resemblance to *L. fallax* is *Cythere foveolata* BRADY, 1880, herein also assigned to *Loxoreticulatum*. I believe that CHAPMAN (1916) mistakenly identified BRADY'S species from his samples collected in McMurdo Sound and that he actually found MÜLLER'S species *fallax*.

Loxoreticulatum foveolatum (BRADY) is very similar to the present form but is smaller, more robust. The reticulations and intermediate fossae are bolder and have more relief. It is possible that *foveolatum* could be a geographic variant of *fallax* but this relationship is yet to be demonstrated. It is not possible to determine whether the form identified by SCOTT (1912) from Scotia Bay in the South Orkney Islands is actually *foveolatum* as he proposes or *fallax* as the diagnostic characters are not stated or visible in the illustrations.

Occurrence. This species, previously reported from Gausstation, is now identified at McMurdo Sound, Antarctica.

Family HEMICYTHERIDAE Puri, 1953

Genus HEMICYTHERE Sars, 1925

Hemicythere Sars, 1925, p. 182; VAN MORKHOVEN, 1963, p. 134-136. Type-species. *Cythereis villosa* Sars, 1866, p. 42 [SD EDWARDS, 1944, p. 517].

HEMICYTHERE sp. aff. *H. KERGUELENENSIS* Brady, 1880

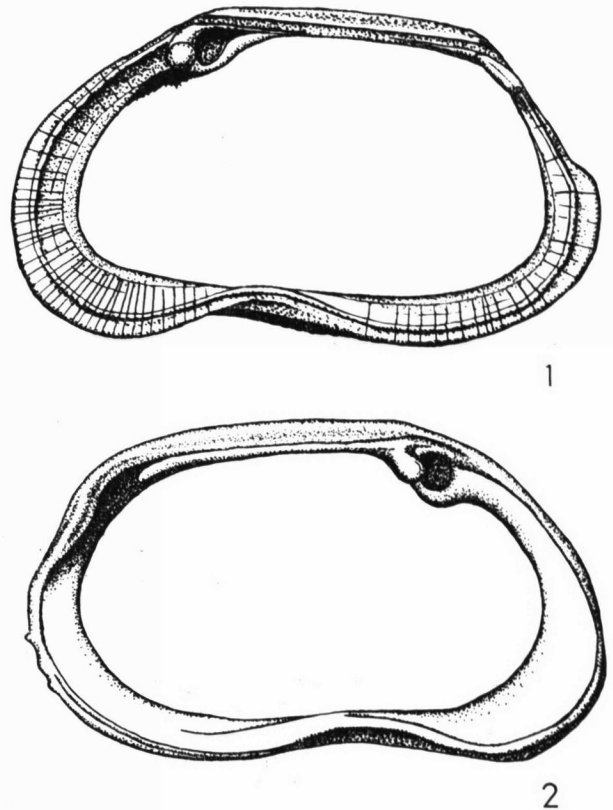
Plate 2, Figures 1, 2, 4; Text-Figures 13, 14.

Cythere kerguelenensis BRADY, 1880, p. 78-79, pl. 4, figs. 16-18, pl. 20, figs. 1a-f; CHAPMAN, 1919, p. 25.

Cythere kerguelensis MÜLLER, 1908, p. 138-140, pl. 18, fig. 7, text-figs. on p. 139 (name misspelled).

Diagnosis. Distinguished by its large, thick, heavy carapace, which is partly covered with punctae, particularly in posterior, and has faint concentric ridges next to the margin.

Description. Carapace large, moderately thick-walled, subrhomboidal to almond-shaped. Subrhomboidal in lateral view; anterior margin narrowly and obliquely rounded, posterior margin with short up-turned caudal process in right valve, more rounded in left; dorsal margin straight along 5/8 of length, truncated in anterior region, joining the anterior margin at a shallow obtuse cardinal angle; ventral margin broadly swung in the posterior two-thirds, merging with the caudal process, with sharp ventral sinuation, continuing anteriorly into the narrowly rounded anterior margin; greatest height at mid-length. Disc-shaped in dorsal view; greatest width at mid-length.



TEXT-FIG. 13. *Hemicythere* sp. aff. *H. kerguelenensis* (BRADY), 1880.—1. Interior view of right valve of adult. —2. Interior view of left valve. (both $\times 65$).

Ovate in end view. Valves subequal in size, the left valve slightly overreaching the left along the anterodorsum.

Surface generally smooth, to coarsely punctate (particularly in posterodorsal region), to finely ridged in the marginal areas, with generally rougher texture at mid-length in the region of a very shallow inconspicuous depression (some forms lack this sulcus and are smoother in the centrolateral region). Margins usually devoid of denticulations, except the antero-venter. Both fine and coarse normal-pore canals are present.



TEXT-FIG. 14. *Hemicythere* sp. aff. *H. kerguelenensis* (BRADY), 1880. Muscle-scar pattern showing the complicated adductor scar, the exclamation mark-like antennal scar, the two mandibular scars, and the additional dorsal scars ($\times 180$).

Hinge holamphidont with an elongate wedge-shaped posterior tooth. Eye socket located antero-ventral to the anterior hinge element. Marginal area is narrow to moderately wide, incurved to fit against the outer lamella. There is a very narrow vestibule; radial-pore canals are straight and simple, very numerous, numbering approximately 50 in the anterior, 26 in the posterior region. Pronounced selvage merges with the terminal elements of the hinge and forms the upper ridge of the median hinge element, which is in turn overlain by a bolder ridge formed by the flange. Both primary and secondary lists are visible. The adductor muscle-scar pattern is a vertical row of four scars, of which the central two are partially or completely divided. Antennal scar composed of two scars in a configuration like that of an exclamation mark. Two mandibular scars are present. Three very conspicuous body scars present just above the adductor scars.

Dimensions. Size range; length of adult specimens 1.22-1.27 mm., width 0.57-0.71 mm., height 0.73-0.75 mm.

Material. Eleven specimens were found.

Remarks. The specimens identified by BRADY (1880) as *Cythere kerguelenensis* and deposited in the British Museum differ from those collected from McMurdo Sound in several respects. The forms described in the present work are generally larger, more rotund, less uniformly and heavily punctate, less robust, the radial-pore canals are more widely spaced, and the margins are slightly more irregular than the specimens collected by BRADY from Kerguelen Island and Bass Straits. The type specimens (a holotype has not yet been designated) are smaller, 4/5 the size of the Antarctic specimens, more uniformly punctate, and the margins are more rounded on the right valve.

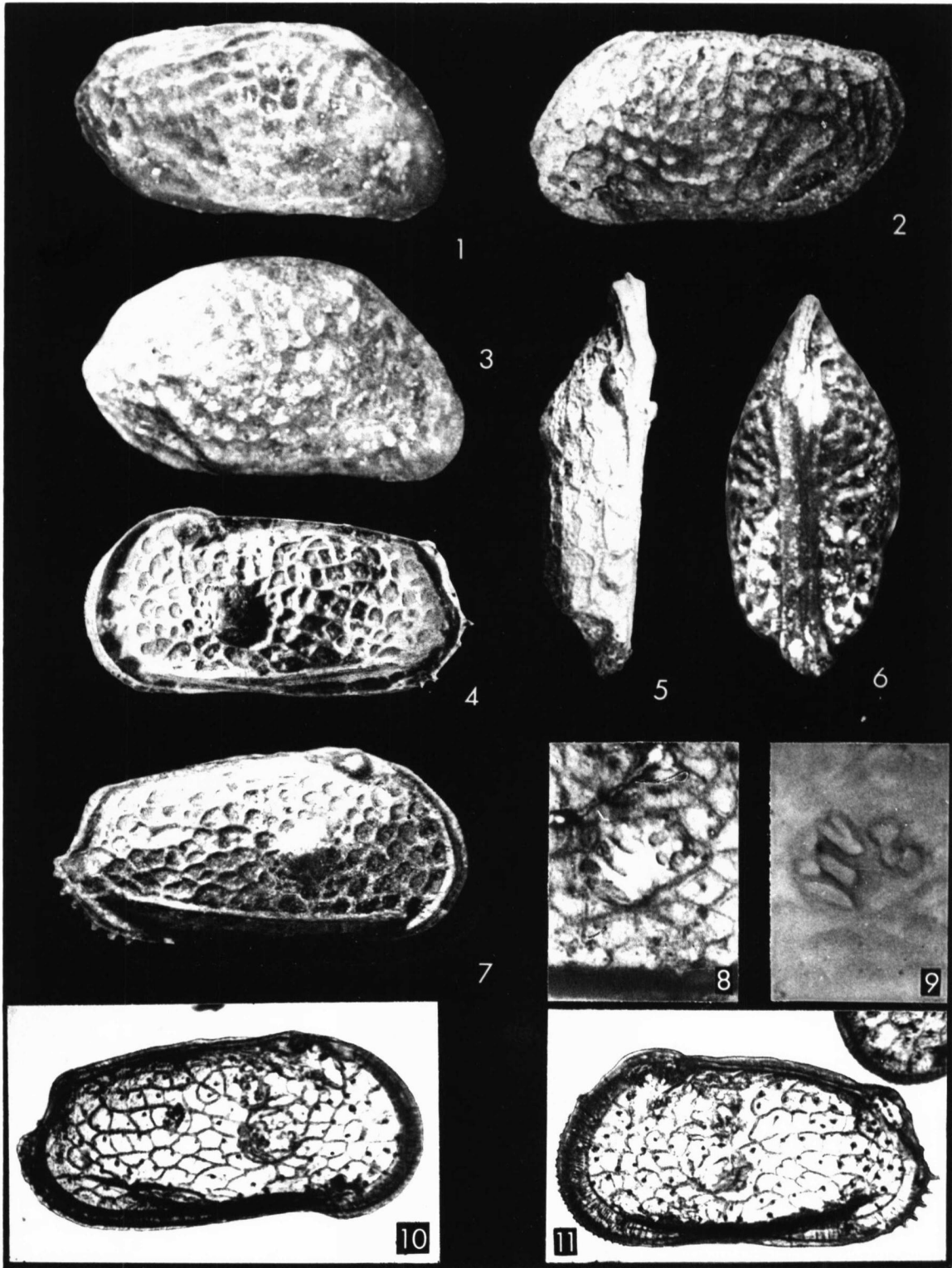
The distribution of punctation over the surface of the carapace varies among the populations sampled

