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J. W. NEALE, B.Sc., Ph.D.

Department of Geology,
University of Hull

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ABSTRACT

TWENTY-SIX species of podocopid ostracods are present in a high Antarctic fauna obtained from Halley Bay. Diagnoses are given of the two new genera *Antarcticythere* and *Myrena*, and the new species *Cativella bensoni*, *Loxocythere frigida* and *Robertsonites antarcticus* are described. Comparisons are made with other faunas described from the Antarctic.

As in other high Antarctic faunas, the species *Antarcticythere laevior*, *Myrena meridionalis*, *Cytheropteron gaussi*, *Xestoleberis rigusa*, *Cativella bensoni*, *Robertsonites antarcticus* and *Australicythere polylyca* are characteristic species. In *Pseudocythere caudata*, and southern forms which cannot be satisfactorily differentiated from this species, size is shown to increase with latitude. It is suggested that the distribution of this fauna is controlled by temperature in conjunction with the East Wind Drift, the Antarctic Peninsula and the Scotia Ridge preventing its spread towards South America.

CONTENTS

I. INTRODUCTION AND PREVIOUS WORK

ON 22 January 1962, D. A. Ardus, C. Dean and M. H. Thurston obtained a 3 kg. bottom sample of pale grey silty sand from Halley Bay, Coats Land, at a depth of 113 fathoms (206 m.). After the sedimentary petrology had been investigated by Hamilton (1965), a part of the sample was examined for ostracods. It yielded 1,020 individuals, all Podocopida and none with limbs or soft parts attached, belonging to 26 species (Table I) among which were two new genera and three new species which are described below.

TABLE I
ABUNDANCE OF ADULT AND JUVENILE SPECIMENS IN THE HALLEY BAY OSTRACOD FAUNA

	Total number	*Percentage*	*Adults*	*Percentage adult population*	*Juveniles*	*Percentage juvenile population*	*Percentage adults of species present*
Australicythere polylyca (Müller) 1908	396	39	47	21	349	44	12
Xestoleberis rigusa Müller 1908	124	12	30	14	94	12	24
Patagonacythere devexa (Müller) 1908	119	12	19	9	100	13	16
Loxoreticulatum fallax (Müller) 1908	95	9	30	14	65	8	32
Cativella bensoni sp. nov.	68	7	11	5	57	7	16
Sclerochilus meridionalis Müller 1908	37	4	5	2	32	4	14
Cytheropteron gaussi Müller 1908	28	3	12	5	16	2	43
Cytheropteron abyssorum Brady 1880	23	2	9	4	14	2	40
Sclerochilus reniformis Müller 1908	23	2	8	4	15	2	35
Robertsonites antarcticus sp. nov.	19	2	4	2	15	2	21
Hemicytherura irregularis (Müller) 1908	19	2	7	3	12	2	37
Loxocythere frigida sp. nov.	12	1	4	2	8	1	33
Pseudocythere cf. *P. caudata* Sars 1866	10	1	10?	5	—	—	100?
Antarcticythere laevior (Müller) 1908	8	<1	2	<1	6	<1	25
Macrocypris cf. *M. similis* Brady 1880	6	<1	5	2	1	<1	83
Hemicytherura anomala (Müller) 1908	6	<1	6	2	—	—	100
Paradoxostoma hypselum Müller 1908	5	<1	5	2	—	—	100
Xestoleberis setigera Brady 1880	5	<1	1	<1	4	<1	20
Copytus elongatus Benson 1964	4	<1	4	2	—	—	100
Sclerochilus antarcticus Müller 1908	3	<1	2	<1	1	<1	66
Bradleya cf. *B. dictyon* (Brady) 1880	3	<1	—	—	3	<1	—
Cytheropteron antarcticum Chapman 1916	2	<1	2	<1	—	—	100
Bairdia labiata (Müller) 1908	2	<1	1	<1	1	<1	50
Myrena meridionalis (Müller) 1908	1	<1	1	<1	—	—	100
Xiphichilus gracilis (Chapman) 1915	1	<1	1	<1	—	—	100
Bythoceratina dubia (Müller) 1908	1	<1	1	<1	—	—	100
	1,020		227		793		

Particular interest attaches to this fauna, since the nearest described podocopid fauna belonging to the "high Antarctic province" (Ekman, 1953) is that described by Daday (1908) from over 920 miles (1,480 km.) away to the north-west, whilst the classic "Gauss station" fauna described by Müller (1908) is 2,100 miles (3,380 km.) away on the other side of Antarctica, and the most recently described fauna from the Ross Sea and McMurdo Sound (Benson, 1964) is nearly 1,500 miles (2,415 km.) away (Fig. 1).

A number of workers have dealt with Antarctic Myodocopida but since none was found in this fauna they are not considered further. The most important description of a podocopid fauna from the high Antarctic is that of Müller (1908) who described 34 species, a further four (including two represented only by larval forms) being left under open nomenclature. These were brought back by the Deutschen Südpolar-Expedition, 1901–03, and 20 of the species (53 per cent) were represented by five specimens or fewer. Brady (1907) dealt with nine species brought back by the National Antarctic Expedition, 1901–04, but only two of these were Podocopida and one, *Xestoleberis reniformis*, was from an unknown locality, and therefore they are of little importance to the present study. Daday (1908, 1913), from material collected by

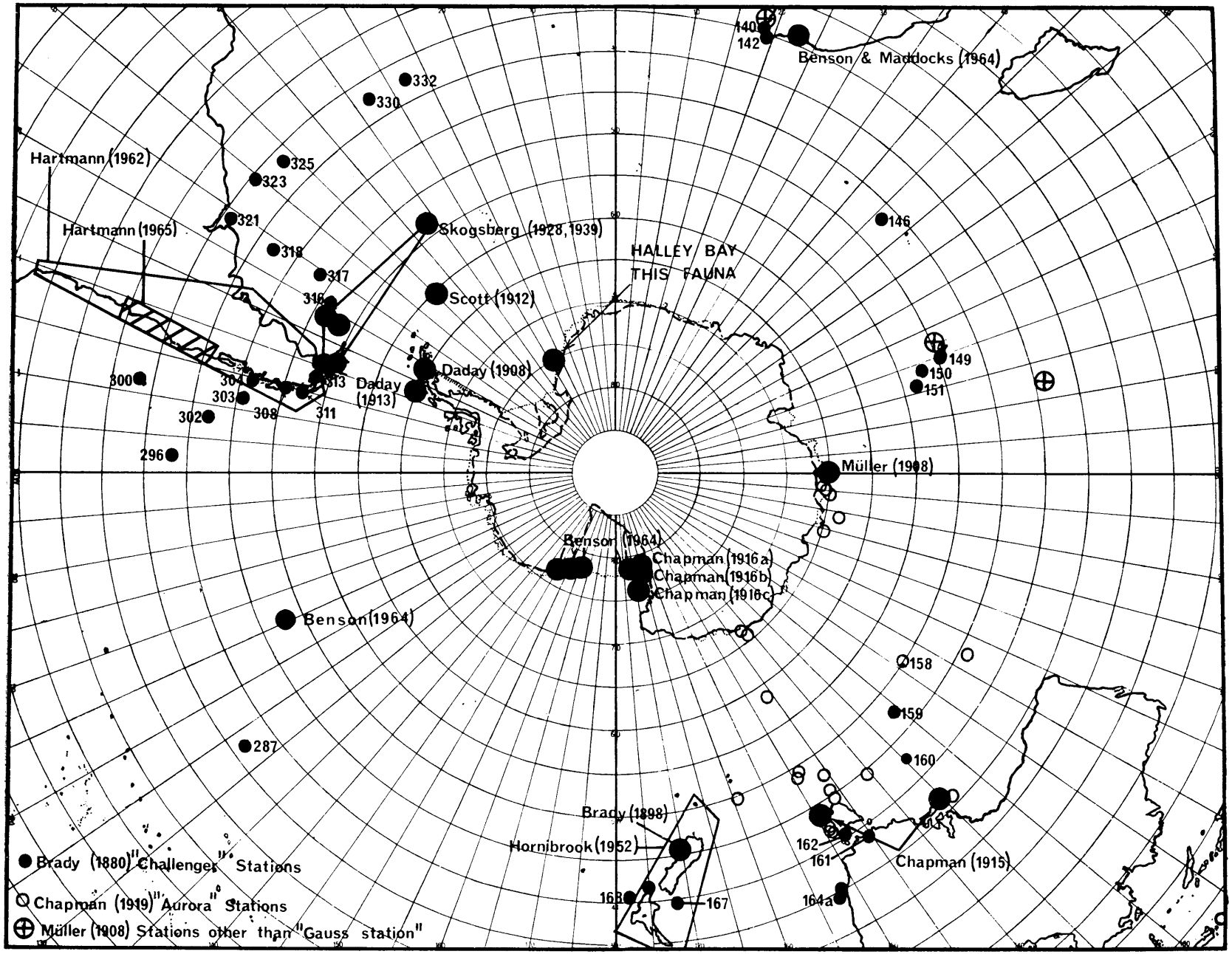


FIGURE 1

Map of the Southern Hemisphere showing the location of the present fauna, together with the location of podocopid faunas described recently and some of the more important localities covered by earlier authors.

the first Expédition Antarctique Française, 1903–05, and the Deuxième Expédition Antarctique Française, 1908–10, described three species in each publication, two of the 1908 species being new Myodocopa; only the 1913 paper has a bearing on the present fauna. Chapman (1916*a*, *b*, *c*, 1919) described faunas from Antarctica south of Australia and New Zealand, whilst more recently from the same general area Benson (1964) has described a fauna of 13 species (six left under open nomenclature), of which four were represented by five specimens or less.

Further afield, Skogsberg (1928, 1939) covered certain ostracods from South Georgia in the "low Antarctic province", and Brady (1880), in his classic *Challenger* report, dealt with Podocopida from Iles de Kerguelen in the same province as well as with many stations in contiguous areas.

Southern South America and the Magellan Straits have been examined by Brady (1867–71) in *Les fonds de la mer, Vol. 1*, as well as in the *Challenger* report (1880), and by Hartmann (1962, 1965) and Skogsberg (1928) in more recent years. The South African area has been recently studied by Benson and Maddocks (1964), as well as having been partially examined by Brady (1880) and Müller (1908). Finally, the Australian area has been investigated by Brady (1880) and Chapman (1915, 1919), and the New Zealand area by Brady (1880, 1898) and more recently in the comprehensive survey by Hornibrook (1952). The areas in which work has recently been carried out on podocopid faunas as well as the localities covered by the most important works of the older authors are shown in Fig. 1.

One of the most disappointing features of the present work has been the inability to trace the location of Scott's Podocopida from the South Orkney Islands on which he based ten new species. All his Copepoda and Myodocopida are in the Royal Scottish Museum in Edinburgh, but the crucial podocopid ostracods were never deposited there. A widespread search of museums, universities and other institutions both at home and abroad has failed to locate them.

Specimens prefixed by the letters "HU" are deposited in the collections of the Department of Geology, University of Hull, and examples of some of the commoner species, including paratypes of *Cativella bensoni*, have been deposited in the British Museum (Nat. Hist.).

II. SYSTEMATIC DESCRIPTIONS

Order Podocopida Müller 1894

Suborder Podocopa Sars 1866

Family Bairdiidae Sars 1866

Genus *Bairdia* M'Coy 1844

Bairdia labiata (Müller) 1908
Fig. 2a, b.

Nesidea labiata Müller 1908, p. 99–100, pl. XIV, figs. 1–6.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve (HU.13.R.12.44).	0·717	0·467	0·250

Description: Shape bairdioid in side view (Fig. 2b) with height about two-thirds the length. Middle section of the dorsal margin arched with straight antero- and postero-dorsal margins. Broadly rounded anteriorly, less so posteriorly. The small calcified lip on the anterior and posterior margins noted by Müller is present. Marginal areas well developed, showing in the smaller specimen eight anterior and nine posterior radial pore canals, which are simple with a prune-shaped expansion in their outer third. Inner margin and line of concrescence scarcely separated anteriorly, coincident ventrally and somewhat more widely separated posteriorly to give a small posterior vestibule. Muscle scars showing typical *Bairdia* pattern of central adductors, with a rounded triangular mandibular scar some distance in front and on

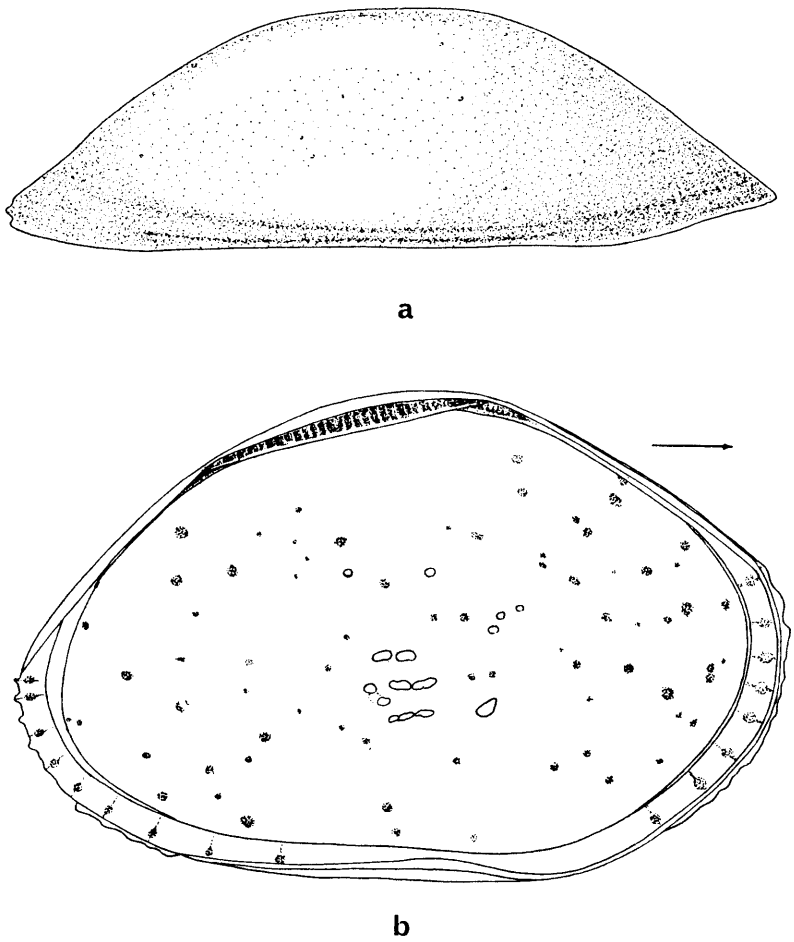


FIGURE 2

Bairdia labiata (Müller) 1908. Juvenile (instar 7 ?). Left valve (HU.13.R.12.44; ×140).
a. Dorsal view.
b. Internal lateral view.

the line of the lowest adductor scars, three small rounded antennal scars above the mandibular scar and a little more dorsally situated than the top adductor scars, and two dorsal muscle scars. The surface of the valve is covered with large normal pore canals.

The hinge in the left valve consists of a locellate groove delimited ventrally by a bar, with anterior and posterior elongate loculate sockets situated at a rather lower level in the valve. In dorsal view (Fig. 2a) the valves are inflated and rounded with the greatest width at about the mid-point, tapering a little more sharply anteriorly than posteriorly.

Remarks: Only two specimens of this species were found, the smaller (length 0·717 mm.) being about half the size of Müller's specimens (length 1·8 mm.) but identical in shape. The second specimen, also a left valve but broken, is larger, the estimated length being 1·0 mm. There is no doubt of the identity of these specimens, although they must be regarded as probably immature forms in view of Müller's measurements. Müller recorded that this species was fairly common at "Gauss station" at a depth of 385 m. (210 fathoms), especially in December. At Halley Bay it is rare.

The only other species which bears any resemblance is Brady's *Bairdia villosa* from Iles de Kerguelen and Prince Edward Islands, which is easily differentiated by its much steeper antero-dorsal margin.

Nesidea Costa 1849, the genus to which Müller referred this species, is now regarded as a synonym of *Bairdia* M'Coy 1844.

Family Cyprididae Baird 1845

Subfamily Macrocypridinae Müller 1912

Genus *Macrocypris* Brady 1867

Macrocypris cf. *M. similis* Brady 1880

Plate Is, s′, t.

cf. *Macrocypris similis* Brady 1880, p. 42, pl. II, fig. 2a–d.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.91).	1·338	0·532	0·273
Left valve (HU.13.R.12.93).	1·338	0·506	0·299

This is probably a new species of *Macrocypris* but, since only six specimens were available for study, it is not proposed to name it at present and it is compared with *M. similis* Brady. The specimens consist of three right valves (two of which are broken), two left valves and one juvenile left valve mounted as HU.13.R.12.88–93.

Description: In side view the greatest height, which is about 36 per cent of the length, lies at or a little in front of the mid-point. The ventral margin is fairly straight, swinging ventrally in the anterior part of the valve where it joins the evenly rounded anterior margin. The dorsal margin is arched, consisting of four relatively straight sections which merge into each other, the most posterior of these passing smoothly into the slightly rounded vertical posterior margin, which occupies the ventral quarter of the height. Zone of concrescence narrow, line of concrescence parallel to the anterior and posterior margins. About 18 straight and fairly wide radial pore canals are present anteriorly where there is a well-defined anterior vestibule occupying approximately the anterior sixth of the valve, the inner margin running obliquely from antero-dorsal to postero-ventral. A similar vestibule occupies the posterior sixth of the valve, the inner margin in this case running much more obliquely from postero-ventrally to postero-dorsal.

Hinge simple, the margin of the right valve producing antero-dorsal and postero-dorsal flanges which fit into and over complementary elongate sockets/shelves developed in the left valve. Between the flanges the right valve would appear to fit immediately under the dorsal margin of the left valve. Muscle-scar pattern difficult to see clearly but it appears to consist of two elongate scars placed obliquely above each other and perhaps one or two smaller scars.

Remarks: Examination of the *Challenger* material in the British Museum (Nat. Hist.) shows that the Halley Bay form is closest to *M. similis*, from station No. 120 (lat. 8°37′S., long. 34°28′W.; 675 fathoms (1,235 m.)), a species also recorded from off Patagonia and off Ascension Island. The Antarctic form differs in being less vaulted postero-dorsally, in the more curved antero-dorsal margin, and in having the greatest height situated slightly farther forward. It is also close to Brady's *M. decora*, a species widely recorded throughout the Southern Hemisphere, but the Iles de Kerguelen specimen of *M. decora* is higher than the Halley Bay species and the greatest height lies more posteriorly. In addition, the outline of the anterior margin differs in side view, being asymmetric in Brady's species. From Müller's *M. inaequalis* it differs in having the greatest height more anteriorly and in tending to be slimmer posteriorly in side view, whilst the postero-ventral margin is straighter.