EXPLANATION OF PLATE 3

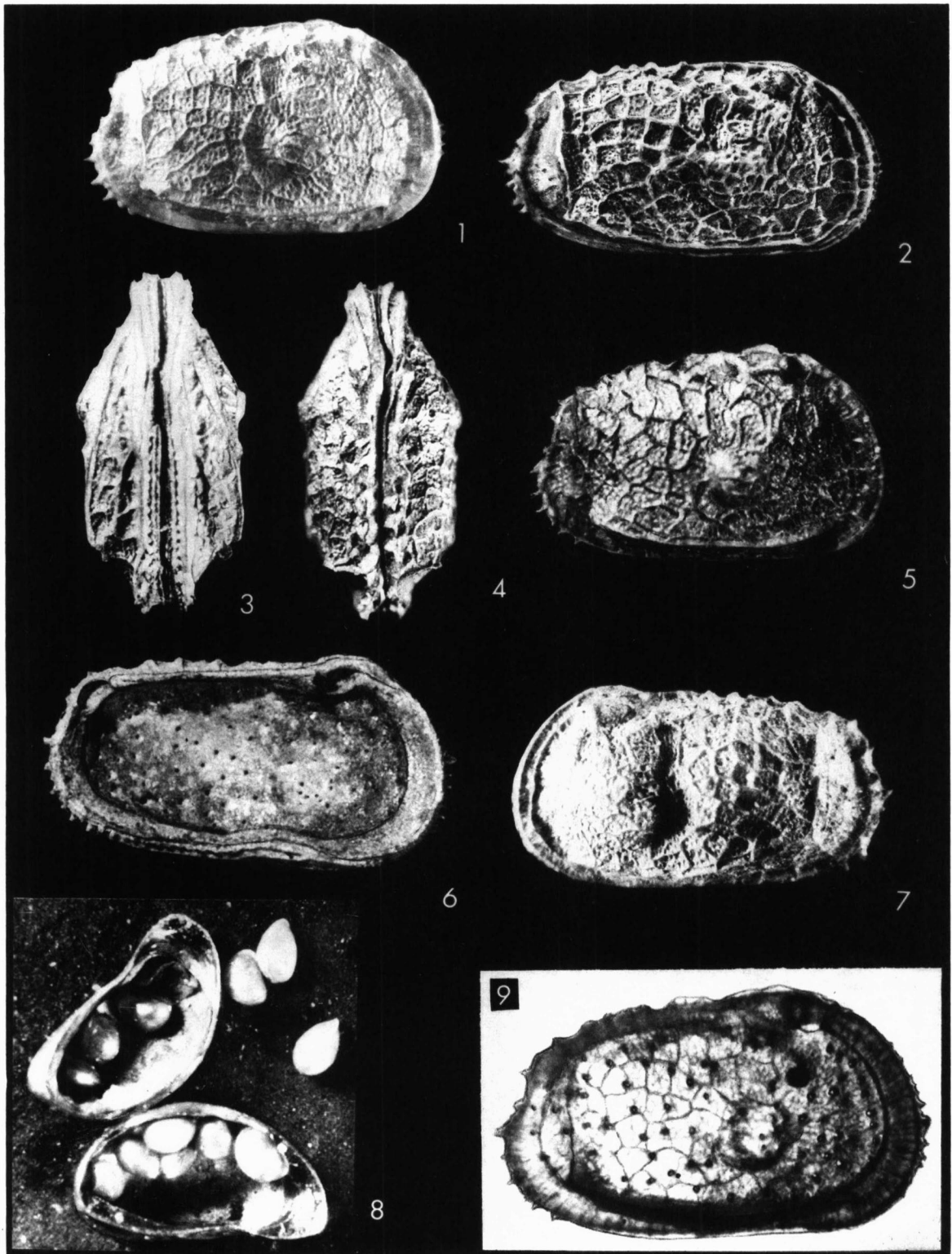
LOXORETICULATUM, PATAGONACYTHERE

(All illustrated forms are from McMurdo Sound, Antarctica)

FIGURE	PAGE	
1-3, 8.....	19	<i>Loxoreticulatum fallax</i> (MÜLLER); 1, lateral exterior view of right valve of male, $\times 90$; 2, lateral exterior view of left valve of male, $\times 90$; 3, lateral exterior view of right valve of female, $\times 95$; 6, dorsal view of complete specimen, $\times 85$.
4, 5, 7-11.	27	<i>Patagonacythere devexa</i> (MÜLLER); 4, lateral exterior view of left valve (retouched), $\times 60$; 5, dorsal view of left valve, $\times 60$; 7, lateral exterior view of right valve, $\times 60$; 8, dark field photograph of muscle scar of left valve, $\times 85$; 9, transmitted light photograph of muscle scar of left valve (retouched), $\times 85$; 10, lateral exterior view of right valve (transmitted light) of penultimate male instar, $\times 60$; 11, lateral exterior view of left valve (transmitted light) of adult male, $\times 55$.



BENSON — Recent Ostracodes, McMurdo Sound, Antarctica



BENSON — Recent Ostracodes, McMurdo Sound, Antarctica

by BRADY, MÜLLER, and myself. Specimens from the more northern populations seem to be more uniformly covered with pits than those of the shelves around Antarctica. The latter forms tend to be smoother on the anterior. SKOGSBERG (1928) described a form, *Cythereis (Procythereis) robusta* from South Georgia which was uniformly covered by numerous small rounded pits. He suspected that his form might be the same as that of BRADY. They differed in that BRADY's form is more nearly covered with pits and its anterior margin is denticulate. SKOGSBERG examined only two specimens.

Occurrence. Found at Station "P" in McMurdo Sound. Previously reported from Kerguelen Island (BRADY, 1880) and the Gaussstation (MÜLLER, 1908) along the coast of Antarctica.

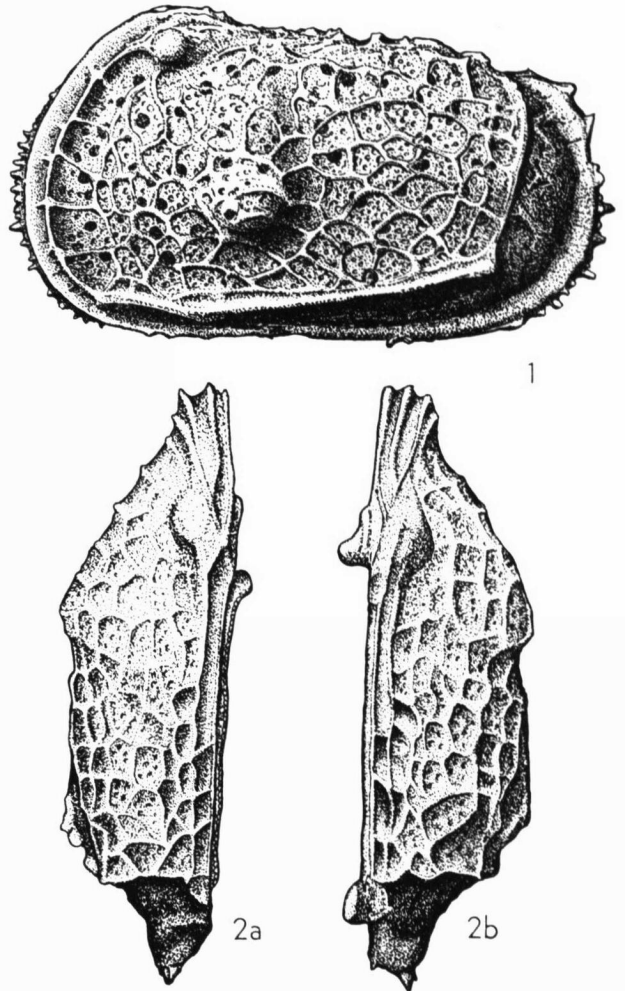
Genus AUSTRALICYTHERE Benson, n.gen.

Type-species. *Cythereis polylyca* MÜLLER, 1908, p. 135, pl. 17, figs. 1, 5, 6.

Etymology. *Austral-i-cythere* (Latin); Venus of the south, in reference to the distribution in the Southern Ocean.

Diagnosis. Carapace subrectangular to subquadrate in shape; surface with a somewhat irregular reticular pattern of delicate ridges and intermediate pitted excavations. There are no bold ridges except the ventrolateral ridge, possibly a vertical posterior ridge, and a submarginal rim at either end. A prominent subcentral tubercle reflects an interior pit which is the locus of a multicomponent hemicytherid muscle-scar pattern. The hinge is holamphidont, the duplicature is fused and contains many radial-pore canals. *Recent; Marine, Southern Hemisphere.*

Remarks. That this new genus belongs to the family Hemicytheridae can be demonstrated by the presence of: (1), divided adductor muscle scar elements and a complicate antennal scar; (2), an antennule consisting of five segments; (3), double setae repre-



TEXT-FIG. 15. *Australicythere polylyca* (MÜLLER), 1908. —1. Lateral exterior view of left valve of adult male showing the delicate reticulated surface, subcentral tubercle, ventrolateral and posterior ridges.—2a,2b. Dorsal view of divided adult carapace showing characteristic configuration of posterior and hinge. (both views $\times 70$).

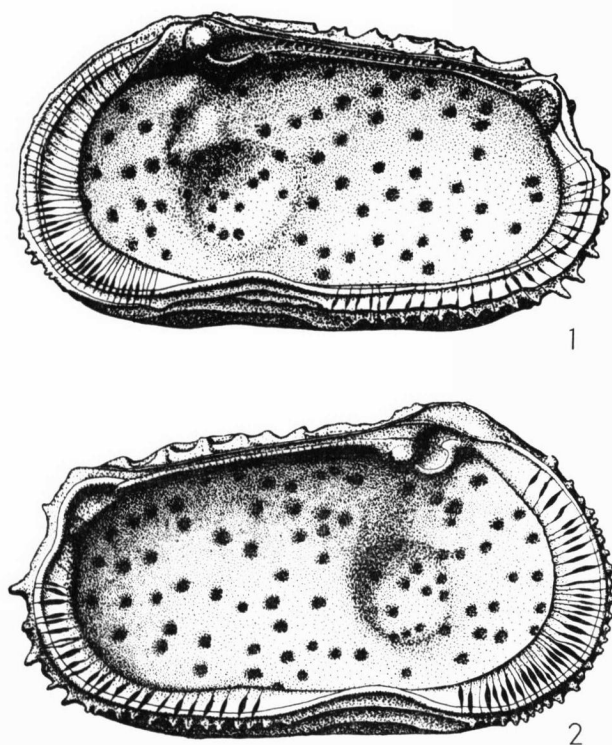
EXPLANATION OF PLATE 4

AUSTRALICYTHERE, XESTOLEBERIS

(All illustrated forms are from McMurdo Sound, Antarctica)

FIGURE	PAGE
1-7,9. <i>Australicythere polylyca</i> (MÜLLER); 1, lateral exterior view of right valve of adult female (retouched), $\times 50$; 2, lateral exterior view of right valve adult male (retouched), $\times 55$; 3, ventral view of complete specimen, $\times 50$; 4, dorsal view of complete specimen, $\times 50$; 5, lateral exterior view of right valve of female (retouched), $\times 50$; 6, interior view of	

left valve of adult male showing pits of sieve-like pore canals, $\times 55$; 7, lateral exterior view of right valve of adult male (lighted very low), $\times 55$; 9, lateral exterior view of right valve (transmitted light) of adult female, $\times 60$.	24
8..... <i>Xestoleberis</i> sp.; photograph of female and brood of instars immediately after opening of sealed carapace of mother, $\times 65$.	12



TEXT-FIG. 16. *Australicythere polylyca* (MÜLLER), 1908. —1. Interior of right valve showing marginal features including the hinge, and the internal pits of the sieve-like pore canals.—2. Interior of left valve of same specimen as 1 showing complimentary hinge elements. (both views $\times 70$)

senting the vestigial exopodite of the mandible; and (4), a complicated chitinous supporting structure in the knees of the thoracic legs.

The genus *Australicythere* is proposed to receive two species *Cythereis polylyca* MÜLLER, 1908 (here designated as the type species) described from the coast of Antarctica, and *Cythereis (Cythereis) megalodiscus* SKOGSBERG, 1928 described from South Georgia. Both species are similar in shape and possess the secondary pitting or reticulation within the fossae of the major reticulation. *Australicythere megalodisca* is smaller (length 0.76-0.80 mm.) than *A. polylyca* (length 1.10 mm.). The vertical posterior ridge present in *polylyca* is absent in *megalodisca*.

The diagnosis of *Australicythere* is yet unstable until other species can be added to this genus. As can be seen by the recent additions of two similar genera to the Hemicytheridae (*Patagonacythere* HARTMANN, 1962, and *Ambostracon* HAZEL, 1962), which were also at first monotypic, we are just beginning to recognize the variation present among the hemicytherids living in the southern hemisphere and Pacific Ocean regions.

Australicythere is similar to both *Urocythereis* and *Patagonacythere*. Like these genera it is subrectangular to subquadrate (in females), without a produced caudal process, holamphidont, and reticulate. A subcentral tubercle is indicated in all three genera if somewhat obscured in *Urocythereis* by the heavy reticulation. The differences between these forms seem to be in the emphasis of certain stages of development in the surface reticulation. *Urocythereis* is grossly reticulated with smooth excavations. The reticulations of *Australicythere* are relatively poorly developed and are subdued in comparison to *Urocythereis*; however, the intermediate fossae are pitted, suggesting the incipient development of a secondary surface pattern. *Patagonacythere* has a delicate to moderately strong reticulated surface depending on the increasing strength of the secondary ridges that emerge from the reticular pattern. *Ambostracon* may represent one line of continuation of this surface development (also see discussion under *Remarks* of *Patagonacythere*).

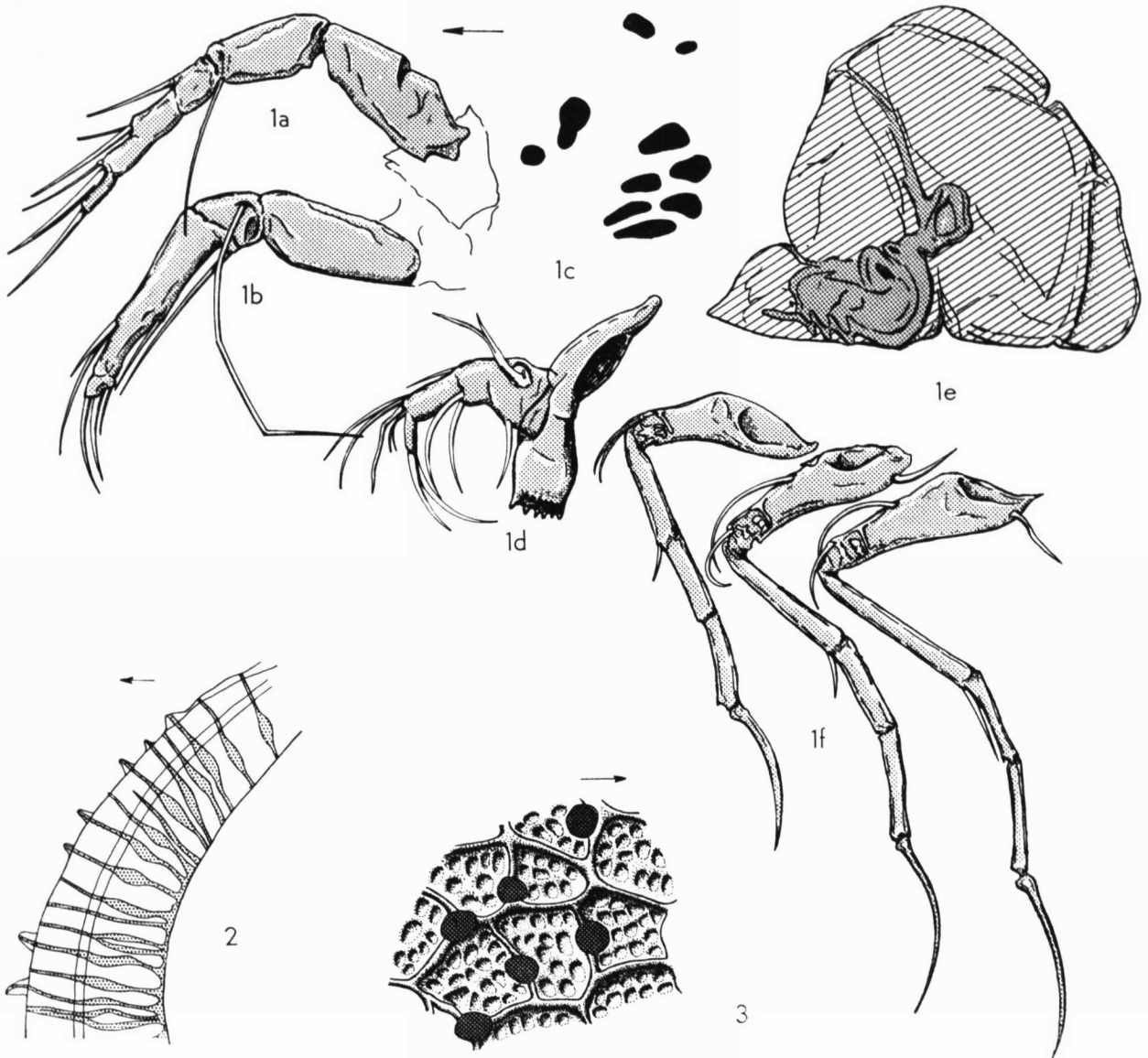
**AUSTRALICYTHERE POLYLYCA (Müller), 1908,
Benson, (n. comb.)**

Plate 2, Figure 10; Plate 4, Figures 1-7, 9; Text-Figures 15, 16, 17.

Cythereis polylyca MÜLLER, 1908, p. 135, pl. 17, figs. 1, 5, 6.
Cythere normani Brady, CHAPMAN, 1916, p. 50, pl. 4, fig. 2.
Cythere davisii CHAPMAN, 1916, p. 72, pl. 6, fig. 46a-c.

Diagnosis. Distinguished from the other known species of *Australicythere*, i.e., *A. megalodiscus* (SKOGSBERG), 1928, by its more subquadrate lateral outline, more distinct ventrolateral ridge and more irregular reticular surface; differences also exist in the structure of the penis, particularly the reduced size of the anterior end in *A. polylyca*. The normal-pore canals are sievelike and always attached to the ridges of the surface reticulation.