Family Cytheridae Baird 1850

Subfamily Paradoxostominae Brady and Norman 1889

Genus *Xiphichilus* Brady 1870

Xiphichilus gracilis (Chapman) 1915

Fig. 3a–c.

Macrocypris gracilis Chapman 1915, p. 37, pl. II, fig. 2a–c.
Xiphichilus gracilis Chapman sp.; Chapman, 1919, p. 40.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.47).	0·717	0·211	0·091

Description: Shape in side view very elongate, the height less than one-third of the length. Dorsal margin gently arched, with the greatest length at two-thirds the height anteriorly, and one-third the height posteriorly. Anterior margin slopes very steeply postero-ventrally almost at right-angles to the anterior part of the dorsal margin. Ventral margin sinuous with concave anterior portion running smoothly into the gently convex posterior portion. Posterior termination narrowly rounded. In dorsal view very slender, width of valve not much more than 10 per cent of the length, fairly evenly rounded and sharply pointed at both ends, somewhat more so anteriorly than posteriorly.

Hinge structure simple, consisting of a simple groove following the dorsal margin. A complementary bar is presumably formed by the dorsal margin in the left valve. Marginal area wide with deep anterior vestibule off which open five marginal pore canals. Posterior relatively difficult to make out with clarity but it appears to have a rather elongate posterior vestibule off which opens a large, single forked marginal pore canal leading to either side of the posterior point. About four or five marginal pore canals are present ventrally.

Muscle-scar pattern, when seen cleared in oil (Fig. 3a), composed of a large number of small muscles which when seen dry (Fig. 3c) appear to be aggregated into four main scars lying very obliquely just anterior of the mid-point of the valve. The third of these scars seems to be divided further into two main parts.

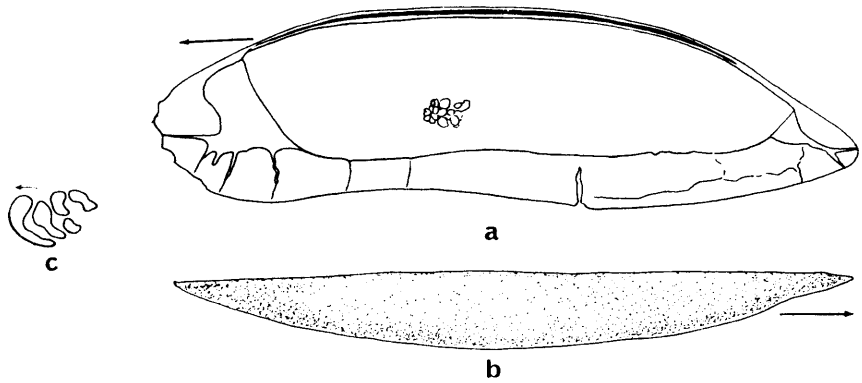


FIGURE 3

Xiphichilus gracilis (Chapman) 1915. Right valve (HU.13.R.12.47).
a. Inside seen cleared in clove oil (×130).
b. Dorsal view (×130).
c. Muscle-scar pattern seen dry (freehand drawing approximately ×228).

Remarks: Probably because of its fragility this species is very rare and only one right valve has been found. Although less pointed anteriorly than the type species of the genus, *X. tenuissima* (Norman), it agrees well in other respects with the characteristics of the genus and with the other species placed within it. Chapman (1919) was undoubtedly right in referring it to *Xiphichilus*. Hitherto all specimens have come from the Tasmanian area at great depths, the *Endeavour* material from 777 fathoms (1,420 m.) and the *Aurora* specimens from 1,300 and 1,320 fathoms (2,380 and 2,415 m.).

Genus *Paradoxostoma* Fischer 1855

Paradoxostoma hypselum Müller 1908
Plate Ig, k.

Paradoxostoma hypselum Müller 1908, p. 118–19, pl. XIX, fig. 7; text-figs. 1–3.
Paradoxostoma hypselum Müller 1908; Benson, 1964, p. 12, pl. 1, fig. 2; text-figs. 4 and 5.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.75).	0·662	0·371	0·169
Left valve (HU.13.R.12.76).	0·688	0·389	0·143

Remarks: The features of these characteristic oval rhomboidal valves with upturned caudal extension as seen in side view have been described by Müller and Benson and there is little to add. The muscle scars often show a binodal arrangement in transmitted light and it is doubtful whether the fifth and top small scar figured by Benson is present in most cases.

P. gaini Daday (1913) from Petermann Island (lat. 65°10′34″S., long. 66°32′30″W.) is probably synonymous. As in the present species, the muscle scars appear binodal in Daday's figures and, whilst 17–20 marginal pore canals are present in the Petermann Island form compared with 13 figured by Benson and 14 or 15 shown by Müller, this is probably within the limits of variation. Daday himself suggested that the greatest affinities of *P. gaini* are with *P. kerguelense* Müller but it differs in the structure of the penis and of the male and female valves (*vide* Müller, 1908, p. 120, figs. 1–4). Daday's specimens are rather larger—length 1·0 mm., height 0·6 mm.—than *P. hypselum.*

P. hypselum seems to be rare in all localities; Müller recorded nine specimens, Benson four, and five were found in the Halley Bay sediment. All the latter appear to be adult.

Genus Sclerochilus Sars 1866

Sclerochilus antarcticus Müller 1908
Plate In.

Sclerochilus antarcticus Müller 1908, p. 104–05; text-figs. 1–5.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve (HU.13.R.12.78).	0·714	0·299	0·121

Description: Muscle-scar pattern typical of *Sclerochilus* with five elongate adductor scars closely juxtaposed in an oblique row. The shape in this elongate species is very characteristic, the height being less than half the length. The dorsal margin is almost straight in the middle half of the length, whilst anteriorly and posteriorly it falls away sharply, the posterior portion being weakly concave. The ventral margin is concave with a marked embayment at about one-third the length from the anterior end.

The marginal pore canals are evenly spaced anteriorly, ventrally and posteriorly, and the number is fairly constant, varying between 24 and 27 as seen in the limited Halley Bay material and the specimens figured by Müller from "Gauss station".

Remarks: This species is very rare at Halley Bay, only two female left valves and one juvenile right valve being found, although it seems to have been commoner at "Gauss station" where 12 specimens were obtained. The adult lengths of 0·714 and 0·740 mm. agree with the female length of 0·73 mm. given by Müller.

Sclerochilus meridionalis Müller 1908
Plate IVd.

Paradoxostoma abbreviatum Sars; Brady, 1880, p. 150–51, pl. XXXV, fig. 1a–d.
Sclerochilus meridionalis Müller 1908, p. 104, pl. XIX, figs. 8, 11, 14; text-fig.
non *Paradoxostoma abbreviatum* Sars 1866, p. 94.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve, penultimate instar (HU.13.R.12.43).	0·506	0·286	0·104

Description: Muscle-scar pattern typical of the genus, the five scars forming an oval area whose long axis is parallel to the antero-dorsal margin. The specimens tally in all respects with the description and figures given by Müller, and the height is about five-ninths of the length, with the greatest height situated just behind the mid-point. Left and right valves similar in shape in side view, narrowly rounded anteriorly and more broadly rounded posteriorly, with strong arched dorsal margin and concave ventral margin. Surface smooth and covered with numerous normal pore canals, which (as Müller noted) appear nail-like in profile or semi-profile. Prominent anterior and posterior vestibules occur, the former being more equidimensional and the latter more elongate. About ten marginal pore canals are associated with the anterior vestibule, about 17 to 20 with the posterior. These canals are closely spaced and are generally closer together than the length of the individual canals. Hinge simple; a crenulate bar formed by the dorsal margin in the left valve and complementary locellate groove in the right valve.

Müller stated that the male and female are similar except for size, the male being smaller. No soft parts were available for study but at Halley Bay the size range of the adults was 0·56–0·64 mm., the three smaller valves possibly to be interpreted as males.

Remarks: Brady (1880, p. 150) noted that the one or two specimens he found in a dredging from "Balfour Bay", Iles de Kerguelen, and which he referred to *Paradoxostoma abbreviatum* Sars, differed from that species in having a more highly arched dorsum and a straighter ventral margin. Examination of the material from "Balfour Bay" in the British Museum (Nat. Hist.) shows that it is identical with this species from Halley Bay and "Gauss station", whilst comparison with Sars' later figure (Sars, 1928, pl. CXIX, fig. 1) confirms the dissimilarities noticed by Brady as well as other differences. The "Balfour Bay" specimens came from a depth of 20–50 fathoms (36–91 m.). This species is common at Halley Bay and 37 specimens were obtained. Only five (three right valves, two left valves), which reached lengths in excess of 0·56 mm., appear to be adult, whilst of the remainder 13 belong to the penultimate instar (8) including the figured left valve, 16 to instar 7, and three to instar 6.

Sclerochilus reniformis Müller 1908
Plate II.