Description. Carapace moderately large and strong, subrectangular to subquadrate in lateral view; dorsal margin straight with irregularities caused by the ridges of the reticulated surface; ventral margin straight, with the ventral sinuation concealed by general inflation of the carapace; anterior margin broadly and evenly rounded from eye tubercle to venter, bordered by distinct marginal rim, denticulate with about 20 small spines in anteroventral sector. The posterior end varies in shape from subrectangular in the left valve of mature females to slightly caudate in the right valve of mature males and some immature forms. There are 6-8 posterior marginal spines. In dorsal view the carapace is inflated, particularly in the region of the subcentral tubercle, anterior wedge-



TEXT-FIG. 17. *Australicythere polylyca* (MÜLLER), 1908.—1. Internal anatomy of male ($\times 125$); *1a*, five part segmented antennule; *1b*, antenna; *1c*, hemicytherid muscle-scar pattern; *1d*, mandible with vestigial exopodite; *1e*, penis showing abbreviated anterior portion and costate median and posterior ridges; *1f*, thoracic appendages showing the complicate chitinous supporting structure in the knees.—2. Centrally inflated radial-pore canals in anterodorsal part of marginal area, without vestibule ($\times 160$).—3. Detailed enlargement of portion of surface reticulation showing secondary pitting and sieve-type pore-canals ($\times 160$).

shaped becoming rectangular because of the prominence of the anterior marginal rim; sides appear parallel because of extension of the ventrolateral ridge, which culminates at a posterior vertical ridge; posterior end converges sharply from the posterior vertical ridge and is truncated at the posterior margin; greatest width near subcentral tubercle. End view inflated subtriangular, flattened venter. Greatest height

in the region of the eye tubercle. Valves of approximately equal size.

Surface delicately reticulate with fine pits in the fossae between the irregularly arranged ribs. Grosser features of ornamentation also include anteromarginal rim, subcentral tubercle, ventrolateral ridge, posteroventral rim (well developed only in adults), vertical ridge at posterior extending from posterior end of

ventrolateral ridge toward the dorsum. Normal-pore canals are sievelike and are always placed on the ribs of the reticular surface pattern. They can be seen as pits on the interior.

Hinge holamphidont with lobate posterior tooth and stepped anterior tooth. In some specimens the prominent anterior socket lock formed by the list in the right valve continues only a short way toward the posterior before merging with the overlying selvage; in others the groove is well defined and crenulate. Marginal area moderately wide, with selvage and list visible in posteroventral region. About 40 centrally swollen radial-pore canals are present in anterior, about 30 in posterior, converging proximally, parallel distally. The line of concrescence merges with the inner margin, no vestibule.

The muscle-scar pattern consists of a vertical row of four adductor scars, the central two of which are divided, placed around the posterior edge of the muscle-scar pit; two antennal scars, which may be three with the upper two fused; body scars noticeable above pit; mandibular scars not visible.

The anatomy of the appendages is illustrated (Text-fig. 17); they are typically hemicytherid with the antennule consisting of five segments, a double seta representing the vestigial exopodite of the mandible, and a complicated chitinous supporting structure in the knees of the thoracic legs. The penis (Text-fig. 17, *1e*) is abbreviated at the anterior; vertical costae are present in the chitinous outer wall in the central and posterior regions.

Dimensions. Range of lengths of mature female specimens 1.05-1.07 mm.; height, 0.66-0.67 mm.; thickness approximately 0.70 mm. Length of male 1.13 mm.; height 0.64 mm.; thickness 0.72 mm.

Material. 150 specimens were examined.

Remarks. This species was originally described by MÜLLER (1908) from the Gausstation on the other side of Antarctica from McMurdo Sound and primarily from empty valves. Most of his description deals with the carapace although the penis, which conforms to the one found in the present study, is described. With as many characters as were described by MÜLLER being found in the McMurdo Sound specimens, there can be little doubt that they are the same form.

In 1928, SKOGSBERG described a new species *Cythereis* (*Cythereis*) *megalodiscus* (p. 90-95; pl. 2, fig. 4; pl. 4, fig. 8; text-fig. XV) from specimens found in waters 24-52 meters deep along the shores of South Georgia. He made no mention of MÜLLER's species in reference or comparison to this species although he

did about at least one other species (*Cythereis kerguelenensis*) elsewhere in his work. One must assume he felt there was no relationship worthy of comment or that he could not see a resemblance of *megalodiscus* to MÜLLER's illustrations. Although I have not yet had the opportunity to examine SKOGSBERG's type-specimens, I feel that the unique characters both illustrated and described by him warrant the recognition of this form as a separate species.

It is probable that the new species described by CHAPMAN (1916, p. 72, pl. 6, figs. 46a-c) as *Cythere davisii* from the Ross Sea is synonymous with MÜLLER's species *polylyca*, although I have not seen CHAPMAN's type-specimen. His illustration of *davisii* looks like a male of *polylyca*. The specimens identified by CHAPMAN (1916, p. 50, pl. 6, fig. 2) as *Cythere normani* is a female of *polylyca*.

Occurrence. Found in McMurdo Sound, in Sulzberger Bay, and in the open western area (CHAPMAN, 1916) of the Ross Sea. Originally reported in the area of the Gausstation (lat. 65°S., long. 90°E.) by MÜLLER (1908). It may have been found by SCOTT (1912) in the South Orkneys, but this is uncertain due to the quality of his illustrations.

Genus PATAGONACYTHERE Hartmann, 1962

Patagonacythere HARTMANN, 1962, p. 249.

Type-species. *Patagonacythere tricostrata* HARTMANN, 1962, p. 250, figs. 200-204.

Diagnosis. Distinguished from other subrectangular, costate, and holamphidontic hemicytherids having a subcentral tubercle by the presence of a moderately strong to delicate, reticular surface ornament that includes prominent main ridges (ventrolateral ridge, anterior submarginal rim, the presence or indication of a posterodorsal loop originating at the subcentral tubercle, and a posteromarginal ridge) and smooth, somewhat regular, intervening fossae. *Recent; Marine; Southern Ocean region.*

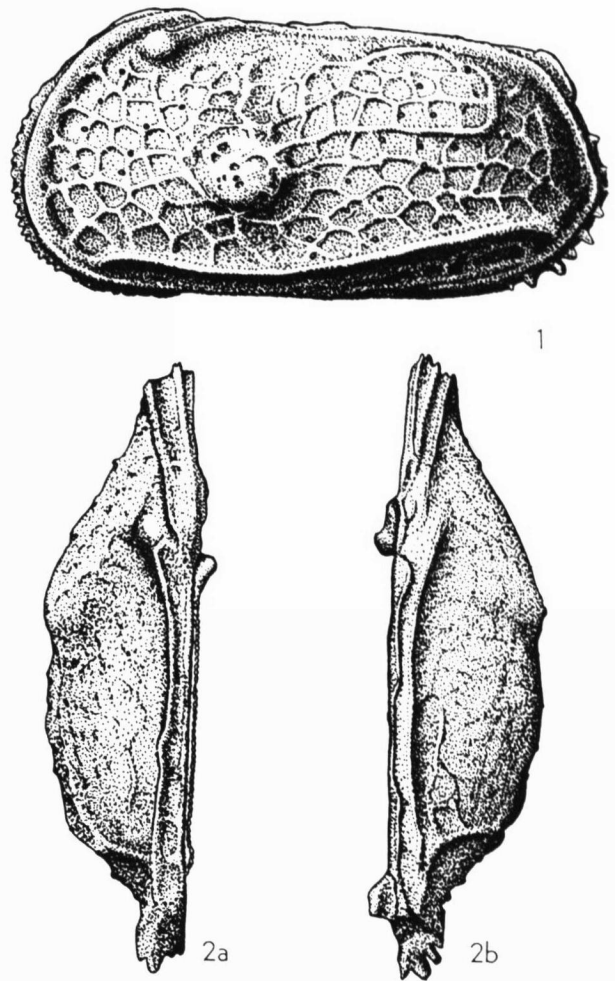
Discussion. The genus *Patagonacythere* was first designated by HARTMANN (1962) to receive the obviously different hemicytherid species *P. tricostrata*. It was monotypic before the present study. At the time of first description HARTMANN considered the following additional genera of the "subfamily Hemicythereinae": *Hemicythere*, *Caudites*, *Procythereis*, *Aurila*, *Pokornyyella*, and *Mutilus*. He judged that *Procythereis*, *Caudites*, *Pokornyyella* and *Mutilus* had general carapace characteristics that easily distinguished them from *Patagonacythere*. No species of *Aurila* was known that had three prominent ridges, and the hinge of *Hemicythere* is hemiamphidont rather than holamphidont.

Not considered by HARTMANN were the genera *Elofsonella*, *Hemicytheria*, *Heterocythereis*, *Nepheokirkos*, *Nereina*, *Tyrrhenocythere*, *Urocythere* or *Urocythereis*. *Ambostracon* was described by HAZEL (1962) contemporaneously with HARTMANN'S work. Of these genera only *Nereina*, *Urocythereis*, and *Ambostracon* bear resemblance to *Patagonacythere*. *Nereina* is subrectangular, ridged and has a subdued subcentral tubercle, however, the massive appearance of the carapace sculpture, the lack of a discrete reticular pattern distinguishes this form. The broad "ridges" of *Nereina* are more like swells (in the topographic sense) than ridges; somewhat similar to those of *Caudites*. *Urocythereis* is also subrectangular in shape, has a strong internal resemblance to *Patagonacythere*, but has a very strongly reticular surface (deep fossae and sharp, distinct ridges) without a prominent subcentral tubercle (the configuration of the reticulations indicates an underlying pit) or a secondary ridge system emerging from the reticular pattern. *Ambostracon* is shaped much like *Patagonacythere*. It has a subcentral tubercle, and like *Urocythereis* has a striking internal resemblance to *Patagonacythere*. Its surface is different however, in that the reticular pattern has been supplanted by a very thick, heavy system of ridges having considerable relief. *Ambostracon* would seem to be representative of an advanced stage of ridge robustness over that of *Patagonacythere*.