Sclerochilus contortus (Norman), Brady 1880 (pars), p. 147–48, pl. XXXV, fig. 8a, b.
Sclerochilus reniformis Müller 1908, p. 103, pl. XV, figs. 6–10.
non *Cythere contorta* Norman 1862, p. 48, pl. ii, fig. 15.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.85).	0·779	0·392	0·143

Description: A typical *Sclerochilus* characterized by the strong concavity or embayment in the ventral margin situated at about one-third the length from the anterior end. Narrowly rounded anteriorly, broadly rounded posteriorly with the dorsal margin strongly arched and straight antero-dorsal margin, but sloping steeply and slightly concave postero-dorsally in the left valve. Right valve similar but dorsal margin more evenly rounded and not concave postero-dorsally. The right valve generally differs posteriorly from Müller's figure (which is atypical although it can be matched in the present material) in that it is not built up so much postero-dorsally but falls away more from about three-quarters of the length of the valve.

Remarks: This is a fairly common species at Halley Bay, 23 specimens being recovered, and at "Gauss station" it was apparently the commonest species of this genus, a role taken over by *S. meridionalis* at Halley Bay. Müller stated that it differs from *S. contortus* in the much fewer marginal pore canals as well as in some aspects of the soft parts. Examination of *S. contortus* material in the British Museum (Nat. Hist.) shows it to be more narrowly rounded anteriorly and more elongate than the present species. The *Challenger* material from 20–50 fathoms (36–91 m.) in "Balfour Bay", Iles de Kerguelen, is identical with *S. reniformis* and belongs here. The Heard Island specimen, also labelled *S. contortus*, is different and does not belong here.

Subfamily Bythocytherinae Sars 1926

Genus *Antarcticythere* gen. nov.

Derivation of name: In reference to its present known geographical occurrence.

Type species: *A. laevior* (Müller) 1908.

Diagnosis: A bythocytherinid with overhang of the dorsal margin in the left valve, simple hinge, blunt posterior termination and absence of alae. Second antenna and termination of body very like *Bythocythere* Sars 1866, less close to *Jonesia* Brady 1866. Terminal claws on thoracic legs apparently shorter than in *Bythocythere*.

Remarks: This species clearly belongs in the Bythocytherinae on the evidence of muscle-scar pattern, marginal areas and limbs as far as the latter are known, but it cannot be fitted into any of the known genera. The carapace features are quite distinctive; the limbs and soft parts figured by Müller are very reminiscent of *Bythocythere* except for the walking legs which show some small differences. The genus is at present monotypic and needs to be stabilized. Careful re-examination will probably show that *Bythocythere dromedaria* Sars belongs here.

Müller (1908, p. 134) got only a single female from "Gauss station" and, whilst the species shows considerable variation judging from the Halley Bay specimens, there is no doubt that they are conspecific. They agree in all respects except that Müller noted that his specimen has at the posterior end of the ventral margin "eine kleine aber sehr deutliche, nach hinten gerichtete Spitze gegen den Ventralrand". Of the eight specimens available for examination, one immature form shows a suggestion of this feature and it is not considered sufficiently important at present to justify separation as a separate subspecies or variety. Müller gave the length of his specimen as 0·5 mm., although measurement on his figure suggests 0·71 mm., which corresponds with instar 8 of the Halley Bay material. Since Müller's figure corresponds most closely with the penultimate instar of the present material this is probably indeed the case.

Antarcticythere laevior (Müller) 1908

Plate Im, o, p; Fig. 4a–e.

Loxoconcha laevior Müller 1908, p. 134; text-figs. 1–7.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Adult left valve (HU.13.R.12.94).	0·948	0·519	0·273
Adult left valve (HU.13.R.12.98).	0·916	0·456	0·221
Right valve, instar 8 (HU.13.R.12.49).	0·705	0·351	0·212
Right valve, instar 8 (HU.13.R.12.95).	0·701	0·338	0·134
Right valve, instar 7 (HU.13.R.12.77).	0·610	0·325	0·169

Description: This species is chiefly notable for the great variation in shape between the various instars. The adult left valve in side view is elongate-oval with straight dorsal margin, broadly rounded anterior margin; ventral margin with an indentation about one-third of the length from the anterior end but convex posteriorly, and the greatest height just behind the mid-point (Plate Ip; Fig. 4b). From this point

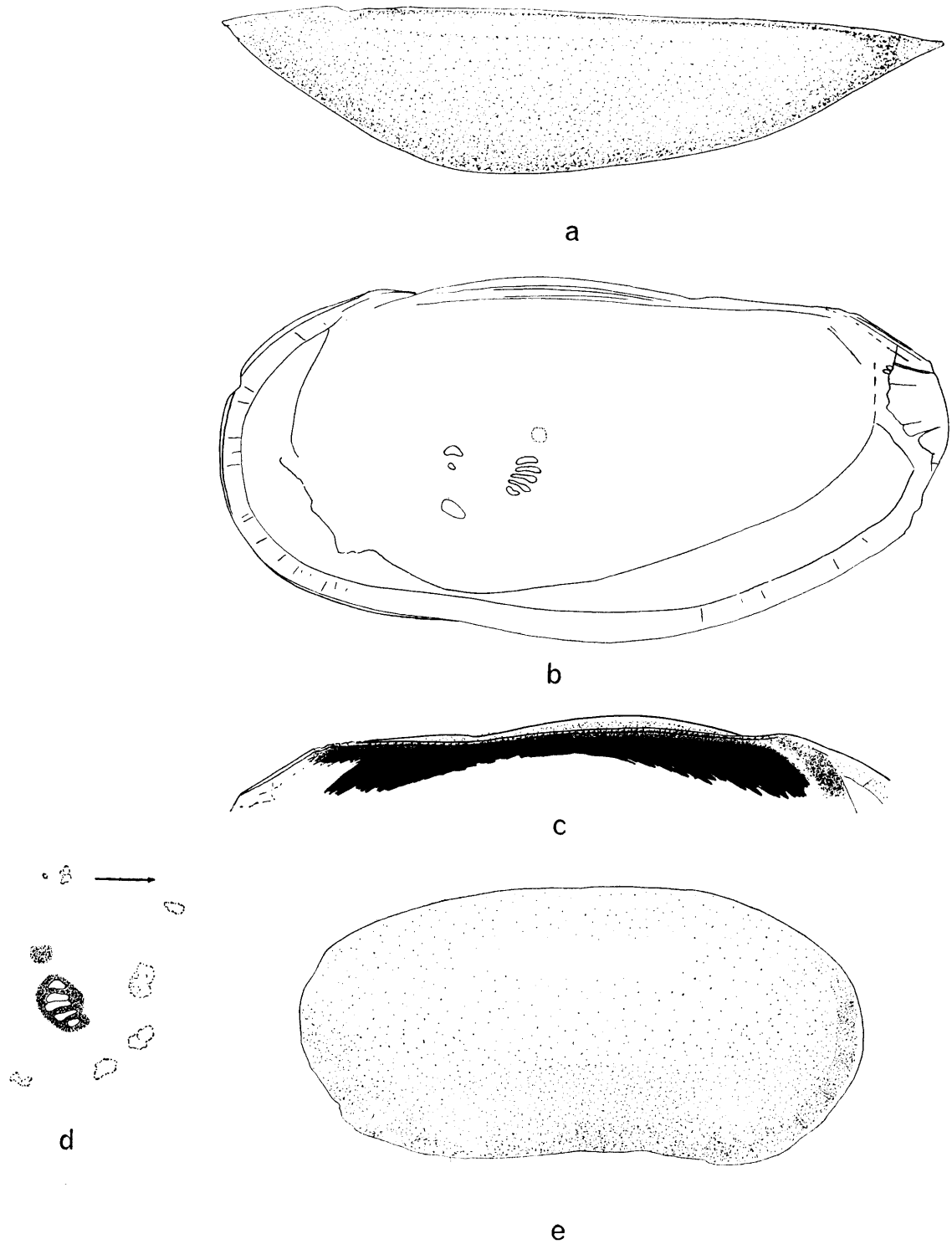


FIGURE 4

Antarcticythere laevior (Müller) 1908. Magnification ×124 in all cases.

a. Adult, left valve (HU.13.R.12.98). Dorsal view.
b. Adult, left valve (HU.13.R.12.98). Cleared in clove oil and seen from the outside in transmitted light.
c. Adult, left valve (HU.13.R.12.98). Hinge structure.
d. Adult, right valve (HU.13.R.12.94). Muscle-scar pattern seen from the inside.
e. Right valve, penultimate instar (HU.13.R.12.49). External lateral view.

the postero-ventral margin converges towards the dorsal margin and ends in a short, almost vertical, posterior section. The dorsal part of the shell overhangs the dorsal margin, giving a convex appearance to the central part of the dorsal outline in external lateral view.

The surface is smooth and shiny with a narrow zone of concrescence which is uniform for most of the free margin but somewhat expanded at the posterior extremity. Radial pore canals are moderately numerous, simple, short and straight. A well-defined simple crescentic vestibule is present anteriorly and a simple elongate vestibule postero-ventrally and posteriorly (Fig. 4b).

The muscle-scar pattern (Fig. 4b, d) is very distinctive with an oblique row of five, elongate, closely spaced adductor scars reminiscent of *Sclerochilus*, with a dorsal scar a short distance above, and well-developed antennal and mandibular scars. The detailed shape of the scars, other than the group of five adductors, has proved difficult to see with clarity and it appears to be somewhat variable.

Hinge structure in the left valve is simple, the dorsal margin forming a finely crenulate bar. No adult right valves were available but, from the evidence of the penultimate instar, it would appear that the dorsal margin of the right valve fits over that of the left valve without the development of a proper groove to take the latter.

In dorsal view the greatest width is at approximately one-third the length from the anterior end (Fig. 4a), the valve being evenly rounded and finely tapered posteriorly.

In contrast to the adult valves, only right valves of the penultimate instar were obtained and these differ considerably in shape from the adult left valves (Plate Io; Fig. 4e). The dorsal part of the valve does not noticeably overhang the dorsal margin, the ventral margin is more markedly concave and the posterior termination is less prominent. As in the adult, the zone of concrescence is narrow, the radial pore canals sparse to moderately numerous and the vestibules well developed. The oval area with the five elongate adductor muscle scars is easily seen, and a dorsal muscle scar is present but vague. The hinge is simple and formed by the dorsal margin which apparently fits over that of the left valve, the latter being accommodated in a recessed shelf which is not defined ventrally by a bar to form a groove.

Both valves of instar 7 (Plate Im) were found. In side view these are asymmetrically rounded anteriorly and the anterior two-thirds of the dorsal and ventral margins are sub-parallel, giving the front part of the shell a smooth and inflated appearance. The postero-dorsal margin slopes gently posteriorly forming a distinct angle in the posterior cardinal area, whilst the postero-ventral margin swings up to meet it in a point, giving the valves a rather triangular appearance posteriorly. The vestibules are not present at this stage of development and the muscle-scar pattern was not seen.

This species is rather rare and altogether eight specimens were obtained, consisting of two adult left valves, three right valves of instar 8, and one left and two right valves of instar 7.

Genus *Bythoceratina* Hornibrook 1952

Bythoceratina dubia (Müller) 1908

Plate IIm, m′.

Loxoconcha (?) *dubia* Müller 1908, p. 135, pl. XVII, fig. 3; pl. XIX, fig. 9; text-fig. 1.
Cytheropteron armatum Chapman sp., var. *spinosa* nov. Chapman 1919, p. 36; pl. XXII, fig. 4, 4a.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve (HU.13.R.12.46).	0·851	0·454	0·389

A typical member of the purely austral genus *Bythoceratina* with the greatest height and width situated in the posterior part of the valve at about two-thirds the length. The most notable feature is the prominent ventro-lateral spine which adds some 30 per cent to the width of the valve in dorsal view. There is a well-developed median sulcus which is reflected on the inside of the valve by a rounded vertical ridge. The surface of the valve is entirely covered with polygonal pits about 0·026 mm. in diameter, which are deep and surrounded by rounded ridges about half as wide as the pits. These ridges carry fine spines about 0·02 mm. long. The anterior margin carries about 13 spines.

The hinge is simple, the dorsal margin in this left valve forming a straight bar with two relatively small terminal sockets.

Remarks: This species was similarly rare at "Gauss station", where Müller found only a single right valve of almost exactly the same length (0·86 mm.), and with the characteristic ornament of which he gave a graphic description.

Hornibrook noted that species described from the Antarctic by Chapman (1919) and belonging to this genus are *Bythocythere ilex* Chapman, *Cytheropteron armatum spinosa* Chapman, and the figures of the specimen identified by him as *Cytheropteron umbonatum acanthoptera* Marsson on external characters, all of them having the vertical sulcus, the straight dorsal margin and the prominent spine so characteristic of *Bythoceratina* and distinct from the alar process of *Cytheropteron*.

Hornibrook described eight species of *Bythoceratina*, of which *B. tuberculata* is restricted to the Forsterian Province, *B. mestayerae* and *B. utilazea* are restricted to the Aupourian Province, *B. fragilis*, *B. powelli* and *B. edwardsoni* are distributed from the Aupourian to the Forsterian Province, whilst *B. maoria* and *B. decepta* are distributed from the Aupourian to the Rossian (sub-Antarctic) Province. The present species bears no relation to the two Rossian forms, but it shows a resemblance in ornament to *B. mestayerae* Hornibrook, which is restricted to the Aupourian Province which takes in the northern two-thirds of North Island, New Zealand, and lies north of the sub-Antarctic (Rossian) and Forsterian Provinces. The most notable difference from the New Zealand species is in the much stronger marginal spination anteriorly and in the posterior part of the valve in dorsal view.

Chapman (1919, p. 36) noted that *Cytheropteron armatum* Chapman var. *spinosa* var. nov. 1919 agreed with the type species from Funafuti except for the anterior extremity which was narrower, whilst the raised area between the pittings was finely spinose. *Cytheropteron armatum* Chapman (1902) [not 1910 as quoted in Chapman 1919] from Funafuti (lat. 13°22′S., long. 178°8′5″E.) appears quite unrelated to his var. *spinosa* or to the present species. The caudal projection in the Halley Bay valve is broken, but there is more spination anteriorly and the outline is less inflated posteriorly in dorsal view than Chapman's variety. Whilst there is less spination anteriorly in Chapman's figure, this appears to be due to abrasion of the antero-dorsal margin, and he drew attention to the characteristic feature of this species when he said (Chapman, 1919, p. 36) "the raised area between the pittings is finely spinose". The difference in the posterior outline in dorsal view appears to be connected purely with orientation and it is not considered significant. Chapman's var. *spinosa* was found in 182 fathoms (335 m.) at lat. 66°21′S., long. 94°50′E. in grey sandy mud with some stones and Polyzoa, and the Halley Bay sample also contains Polyzoa.

This is an exceedingly rare species and only one valve was found at Halley Bay.

Genus *Pseudocythere* Sars 1866

Pseudocythere cf. *P. caudata* Sars 1866

Plate Ia, b, e, f; Fig. 5a–i.

cf. *Pseudocythere caudata* Sars 1866, p. 88; 1926, p. 239, pl. CIX, fig. 2.
(See Elofson (1941, p. 336–37) for a complete synonymy up to 1941.)

From Antarctica:
Pseudocythere similis Müller 1908, p. 106, pl. X, figs. 13–16.
Pseudocythere sp. aff. *P. caudata* Sars 1866; Benson, 1964, p. 13–16, pl. 1, fig. 8; text-fig. 7.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Halley Bay. Left valve (HU.13.R.12.42).	0·727	0·389	0·137
Halley Bay. Right valve (HU.13.R.12.41).	0·695	0·371	0·130
Franz Josef Land. Carapace (Royal Scottish Museum 3).	0·623	0·351	0·209
Franz Josef Land. Carapace (Royal Scottish Museum 4).	0·688	0·358	0·203

Material: Two right valves and five fragmentary right valves, two left valves and one fragmentary left valve.

Remarks: Benson (1964) dealt with this form in some detail and found it impossible to separate it palaeontologically from *P. caudata*. Through the kindness of the authorities of the Royal Scottish Museum it has been possible to borrow some of Scott's material from Franz Josef Land, from a roughly comparable northern latitude (ca. lat. 81°N.) and of closely comparable size. In addition it has been possible to examine

and measure all the material from various localities in the British Museum (Nat. Hist.). In general all the specimens are very similar and it is difficult to detect any differences other than size (cf. Plate Ia, b, e, f; Fig. 5a–h). Conventionally taking the anterior margin from the anterior cardinal angle to a point vertically beneath it, the Antarctic specimens have usually eight or nine radial pore canals, whilst the European forms usually have nine or ten. On the other hand, this feature is subject to a certain amount of variation for specimens with eight or nine radial pore canals are found in the European area, and the *Challenger* specimen from 50–100 fathoms (91–182 m.) off the Prince Edward Islands (lat. 47°S.) shows about ten. Sars (1926) showed nine and ten radial pore canals anteriorly in his valves, whilst a figure of one of the rare specimens from the Netherlands Holocene (Wagner, 1957, p. 182–83, pl. XII) shows 12. This latter figure shows only four adductor muscles and Benson suggested that the fifth was probably overlooked. On the other hand, this may be purely a matter of size since Wagner's specimen is only 0·47 mm. long compared with the 0·57 mm. normal for this latitude.

This question of size is interesting, for whilst Protozoa and Copepoda generally increase in size with increase in latitude, as noted previously (Neale, 1965, p. 274), ostracod data in this respect have proved somewhat equivocal. Measurement of material from a wide range of localities (Table II) now convincingly demonstrates the validity of this trend in the case of the present species.