Mutilus represents still another direction of development of the hemicytherids as a grossly reticular aurilid form. *Patagonacythere* differs from *Australicythere* (newly described here in the present work) in the smoothness of the floor of the interreticular excavations or fossae, the absence of sievelike normal-pore canals, the presence of a posterodorsal loop, dorsal marginal ridge, and anteromedian ridge. These two genera are probably closely related. *Australicythere* has been separated because of the distinctiveness of a number of its morphological characteristics and also because the type-species does not seem as closely related to any of the species of *Patagonacythere* as they do to each other.

The muscle-scar patterns of *Patagonacythere* and *Australicythere* seem to represent a stage of advancement in complexity among the hemicytherids equal to that of *Elofsonella*. More study of this feature may be helpful in developing the relationships among the hemicytherids.

Thus far I would include four species in the genus *Patagonacythere*; *P. tricostata* HARTMANN, *Cythereis* (*Cythereis*) *longiductus* SKOGSBERG (including two



TEXT-FIG. 18. *Patagonacythere devexa* (MÜLLER), 1908.—1. Lateral exterior view of adult male showing reticular surface pattern with subtle posterodorsal loop, subcentral tubercle, and ventrolateral ridge.—2. Dorsal view of divided adult male carapace showing rounded outline and hinge. (both views $\times 70$)

subspecies), *Cythereis devexa* MÜLLER, and *Cythereis wyvillethompsoni* BRADY.

**PATAGONACYTHERE DEVEXA (G. W. Müller), 1908,
Benson (n. comb.)**

Plate 2, Figure 11; Plate 3, Figures 4, 5, 7-11; Text-Figures 18, 19, 20.

Cythereis devexa MÜLLER, 1908, p. 137, pl. 17, figs. 4, 8, text-figs.; —, 1912, p. 348.

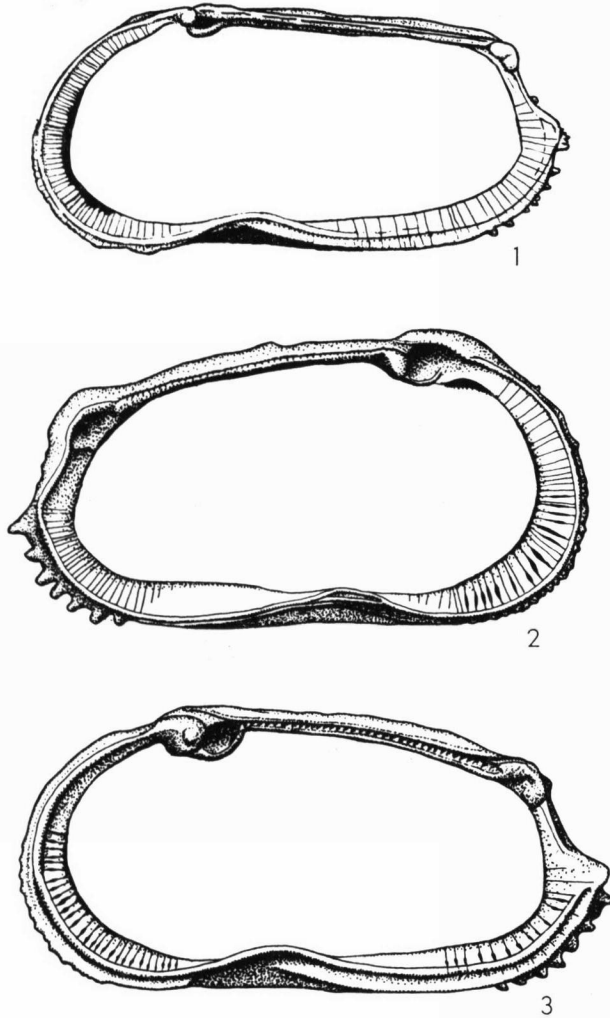
Cythere parallelogramma BRADY, CHAPMAN, 1916, p. 38, 49, pl. 4, fig. 3.

Cythereis (*Cythereis*) *frequens* SKOGSBERG, 1928, p. 95-100, pl. 2, fig. 5, pl. 5, fig. 1.

Aurila frequens (Skogsberg), HARTMANN, 1962, p. 236.

Diagnosis. Distinguished from the type-species of *Patagonacythere* (*P. tricostata*), by its reduced ratio of length to height; finer, more closely spaced reticular

ridges, less pronounced median ridges in front of or behind the subcentral tubercle; numerous normal-pore canals with volcano-like exterior openings tangent to or connected to the ridges of the reticular surface ornament; and more discernibly divided central adductor muscle scars. It is more slender and longer in dorsal view than *P. longiductus* SKOGSBERG; has more evenly



TEXT-FIG. 19. *Patagonacythere devexa* (MÜLLER), 1908.—1. Interior of penultimate male showing incompletely developed marginal structures and protodont hinge.—2. Interior view of left valve of adult male.—3. Interior view of mature male showing more completely developed holamphidont hinge and marginal structures. (all $\times 70$)

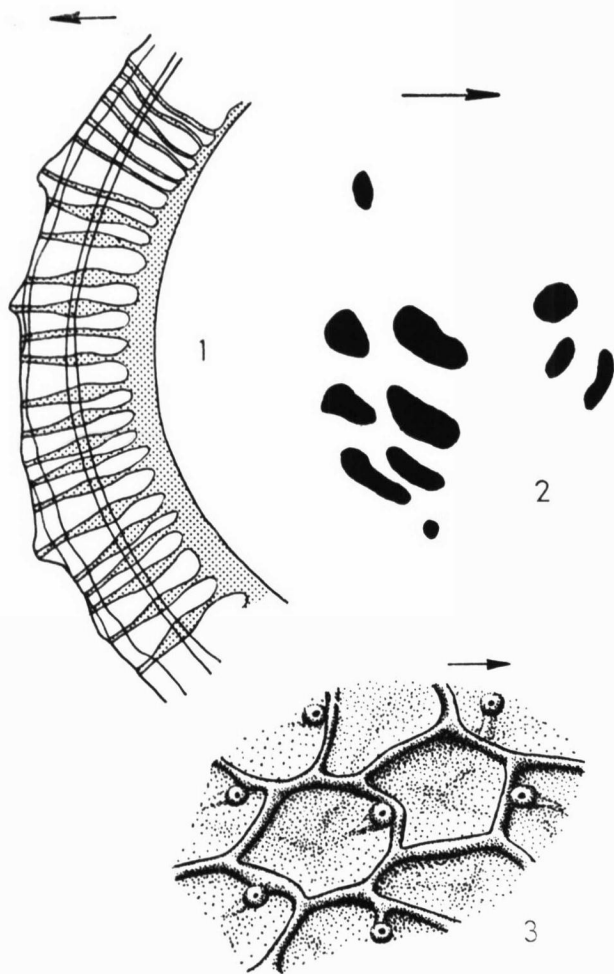
distributed though similar normal-pore canals; has a very narrow vestibule in the anterior of some forms which could not be found in specimens of *longiductus*.

Description. Carapace moderately large, robust; inflated, subrectangular in male, inflated, subquadrate in female. Lateral outline subrectangular with obliquely

rounded anterior margin and slightly caudate posterior, particularly in right valve; dorsal margin straight to slightly undulate, with distinct cardinal angles and a posterodorsal "hinge ear" on margin of left valve; ventral margin straight in left valve, in right valve convex near anterior flange; anterior margin evenly and obliquely rounded; posterior margin moderately caudate in males, blunter in females; greatest height at anterior cardinal angle. Anterior wedge-shaped in dorsal view, sides subparallel to converging in the central and posterior sections; flange-like posterior projection more pronounced than in *P. longiductus*; carapace slightly more inflated in anterior one-third, greatest width at subcentral tubercle. Outline in end view inflated, with flattened venter. Valves subequal in size and symmetrical; contact even, with no apparent overlap.

Surface moderately to finely reticular; conspicuous enlargement of the ridge system in a posterodorsal loop beginning at the subcentral tubercle and ending near the eye tubercle subparallel to the dorsal margin. A very prominent ventrolateral ridge is present. An anterior marginal rim originates just above the eye tubercle, runs subparallel to the margin and beneath the ventrolateral ridge to emerge on the posterior as a submarginal ridge. The subcentral tubercle is subdued. Normal-pore canals are plainly visible and are located on, tangent to, or connected to the ridges of the reticular surface. Five to eight marginal spines are present along the margin of the caudal process, most of them on the ventral side. At least 25 marginal denticles are present along the anterior margin. A depression can be seen tangential to the posterior edge of the subcentral tubercle, extending from the dorsal margin along the ventral side of the subcentral tubercle parallel to the ventrolateral keel. This depression is particularly noticeable on adult carapaces.

Hinge holamphidont. The posterior tooth may be subdivided by an incision on the venter. The intermediate groove is not bounded by a ventral bar in some specimens, but one is present below a serrate groove in others. Marginal area narrow and delicate, duplicature fused, widest in anterior and posteroventral regions. Radial-pore canals numerous, straight, centrally swollen and closely spaced with about 40 canals in the anterior and 20 in the posterior. The selvage is conspicuous, forming a well sinuate venter in the right valve, removed from and concentric with the margin except in the posterior and hinge areas, where it is marginal. Adductor muscle-scar pattern a vertical row of four elongate and inclined scars with the intermediate two divided. A singular mandibular



TEXT-FIG. 20. *Patagonacythere devexa* (MÜLLER), 1908. —1. Detailed enlargement of radial-pore canals and shallow vestibule of segment of anterior of right valve ($\times 270$).—2. Muscle-scar pattern of left valve ($\times 150$).—3. Detailed enlargement of portion of surface reticulation showing tangential volcano-like normal-pore canals and off shooting secondary ridgelets ($\times 300$).

scar may have been visible. The antennal scar is a cluster of three scars. A single scar was present above the adductor group.

In none of the specimens found were the soft parts adequately preserved for study.

Dimensions. Length 1.10 mm., width 0.50 mm., height 0.53 mm.

Material. 300 specimens, of which a few were living when collected.

Remarks. This may be the form that was identified by CHAPMAN (1916) from McMurdo Sound as *Cythere parallelogramma* BRADY, 1880. The specimens collected by BRADY from Prince Edward Island and in the Challenger material of the British Museum

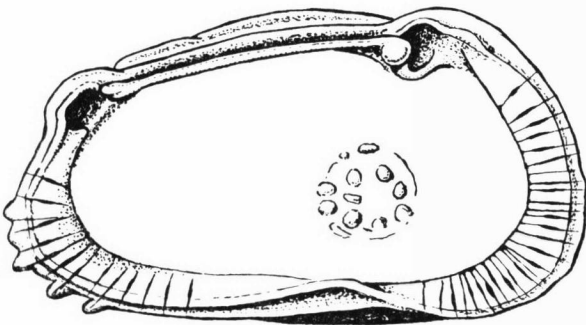
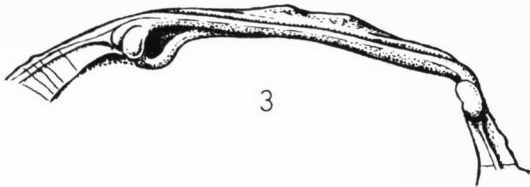
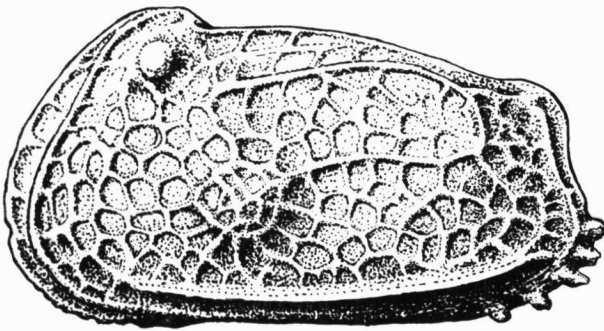
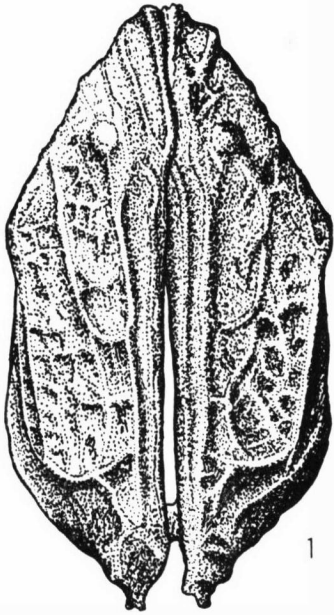
show a strong affinity to the ones collected for this report. They are more robust and differ only slightly in ornamental detail. The muscle-scar patterns are similar, except that of *parallelogramma* has a seemingly undivided adductor scar, third from the top, and a crescent-shaped uppermost adductor scar. I hesitate to interpret too much from the material available in the British Museum as the type has not been chosen and the poorly developed hinge of the available specimen indicates that it is probably not a typical representative of the species.

I have identified the material from McMurdo Sound as conspecific with that described by MÜLLER 1908 (established on the basis of one male and three empty valves) from Gausstation. Without reference to MÜLLER's types it cannot be stated with certainty if he had just the one species represented or possibly may have also had a specimen of the form I have identified as *P. longiductus* SKOGSBERG. From similarity of the outline of the left valve of the female (see MÜLLER's pl. 17, fig. 4, and my pl. 3, fig. 11), the rounded dorsal outline and well developed marginal flange (see MÜLLER's pl. 17, fig. 8, and my pl. 3, fig. 5), the density of normal-pore canals (*P. longiductus* has very sparsely distributed normal-pore canals) and the failure of MÜLLER to mention the posterodorsal loop, which is more conspicuous in *P. longiductus*, I have decided on the identity of the Gausstation and McMurdo Sound forms. Both MÜLLER's and my specimens were 1.10 mm. in length; representatives of *longiductus* seldom exceed 0.90 mm. in length.

MÜLLER (1908, p. 137) states that the normal-pore canals do not usually come in contact with the ridges of the reticular pattern. This characteristic was not found to be true in the McMurdo Sound specimens. By examination of specimens stained with silver nitrate, the volcano-like exterior openings of the canals were found to be either tangential to the ridges or connected to the ridges by very small ridges. Many of the canal openings had a tiny ridge originating from them and projecting toward the center of the fossa between the ridges.

MÜLLER (1912, p. 348) suggested a similarity between *devexa* and *Cythereis lineata*. Later workers would classify these forms in separate families.

SKOGSBERG (1928) would include MÜLLER's *devexa* and his own species *frequens* in the same group possibly with *Cythere wyville-thompsoni* BRADY, 1880 (herein called *Patagonacythere wyvillethompsoni*). He suggested that *frequens* was structurally close to *devexa* but had small differences in the sculpture of the carapace and structure of the penis. MÜLLER's



drawings of these characters are not thought by me to be that sufficiently detailed or different to have warranted recognition of separate species. SKOGSBERG's descriptions and illustrations together with his emphasis on marginal, ventrolateral and posterodorsal ridges suggest to me that his forms from South Georgia and those from McMurdo Sound probably belong to the same species. Both forms also have similar closely set, angular fossae with rather smooth, shallow bottoms.

I have examined the specimens of *Cythere wyville-thompsoni* BRADY (1880, p. 82, pl. 20, fig. 4) from Challenger Station 149 that are now in the British Museum. This species is related to both *P. devexa* and *P. longiducta*. It will be discussed further under the remarks of *P. longiducta*.

Occurrence. This species has been reported from MÜLLER's Gausstation, and McMurdo Sound in Antarctica and from South Georgia (SKOGSBERG, 1928) and southern Chile (HARTMANN, 1962). It may have been found in Scotia Bay, South Orkney Islands by SCOTT (1912) and listed under the name of *Cythere quadridens*, n. sp. The validity of this form as a separate species cannot be determined until SCOTT's specimens have been reexamined.

**PATAGONACYTHERE LONGIDUCTA ANTARCTICA Benson,
n. subsp.**

Plate 2, Figure 7, 8, 9; Text-Figures 21, 22.

Etymology. *Antarktikos* (Greek); south, in reference to distribution of the subspecies.

Type-locality. McMurdo Sound, Antarctica.

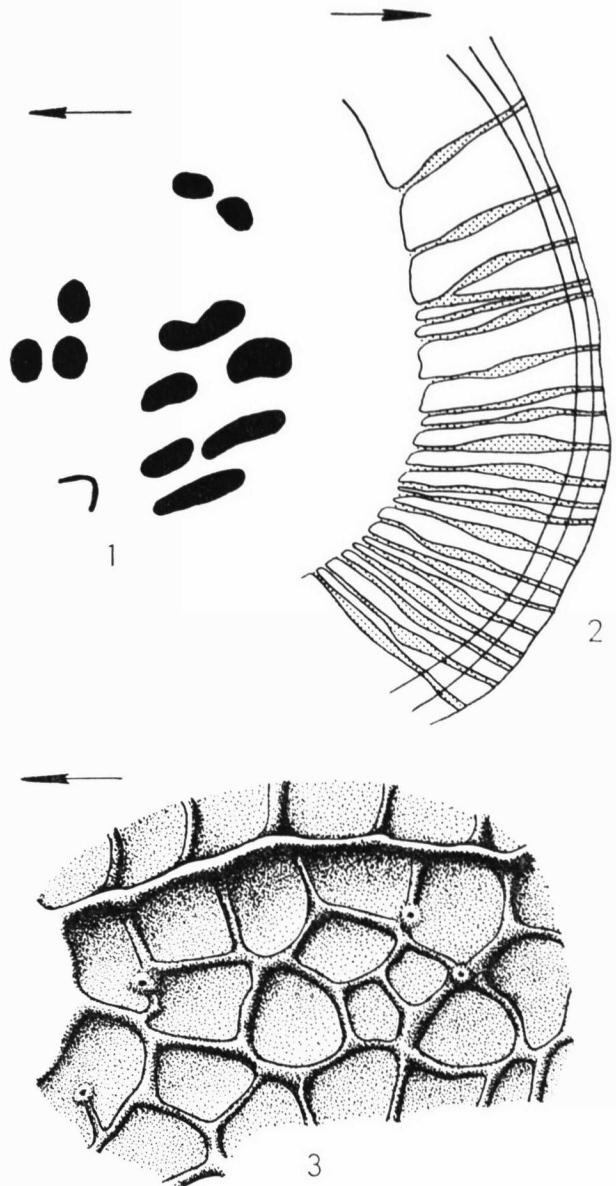
Diagnosis. Distinguished from *Patagonacythere longiducta longiducta* (SKOGSBERG) by its finer, less robust reticular surface ornament and particularly by the absence of a vertical ridge joining the posterodorsal loop and the posterior of the ventrolateral ridge (a possible key characteristic). The species *P. longiducta* differs from other related species by its short rotund shape, pronounced "hinge ears" formed at the cardinal angles of the left valve, well developed posterodorsal loop within the surface reticulation, and the sparseness of the normal-pore canals within the interreticular fossae.

TEXT-FIG. 21. *Patagonacythere longiducta antarctica* BENSON, n. subsp.—1. Dorsal view of partially separated rotund carapace.—2. Lateral exterior view of left valve of adult male showing the surface reticulation, submarginal ridges or rims, and posterodorsal loop.—3. Hinge of right valve.—4. Interior of left valve showing hinge and marginal structures. (all $\times 90$)

Description. Carapace of moderate size, rotund; subrectangular to subtriangular in lateral outline with high anterior; dorsal margin convex but not arched, terminating at the well-developed anterior and posterior cardinal angles with "hinge ears" in the left valve; ventral margin straight to convex near the outer edges of venter but depressed along margin, forming a ventral sinuation; anterior end high, foreshortened, obliquely rounded, forming a ventral lip in right valve just anterior to sinuate venter; posterior end with caudal extension produced at venter, truncate dorsally with accentuated shoulder at cardinal angle; greatest height anterior, at cardinal angle and eye tubercle. Outline in dorsal view shortened, bilaterally symmetrical, terminations subequal and parabolic, sides subparallel with median sulcus separating subcentral tubercle and inflated posterior; greatest width at subcentral tubercle, and almost equally in posterior inflation. Valves subequal in size, with no apparent overlap.