TABLE II

SIZE IN *Pseudocythere caudata* AND *Pseudocythere* cf. *P. caudata*

Locality	*Approximate latitude*	*Length of three largest specimens* (mm.)			*Height as percentage of length*		
		1	2	3	1	2	3
Franz Josef Land	80°40′N.	0·69	0·62	0·48	52	56	57
Off Sartoro, Norway	60°20′N.	0·61	0·61	0·60	53	46	56
Stokksund, Norway	59°45′N.	0·61	0·57	0·55	51	52	47
Norway		0·60	0·60	0·60	52	54	50
Shetland	60°20′N.	0·58	0·56	0·55	51	50	60
The Minch	58°N.	0·58	0·56	0·56	52	50	47
Clyde	55°55′N.	0·58	0·57	0·56	50	51	50
Biscay	44°N.	0·54	0·51	0·50	52	54	51
Off Capri	40°32′N.	0·61	0·61	0·59	53	51	55
Prince Edward Islands	47°S.	0·66	—	—	59	—	—
Halley Bay	75°S.	0·73	0·73	0·70	54	54	53

According to Müller (1908, p. 106), the differences in the soft parts of *P. caudata* and *P. similis* lie in the furca of the male whose bristles are more spaced in the last species, and in the structure of the copulatory appendage, the end part of which in *P. similis* is somewhat three-cornered or triangular, whilst in *P. caudata* it is rhombic. The course of the vas deferens is also supposed to differ. The furca of the female has three bristles in *P. similis* but only one in *P. caudata.*

Only valves were obtained from Halley Bay. *P. caudata* was first found in the upper part of Oslo Fjord at a depth of about 40 fathoms (73 m.) and Sars (1926, p. 240) recorded it as occurring at other places on the Norwegian coast up to Trondhjem Fjord in similar depths. In view of the poor published figures of the copulatory appendage, the question that has been raised concerning the form from the Bay of Naples which Müller referred to *P. caudata,* the emphasis on the differences in this organ between *P. caudata* and *P. similis,* and the note of caution sounded by the present author (Neale, 1965, p. 261) on the use of the copulatory appendage as a differentiating criterion, it was decided that a re-examination of *P. caudata*

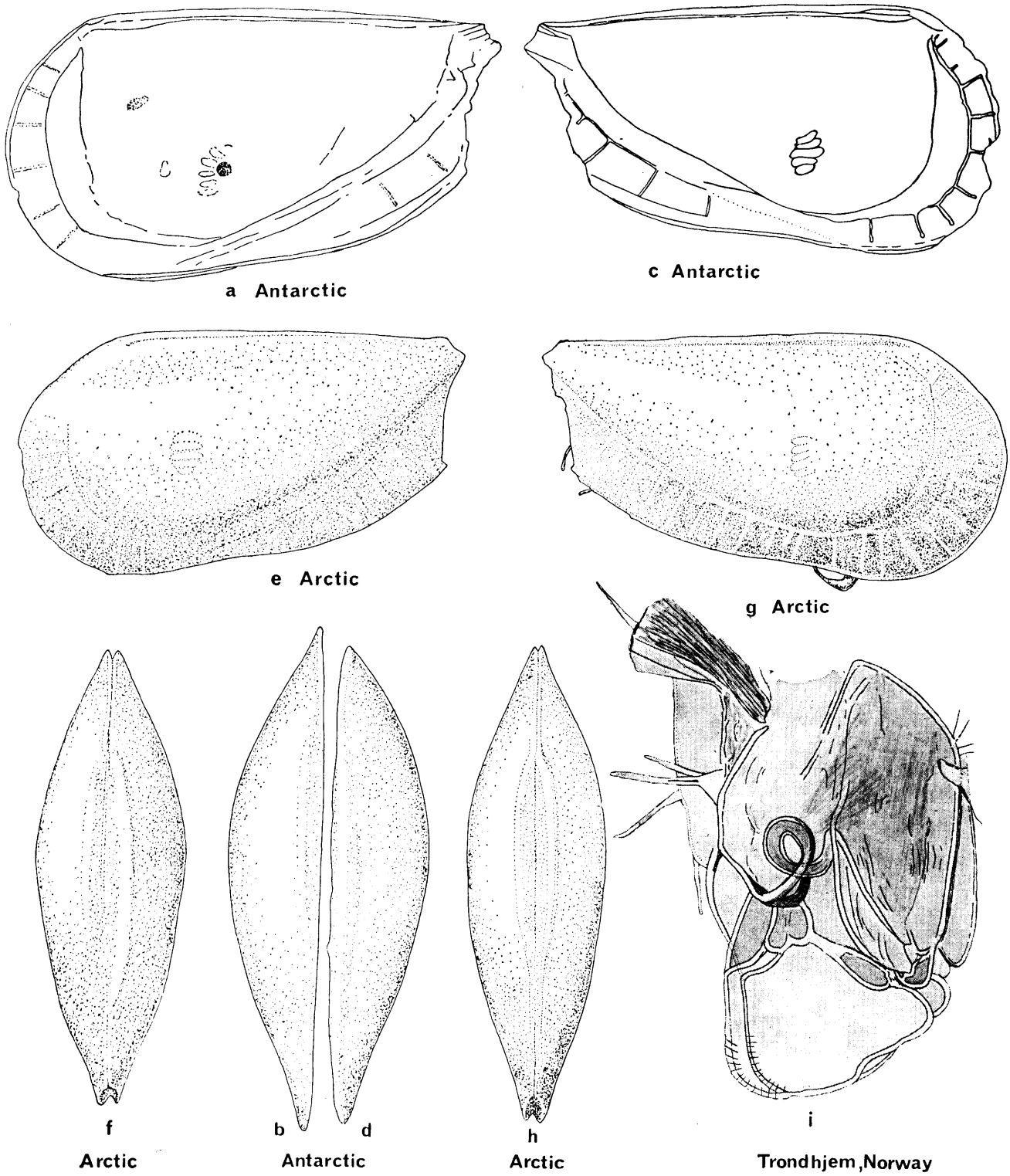


FIGURE 5

Magnification Fig. 5a–h ×117; Fig. 5i ×700.

a and b. *Pseudocythere* cf. *P. caudata* Sars 1866. Left valve (HU.13.R.12.42). Halley Bay.
a. External lateral view in transmitted light. b. Dorsal view.

c and d. *Pseudocythere* cf. *P. caudata* Sars 1866. Right valve (HU.13.R.12.41). Halley Bay.
c. External lateral view in transmitted light. d. Dorsal view.

e and f. *Pseudocythere caudata* Sars 1866. Carapace. Norman Collection, Royal Scottish Museum, Edinburgh (1921–145). Lower middle specimen. Vicinity of Cape Flora, Franz Josef Land, 1896–97.
e. External lateral view from left. f. Dorsal view.

g and h. *Pseudocythere caudata* Sars 1866. Carapace. Norman Collection, Royal Scottish Museum, Edinburgh (1921–145). Lowest specimen. Vicinity of Cape Flora, Franz Josef Land, 1896–97.
g. External lateral view from right. h. Dorsal view.

i. *Pseudocythere caudata* Sars 1866. Male copulatory appendage from right. Trondhjem, Norway, 1893. British Museum (Nat. Hist.) Norman Collection (1911.11.8. 36140–142). Dissection 1.

from the type area might be profitable as a first step to elucidating the variation that occurs. The British Museum (Nat. Hist.) kindly allowed the author to dissect three specimens from Trondhjem Fjord, in the Norman Collection, and the copulatory appendage of the first dissection is figured here (Fig. 5i). A fuller analysis of the limbs and other soft structures in *P. caudata* will be published elsewhere. It is clear that a great deal depends on the nature of the dissections and on the mounting in the case of this organ. The present dissection differs from all three published figures—Sars' (1926, pl. CIX, fig. 2 cop. app.) of *P. caudata*, Müller's (1894, pl. 16, fig. 35) of *P. caudata* from the Bay of Naples, and Müller's (1908, pl. X, fig. 15) of *P. similis* from "Gauss station". In some respects the Trondhjem dissection is nearest to the Antarctic form figured by Müller. It is furthest from the Bay of Naples specimen figured as *P. caudata* by the same author. It thus appears that, when Antarctic material is available, the soft parts which are supposed to differentiate the two species will be found to lie within the variation observed in *P. caudata* in the European area. It was felt that a study of the furca at the present time would serve no useful purpose. Benson (1964) was unable to separate *P. similis* from *P. caudata* on palaeontological grounds. The present author concurs in this and also believes that the same will prove true of the limbs and soft parts.

Subfamily Xestoleberidinae Sars 1928

Genus *Xestoleberis* Sars 1866

Xestoleberis rigusa Müller 1908

Plate Id, d′; Fig. 6.

Xestoleberis rigusa Müller 1908, p. 125–26, pl. XIX, fig. 10; 4 text-figs.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve (HU.13.R.12.80).	0·597	0·371	0·221

Description: Rounded triangular in side view with the greatest height at about the mid-point and equal to about two-thirds of the length. Ventral profile slightly concave. Surface smooth and shining with a moderate number of sieve-like normal pore canals. Zone of concrescence narrow with about 21 radial pore canals in the posterior half of the shell. Tooth plates crenulate but not markedly so. In dorsal view wide, the outline fairly evenly rounded but with the anterior third rather straight and meeting the remaining two-thirds of the outline at a slight angle. Greatest width in this view at, or a little behind, mid-length.

Remarks: The typical reniform post-ocular scar characteristic of *Xestoleberis* is present, a scar which Hartmann (1965, p. 583) said is absent in the Patagonian genus *Semixestoleberis* (Hartmann, 1962, p. 230 *et seq.*). In his diagnosis of the latter Hartmann drew attention to the sieve-type normal pore canals, a feature present in *X. rigusa*, but one which is also present in the type species of *Xestoleberis* itself, *X. aurantia* (Baird) as shown by Wagner (1957, p. 94, pl. XLV, fig. 3), and which should thus be regarded as of no diagnostic significance in the case of these genera. In the other diagnostic features, the crenulate tooth plates and the relatively numerous marginal pore canals (*Semixestoleberis debueni* Hartmann, the type species of *Semixestoleberis* has only seven marginal pore canals in the posterior half of the shell compared with about 21 in *X. rigusa*), *X. rigusa* agrees with *Xestoleberis* and not with *Semixestoleberis*.