Surface moderately to finely reticulate with ridges emphasized as follows: along the venter, forming a strong ventrolateral keel; subparallel with the anterior margin, forming an anterior marginal rim; along the caudate posterior, forming a delicate submarginal ridge; along the dorsum, emanating from the eye tubercle, following the hinge margin to the posterior cardinal angle; from the subcentral tubercle toward the posterior along the mid-line, turning toward the dorsum, then toward the anterior to cross a median depression, fading into the reticulations near the eye tubercle. The excavations or fossae among the reticulations have smooth floors; a moderately conspicuous subcentral tubercle is present. Four or five spines emanate from the margin on the posteroventer of the caudal extension. The normal-pore canals emerge sparsely on the surface of the carapace either on or next to a ridge of the reticulate surface.

Hinge holamphidont with a stepped anterior tooth, an open intermediate groove and a reniform posterior tooth. Marginal area moderately broad and uniform in width over most of the free margin. Duplicature fused, no vestibule. Radial-pore canals moderate in number in anterior, less so in posterior, straight with swelling at midlength. Muscle-scar pattern complicate, with six discrete adductor scars due to the division of the middle two. The three antennal scars and the mandibular scars lie along the periphery of the muscle-scar pit (reverse of the subcentral tubercle) and form the remainder of a ring of scars with the adductors. Each scar forms a boss within the pit. Two other scars are found dorsally to the adductors.



TEXT-FIG. 22. *Patagonacythere longiducta antarctica*, BENSON, n. subsp.—1. Muscle-scar pattern of left valve ($\times 340$).—2. Detailed enlargement of radial-pore canals of segment of anterior margin of left valve ($\times 260$).—3. Detailed enlargement of reticular surface of the area postjacent to the subcentral tubercle in the left valve showing the sparsely distributed normal-pore canals located on the ridges ($\times 300$).

The soft-parts found within the specimens collected were not well enough preserved to describe in detail.

Dimensions. Length of adult specimen 0.87 mm.; height 0.49 mm.; width 0.40 mm.

Material. Specimens examined 35, of which 15 had both valves intact.

Remarks. *Patagonacythere longiducta* differs from the type-species (*P. tricostata*) in that it is shorter, more rotund, and has a more delicate, more closely spaced surface reticulation. In particular, the median ridge of *longiducta* joins and stops at the subcentral tubercle rather than continuing above the tubercle. There is no large ridge anterior of the subcentral tubercle except for the anteromarginal rim. Both forms have more pronounced posterodorsal loops in the reticular pattern than does *P. devexa*. All have well-developed ventrolateral ridges.

BRADY'S (1880) species *Cythere wyville-thompsoni*, herein referred to as *Patagonacythere wyvillethompsoni* (BRADY), is closely related to *P. longiducta*. The Challenger specimens collected from Kerguelen Island (Station 149), now at the British Museum, have a well-defined dorsal and posterodorsal ridge that form a posterodorsal loop toward the subcentral tubercle (not shown on BRADY, 1880, pl. 20, figs. 4a and e). Like *P. tricostata* HARTMANN, there is a bolder ridge within the reticular pattern that extends toward the anterior from the subcentral tubercle. The caudal spines of *wyvillethompsoni* are more pronounced than those of *longiducta* or any of the other species of *Patagonacythere*.

The sparseness of the normal-pore canals that coincide with the reticular ridges together with differences in size, shape, and emphasis on the dorsal segment of the posterodorsal loop serve to distinguish *longiducta*, and a vestibule of any kind has yet to be found in the latter species.

Occurrence. *Patagonacythere longiducta antarctica* has thus far only been found in McMurdo Sound; however, the species *longiducta* has a much broader range reaching to Scotia Bay in the South Orkneys (SCOTT, 1912) and to South Georgia (SKOGSBERG, 1928).

Family TRACHYLEBERIDIDAE Sylvester-Bradley,
1948

Genus CATIVELLA Coryell & Fields, 1937

Cativella CORYELL & FIELDS, 1937, p. 9; VAN MORKHOVEN, 1963, p. 185.

Type-species. *Cativella navis* CORYELL & FIELDS, 1937, p. 9, fig. 9.

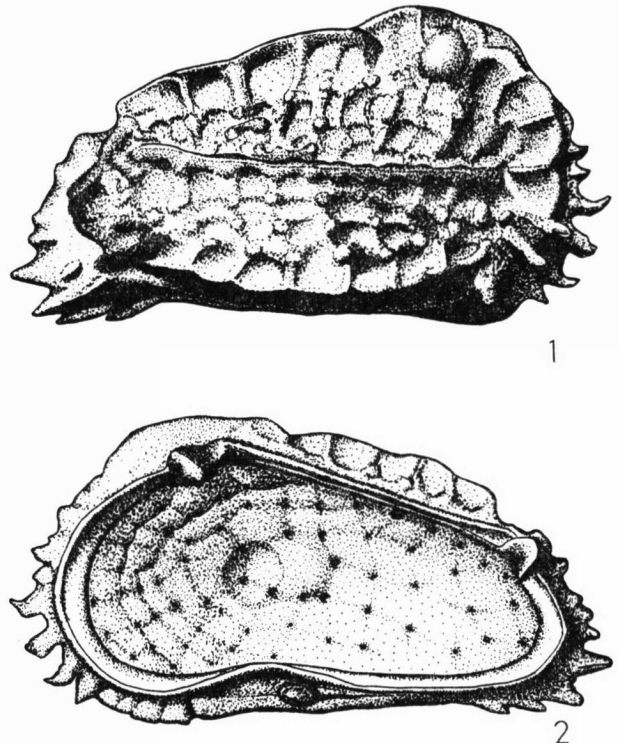
Diagnosis. A trachyleberidid genus distinguished by its posteriorly tapering shape, fluted ventrolateral, dorsal, and median ridges and marginal rims. The posterior and anterior margins usually have coarse spines. The posterior is produced, unlike that of *Carinocythereis* which is fore-shortened. *Upper Eocene to Recent; Marine, Western Hemisphere.*

Remarks. Considerable parallelism seems to exist in the development of the surface ornamentation of this genus and *Carinocythereis*. There is no evidence as yet, however, to indicate that they are phylogenetically related. The species *Cythere polytrema* BRADY (1878) has been referred to the genus *Costa* NEVIANI by VAN MORKHOVEN. This species should be studied further as some of the specimens identified as *polytrema* may belong to a reticulated species of *Cativella*. The character of the specimen described herein would seem to indicate that cativellid forms may grade from smooth and ridged, to reticular and ridged.

CATIVELLA sp.

Text-Figure 23.

Description. The right valve found is moderately large, robust and subcuneiform in shape. Wedge-shaped in lateral view with straight dorsum obscured by undulating and divided dorsal crest; anterior margin broadly rounded with about six prominent spines; venter straight, converging with dorsum toward posterior; posterior produced, heavily ornamented with



TEXT-FIG. 23. *Cativella* sp.—1. Lateral exterior view of right valve of immature (probably penultimate) instar showing the pappilate-subreticular surface and fluted three main ridges.—2. Interior of same right valve showing protodont hinge and internal configuration of normal-pore canals. (both $\times 70$)

rim and large backward directed spines. Prominent dorsal crest, and anterior and posterior rims visible in dorsal view; central domicilium rounded by median ridge terminating in spine toward posteroventer as seen from above.

Surface very rough with spinose-subreticular texture; large features include prominent notched dorsal crest, median ridge, ventrolateral ridge, anterior and posterior rims, and ventral rim. The interridge areas are covered with reticulations grading all over the surface into short spines forming a confused irregular pattern. The bases of the ridges are fluted, merging with the spinose-reticular interridge surface. Heavy spines are present at the terminal margins.

Hinge protodont (reflecting immature holamphidont) with lobed, slightly crenulate posterior tooth. Narrow inner margin. Surface of the interior punctate with minor, lineal depressions concentric with the inner margin.

Dimensions. Length of adult specimen 1.10 mm.; height 0.66 mm.; thickness of one valve 0.37 mm.

Material. Only one specimen was found.

Remarks. Attention is directed to this single immature specimen as it has an unusual kind of surface ornamentation. An identification was not attempted

because of the uncertain status of BRADY's species *Cythereis lacerata* BRADY, 1866, which seemed to be the closest choice among established and possible related forms. BRADY's description is vague. No other known species description within *Cativella* comes close to the present form. The unusual spinose-reticular surface texture may warrant erection of a new species once sufficient material is found. The specimen was not that of an adult, but probably a penultimate instar.

Occurrence. Found in the eastern part of the Ross Sea at Station 3 (lat. 77°31'S., long. 160°34'W.) in 448 meters of water in the top 9 cm. of a core. This was one of the deeper samples taken in a traverse northward across Sulzberger Bay. This also represents the southernmost occurrence of any known find of the genus *Cativella*. It is not known whether the specimen was a fossil or the remains of a recently dead animal living in the area. CHAPMAN (1916, p. 50) found a form he identified as *Cythere polytrema* BRADY, which occurred in large numbers in the elevated deposits on the slopes of Mount Erebus on Ross Island in McMurdo Sound. I would suspect this form is conspecific with the one described here, however, it may not be *polytrema*.

ADDENDUM

While studying the Antarctic species just described, I found a sample in the collections of the Museum of Invertebrate Paleontology of the University of Kansas from the southeast slope of the Pacific-Antarctic Ridge. Little is known about this sample other than its location (lat. 48°45'S., 114°33'W.) and the approximate depth of water (2000 fathoms) where it was taken. Because this location is so remote from that of any previous collecting locality for benthic ostracodes, I considered it worthwhile to include a brief description and illustrations of the specimens found in this sample.

Subclass OSTRACODA Latreille, 1806

Order PODOCOPIDA Müller, 1894

Suborder PODOCOPINA Sars, 1866

Superfamily CYTHERACEA Baird, 1850

Family TRACHYLEBERIDIDAE Sylvester-Bradley, 1948

Genus BRADLEYA Hornibrook, 1952

Bradleya HORNIBROOK, 1952, p. 38; VAN MORKHOVEN, 1963, p. 158-162.

Type-species. *Cythere arata* BRADY, 1880, p. 101, pl. 24, fig. 2a-c.

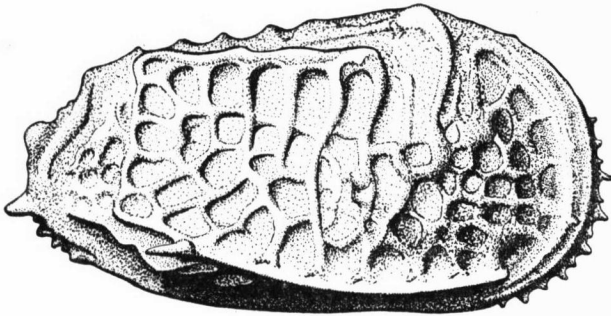
BRADLEYA? DICTYON (Brady), 1880

Text-Figure 24.

Cythere dictyon BRADY, 1880, p. 99-101, pl. 24, figs. 1a-y.
non *Bradleya dictyon* Brady, HORNIBROOK, 1952, p. 39, pl. 6, figs. 80, 83, 86 (see HORNIBROOK for more complete synonymy).

Description. Single right valve subrectangular, rotund but of moderate strength and size. In lateral view, valve with straight dorsal margin, scalloped in posterior half; broadly rounded anterior end; straight venter; produced caudate posterior end; dorsal and ventral margins slightly convergent toward posterior end. Inflated in dorsal view with marginal rims apparent at anterior end; greatest width in posterior third, culminating at posterior end of ventrolateral ridge, compressed at posterior.

Surface coarsely reticulated with subdued subcentral tubercle, conspicuous ventrolateral ridge, anterior and posterior rims, and dorsoalateral ridge. Eye tubercle subdued. Reticular pattern of broadly spaced ridges with radiation of ridges anterior to the subcentral tubercle; dominantly vertically oriented in postero-dorsal region. One conspicuous ridge runs from the location of the eye tubercle to the subcentral tubercle.



TEXT-FIG. 24. *Bradleya? dictyon* (BRADY), 1880. Lateral exterior view of right valve of adult male showing the configuration of the surface reticulation ($\times 70$).

Small marginal denticles on anterior and posterior margins. One conspicuous spine at posterior terminus of ventrolateral ridge.

Hinge holamphidont with pyramidal posterior tooth; anterior tooth broken; median groove bordered by ventral ridge, not visibly serrate. Marginal area narrow; no vestibule; radial-pore canals not visible; muscle-scar pattern not visible.

Dimension. Length of right valve 1.09 mm., height 0.61 mm., thickness of one valve 0.27 mm.

Material. Only one specimen was found.

Remarks. BRADY (1880, p. 99) and later HORNIBROOK (1952, p. 40) both have commented on the apparent broad range of variation of surface sculpture that seems to be characteristic of "*Cythere*" *dictyon*. HORNIBROOK has included a form with a strong median hinge in *dictyon*, which I believe is not conspecific (1952, pl. 6, figs. 81, 82, 84, 85) and may represent a new species, even a new genus. This circumstance may be equally true of the forms illustrated by CHAPMAN (1926, pl. 21, fig. 7) and VAN DEN BOLD (1946, pl. 10, fig. 13). All of these forms seem (the illustrations are not all clear) to have a prominent median lateral ridge originating at the subcentral tubercle which is not present in the specimen discussed here or on the Challenger specimens in the British Museum.

After examination of the original specimens described by BRADY, I would add a few descriptive notes about this material. The specimens that I examined looked like the specimens illustrated in the Challenger Report (pl. 24, 1e-i). The general shape of the carapace is more subrectangular than subquadrate and the valves are relatively fragile. The reticular ridges are not as coarse as represented in BRADY's figures *j* and *v* (BRADY pondered whether to include this form in *dictyon*, p. 100). Most of the normal-pore canals are located in the center of the reticular excavations.

There is almost no subcentral tubercle. The hinge is weak holamphidont with a reniform posterior tooth. The marginal area is narrow.

I would agree with VAN MORKHOVEN that *Cythere dictyon* possibly does not belong to *Bradleya* (*sensu stricto*) because of the differences in reticular surface between *dictyon* and *arata*. However, there is no strong median ridge present in the specimens identified by BRADY as *dictyon* as mentioned by VAN MORKHOVEN.

Occurrence. The specimen described and illustrated herein was found in the South Pacific at lat. $48^{\circ}45'S$, $114^{\circ}33'W$. The exact depth is not known but believed to be about 2000 fathoms. The specimen occurred in the top one centimeter of a core. The species has been reported from many parts of all of the deep ocean areas and was characterized as "ubiquitous" by BRADY (1880, p. 101). Although found in numerous localities, it is seldom abundant and its morphologic variability still poses taxonomic problems.

Genus ECHINOCYTHEREIS Puri, 1953

Echinocythereis PURI, 1953, p. 259; VAN MORKHOVEN, 1963, p. 171-173.

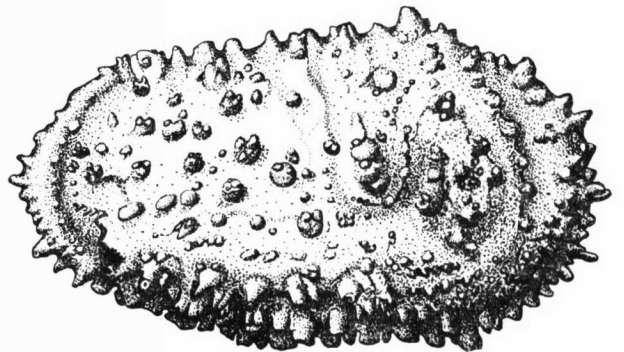
Type-species. *Cythereis garretti* HOWE & MCGUIRT, 1935, in HOWE & GRAD. STUD., 1935, p. 20, pl. 3, fig. 17-19; pl. 4, fig. 5, 15.

ECHINOCYTHEREIS DASYDERMA (BRADY)?, 1880

Text-Figure 25.

Cythere dasyderma BRADY, 1880, p. 105, pl. 17, figs. 4a-f, pl. 18, figs. 4a-f; BRADY, 1885, p. 300; BRADY & NORMAN, 1889, p. 153.

Description. Single right valve of adult male large, rotund, moderately fragile. In lateral view, subrectangular with straight dorsal margin, slightly convex ventral margin, broadly rounded anterior end, short but caudate and slightly upturned posterior end;



TEXT-FIG. 25. *Echinocythereis dasyderma* (BRADY)?, 1880. Lateral exterior view of right valve of adult showing spinose surface with occasional bifurcate and trifurcate spines ($\times 60$).

greatest height at anterior cardinal angle. In dorsal view, generally inflated, greatest thickness in posterior half, compressed near anterior and posterior margins.

Surface spinose with only a trace of an underlying reticular pattern in the ventrolateral region. A subdivided marginal rim bounds the anterior and posterior ends. A slight swelling, which separates two shallow vertical and ventrally converging furrows, marks the location of the subcentral tubercle. Most of the smaller spines are simple, however, the larger ones are bifurcate and trifurcate. A series of larger spines are aligned along the locality of the ventrolateral ridge, terminating posteriorly in the largest spine. No eye tubercle is visible but the exterior of the valve over the terminal element of the hinge is enlarged.

Internally, the hinge is holamphidont, relatively narrow and fragile; marginal area narrow; adductor scar consists of four vertically arranged scars. The antennal scar is V-shaped; no radial-pore canals visible.

Dimensions. Length of single adult male right valve 1.36 mm., height 0.80 mm., estimated thickness 0.27 mm.

Material. Only one specimen was found.

Remarks. This single specimen is noteworthy because it provided the opportunity to document the character of the carapace of a species that is poorly known. Other specimens of this species that I have in my collection from the northern Pacific are not identical to this one and they will also be documented for contrast at a later time.

There are four specimens in the Challenger material of the British Museum collected from Station 296 (lat. 38°6'S., long. 88°2'W.) from the deep area (1825 fathoms) of the southeastern Pacific. The spines are less well developed in the larger of the four specimens. Faint ridges tend to connect the spines. One specimen is noticeably subreticulated becoming ridged in the posteroventer. Two of the largest specimens have subdivided spines and depressions or sulci just anterior of the midline.

The specimen just described is different from the form described by BRADY (1880, p. 105) in several ways, especially with respect to details of spinosity and reticulation. The form of the present report is not as reticulated as that of BRADY, it also has better developed anterior and posterior marginal rims. The identification is left as tentative until more is known about the variation of this species.

Trachyleberis (Trachyleberis) spinosa (LIENENKLAUS), a Rupelian form identified and illustrated by KEIJ (1957, p. 93, pl. 12, fig. 3, pl. 13, fig. 5) is morphologically similar to the one discussed in the present report. It has a few trifurcate or tridentate spines scattered among many simple ones. Future workers may care to consider *spinosa* as possibly related to *dasyderma*.

Occurrence. *Echinocythereis dasyderma* is found throughout the world in the deep parts of the oceans. The specimen described here was found in the southern Pacific at lat. 48°45'S., long. 114°33'W. in waters approximately 2000 fathoms deep.

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