X. rigusa is by far the commoner xestoleberid at Halley Bay, being represented by 124 specimens of which 30 are adult, 43 belong to instar 8, 34 to instar 7, 11 to instar 6, five to instar 5 and one to instar 4. Müller described the male of this species in the community from "Gauss station". It is curious that at Halley Bay only females occur, a situation also found in the other species of *Xestoleberis* present.

The present species differs from *X. margaritea* Brady in being higher in proportion to the length, and as seen in side view it is built up more postero-dorsally than *X. capensis* Müller and *X. setigera* Brady. In this respect, as well as in its greater tumidity in dorsal view, the Halley Bay species also differs from *X. granulosa* Brady.

Two of the specimens from McMurdo Sound figured by Benson (1964, text-fig. 6; pl. 1, fig. 6) appear to belong here; the other two figured specimens seem more doubtful, his pl. 1, fig. 3 bearing a resemblance to *X. kerguelensis* in side view.

Xestoleberis setigera Brady 1880
Plate Ic, c′; Fig. 6.

Xestoleberis setigera, Brady 1880, p. 125, pl. XXXI, figs. 2a–d, 3a–c.
Xestoleberis setigera Brady, Chapman 1916*c*, p. 73, pl. VI, fig. 49.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Carapace (HU.13.R.12.79).	0·545	0·286	0·351

Remarks: This low, depressed form is characterized by the low height in proportion to the length (about 50 per cent) and in the width being much greater than the height (about 120 per cent of the height) in carapaces. This species is much rarer than the preceding one, only five specimens being found. It is easily differentiated from *X. rigusa* by simple length: height measurements as shown in Fig. 6, and as in that species only females and juveniles were found at Halley Bay.

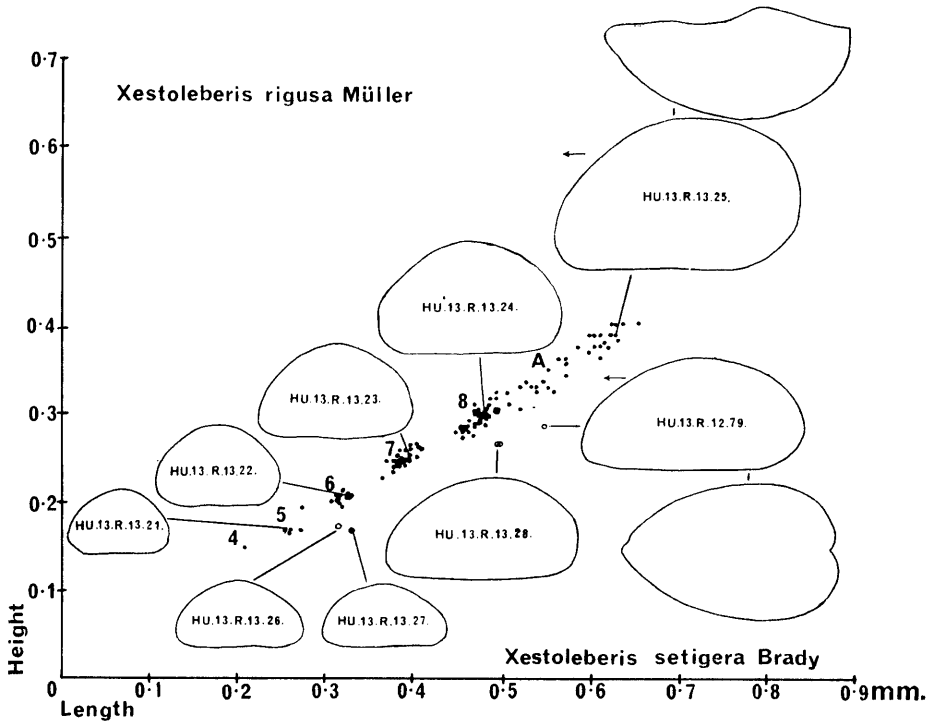


FIGURE 6
Graph showing the growth and development of *Xestoleberis rigusa* Müller and *X. setigera* Brady.

The Halley Bay material agrees well with the specimen of *X. setigera* in the British Museum (Nat. Hist.), although the latter is a little sharper anteriorly. The adult also agrees very closely with the form from "Balfour Bay", Iles de Kerguelen, which Brady also found from lat. 52°4′S., long. 71°22′E. and figured as the female of *X. depressa* Sars (Brady, 1880, pl. XXXI, fig. 4a–d). Brady, himself, commented that the distinctions between *X. setigera* and *X. depressa*, if valid at all, are very slight and lie in the fact that X. *setigera* is less tumid in front and behind. Whilst his remarks are very pertinent, the distinction between the two species is upheld provisionally until a fuller study can be undertaken.

The left valve, obtained at lat. 76°55′S., long. 164°45′E. in 121 fathoms (222 m.) of water and figured by Chapman (1916*c*, pl. VI, fig. 49) as *X. setigera*, agrees fairly closely and it is included here in the synonymy although it is unfortunate that he did not include a dorsal view.

From *X. reniformis* (Brady, 1907) it differs in lacking the markedly concave ventral margin, and from *X. davidiana* Chapman (1916*b*) it differs in being more tumid posteriorly and less acute anteriorly in dorsal view, and in having a less concave ventral margin in side view. With other species it does not agree

closely. Brady's specimens came from 120 fathoms (220 m.) off "Christmas Harbour", Iles de Kerguelen, from mud at 75 fathoms (140 m.) off Heard Island (station 151), and from 50–150 fathoms (91–275 m.) off the Prince Edward Islands.

Of the five specimens one is interpreted as an adult, two as belonging to instar 8, and the other two to instar 6.

Subfamily Loxoconchinae Sars 1925

Genus *Myrena* gen. nov.

Derivation of name: In honour of my wife, Mrs. Patti Myrena Neale.

Type species: *Myrena meridionalis* (Müller) 1908.

Other species: *M. grateloupiana* (Bosquet) Rupelian, Belgium.
? New genus of Loxoconchinae from Recent mud, Aburatsubo Cove (Hanai, 1961, p. 371, text-figs. 12, 1a, b).

Diagnosis: A genus of loxoconchinid in which the posterior tooth in the right valve is joined to the dorsal and posterior rim of the hinge groove in the right valve by a convex crenulate ridge which leaves the antero-dorsal side of the tooth abruptly and arches over the posterior socket. The surface is coarsely reticulate.

Remarks: The Lower Miocene *Loxoconcha grateloupiana* clearly belongs here by virtue of both hinge and ornament. The new genus figured by Hanai (1961) belongs here on the evidence of the hingement but Hanai unfortunately gave no details of ornament. *Loxoconcha curryi* Keij (1957, p. 139–40), from the Eocene of the Isle of Wight, is closely related to the new genus agreeing well in ornament but differing in hinge structure, the bar in the left valve not terminating abruptly but passing into the dorsal margin of the valve posteriorly.

Myrena meridionalis (Müller) 1908
Plate Ih; Fig. 7.

Loxoconcha meridionalis Müller 1908, p. 133, pl. XVIII, figs. 1, 9.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.48).	0·519	0·325	0·182

Description: Shape in side view somewhat rhomboidal with a straight dorsal margin, more or less parallel but slightly concave ventral margin, broadly rounded slightly asymmetric anterior margin and asymmetric posterior margin.

The hinge structure is very characteristic (Fig. 7) and in the right valve it consists of a large anterior socket which is well-defined ventrally, and from which a narrow dorsal extension loops over the large round anterior tooth to join the median, locellate hinge groove. The latter is well-defined dorsally, ventrally and posteriorly by ridges. From the posterior ridge a thin convex bar bearing traces of about six denticles loops over the large posterior socket and joins the smooth, triangular/rhomboidal rounded posterior tooth abruptly.

The broad anterior marginal area has a small vestibule and carries nine or ten straight, simple pore canals. There is a small elongate posterior vestibule and only four or five marginal pore canals are present posteriorly.

Muscle-scar pattern consists of a vertical row of four adductor scars with two or three scars in front. Ornamentation is coarsely reticulate and very characteristic, the rows of pits being arranged concentrically in some seven or eight rows which accentuates the longitudinal ridges between the pits and gives the

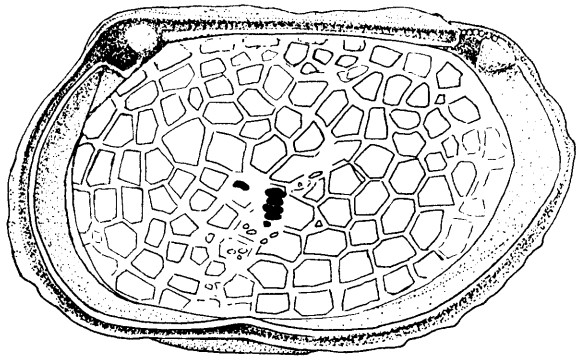


FIGURE 7

Myrena meridionalis (Müller) 1908. Right valve (HU.13.R.12.48). Inside seen in part transmitted, part incident light (×142).

ornamentation a concentric appearance. A postero-dorsal ridge affects the outline slightly postero-dorsally in side view and a very small eye tubercle may be present.

In dorsal view the valve is inflated and rises sharply from the rather compressed anterior and posterior rims, reaching its greatest width at approximately two-thirds the length. The posterior tooth in the right valve is particularly well seen (the anterior less so) and the individual denticles on the bar stand out clearly. In this view the anterior tooth is elongate oval and the posterior tooth is elongate oval and set obliquely at the end of the crenulate ridge.

Remarks: This distinctive species is extremely rare. Besides the present specimen, the only other known examples are the four specimens obtained from "Gauss station" and described by Müller.

Genus *Loxoreticulatum* Benson 1964

This genus was established to include forms with loxoconchid-type reticulate exterior, but with *Cytheropteron*-like hinge, marginal areas and appendages.

Loxoreticulatum fallax (Müller) 1908

Plates Ii, j; IVb, b′, c.

Cytheropteron fallax Müller 1908, p. 107–09, pl. XVIII, figs. 5, 6, 10; text-figs. on p. 108.
Loxoreticulatum fallax (Müller) 1908; Benson (n. comb.); Benson 1964, p. 19–21, pl. 3, figs. 1, 2, 3, 6; text-figs. 11, 12.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Male right valve (HU.13.R.12.57).	0·617	0·355	0·180
Juvenile right valve (HU.13.R.12.58).	0·506	0·286	0·143
Female right valve (HU.13.R.12.59).	0·588	0·338	0·199
Female left valve (HU.13.R.12.60).	0·597	0·325	0·195

Description: Since this species has been completely re-described and figured recently by Benson, a full description is not given here. 95 specimens were examined of which 30 were adult.

The full adult stage with marked sexual dimorphism is reached at lengths above about 0·5 mm. in this population. The hinge structure in the right valve consists of two terminal tooth plates which are triangular in dorsal view and in the adult are usually divided to form three teeth. Between them, and separating them from the dorsal margin, is a crenulate groove which contains some 24–26 small sockets in the adult which accommodate the teeth along the margin of the left valve formed by the junction of the list and the selvage. The groove in the right valve is not bounded ventrally by a ridge and the size of the sockets tends to increase terminally with complementary increase in the size of the terminal teeth on the ridge in the left valve. There is little change in the hinge structure after a length of 0·4 mm. is reached except for the increasing differentiation of the terminal parts of the groove and a little increase in the size

of the terminal tooth plates in the right valve. The main change during the later stages of development lies in the increasing differentiation of the marginal areas and particularly in the development of the prominent anterior vestibule.

Remarks: A considerable problem is evident in the interpretation of Müller's species and Benson (1964, p. 21) has already noted the possibility that *L. fallax* from "Gauss station" and *L. foveolatum* (Brady) 1880 from Iles de Kerguelen and Heard Island (lat. 49°30′ to 53°S., long. 70° to 72°30′E.) may be only geographical variants. Examination of the *Challenger* material in the British Museum (Nat. Hist.) shows that, whilst a little smaller (female length 0·575 mm., male 0·59 mm.), the designated types from Heard Island differ only in the accentuation of the longitudinal ridges between the pits in the ventral part of the shell. Three or four of the adults from Halley Bay (two figured here as Plates Ij; IVb, b′) can be assigned to *L. foveolatum*, the figured male corresponding exactly to the Heard Island type, except for being a little less than 5 per cent longer. Rather than regard two separate species as being present, it is preferable to consider the Halley Bay community as one species in which about 10 per cent of the individuals show variation which would place them in *L. foveolatum*. For the present the most useful solution seems to be to retain Müller's name for communities in which adults showing accentuation of the longitudinal ridges in the ventral part of the shell so characteristic of *L. foveolatum* are in a minority. While the *Loxoreticulatum* communities of Scott (1912) in the South Orkney Islands and Chapman (1916*a*) from uplifted deposits in the Ross Sea area probably fall into *L. fallax* as thus interpreted, until the material can be re-examined, a synonymy can obviously not be attempted.

Subfamily Cytherurinae Müller 1894

Tribe Cytherurini Müller 1894

Genus *Hemicytherura* Elofson 1941

Hemicytherura anomala (Müller) 1908

Plate IIc, f, i.

Cytheropteron anomalum Müller 1908, p. 113–14, pl. XVI, figs. 3, 6; 1 text-fig.
Cytherura ornata Scott 1912, p. 584, pl. XIV, figs. 19–21.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve, male (HU.13.R.13.32).	0·389	0·215	0·091
Left valve, male (HU.13.R.13.33).	0·428	0·228	0·120
Right valve, female (HU.13.R.13.31).	0·454	0·273	0·133

Description: Six specimens of this easily recognized species were obtained, all apparently adult and consisting of three right valves (two female and one male) and three left valves (two female and one male). The size range was narrow, the length varying from 0·389 to 0·454 mm.

Sexual dimorphism is particularly strong in the right valve, the female (Plate IIi) being much higher and the dorsal margin much more arched than the male (Plate IIc). Ribbing is the most characteristic feature, especially the virtually straight, horizontal median rib (Müller's "fourth" rib) which starts at the anterior margin, where it forms a blunt point affecting the outline of the valve, and runs along the valve at somewhat below mid-height as a high, smooth, plate-like rib until it tapers out about one-seventh of the length from the posterior end. A similar flange-like rib accompanies the dorsal margin and it forms the outline in side view. In the posterior third of the shell it is replaced *en échelon* by a similar flange which continues along the postero-dorsal margin, swinging down in front of the caudal process to about mid-height. At mid-height it turns and follows the postero-ventral margin some distance in, not as a high knife-like rib but as a reduced ridge, to join the posterior termination of the ventral rib. The latter (Müller's "fifth" rib) is another high flange-like rib which forms a stumpy point affecting the outline of the valve anteriorly. From there it follows the ventral margin a short distance inside it until about the mid-length when it curves down in a shallow arch, concave upwards and forms the profile in the posterior part of the

valve. It terminates in a short blunt point posteriorly about one-eighth of the length from the posterior end. The main ribs are completed by another thin high rib (Müller's "third" rib), which starts anteriorly at about mid-height and about one-eighth of the length in from the margin and forms a convex-upwards arch parallel to the dorsal margin, which is accentuated postero-dorsally to give a very high and prominent, rounded-triangular, flange-like plate which affects the outline in the posterior quarter of the shell in dorsal view as noted by Müller. In this view the outline in the anterior two-thirds of the valve is formed by the horizontal median rib ("fourth" rib), the outline rising steeply to almost full width in the anterior quarter of the valve and then running almost parallel to the mid-line until at about two-thirds length it curves in and the postero-dorsal part of the "third" rib flares out to form the outline as a triangular projection. The posterior end of the outline is formed by the caudal process which is at first parallel to, and then wedges in to, the mid-line. In side view the caudal process is a small, stumpy triangular prolongation with a steep, almost vertical, posterior termination.

A number of other minor ribs occur, notably two horizontal ones *en échelon* in the second and third quarters of the length between the "fourth" and "fifth" ribs, and a longer horizontal one in the middle part of the length between the "third" and "fourth" ribs of Müller. A few cross ribs of varying distinctness also occur.

The left valve is lower than the right valve and thus differs in shape; the ornament is otherwise the same. Hinge typical of *Hemicytherura*; beneath the dorsal margin in the right valve is a groove with terminal expansions below which the selvage of the antero- and postero-dorsal margins ends in two small tooth plates, each carrying two or three teeth. Marginal areas, muscle-scar pattern, dorsal overhang of the right valve and other features as far as ascertainable are characteristic of the genus.

Remarks: It is clear that this is the same as Scott's *Cytherura ornata* from Scotia Bay, South Orkney Islands. In the side view figured by Scott, it appears that the carapace was tilted away from the viewer dorsally so that the "third" rib now forms the dorsal outline, and in consequence the "fifth" rib ceases to form the postero-ventral outline. Among the *Challenger* material the nearest approach to this species is *Cytherura lilljeborgi* which lacks the marked expansion of the "third" rib postero-dorsally and shows less differentiation between the major and minor ribs.

Hemicytherura irregularis (Müller) 1908

Plate IId, e, g, j.

Cytheropteron irregularis Müller 1908, p. 109, pl. XVIII, figs. 2, 3, 8; 3 text-figs.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Female adult right valve (HU.13.R.13.47).	0·493	0·299	0·130
Male left valve, instar 8 (HU.13.R.13.36).	0·435	0·234	0·130
Female left valve, instar 8 (HU.13.R.13.44).	0·409	0·229	0·104
Right valve, instar 7 (HU.13.R.13.45).	0·312	0·185	0·078

Material: Altogether 19 specimens were found of which seven were adult, eight belonged to the previous moult stage, and four to instar 7.

Description:

Instar 7 (length 0·305–0·325 mm.). As in all the observed stages in this species, there is a considerable difference in shape between the left and right valves. The right valve (Plate IIe) is the higher with the greatest height at the anterior cardinal angle, with steeply sloping but straight to gently convex antero-dorsal margin and convex dorsal margin. Ventral margin almost straight, passing smoothly into the straight, steeply inclined postero-ventral margin which meets the postero-dorsal margin in a rounded point at or a little above mid-height. The anterior margin is asymmetrically rounded.

In shape the left valve is lower in proportion to the length and in consequence the postero-ventral margin is less steeply inclined. The hinge is very simple and formed by the dorsal margins, the left valve fitting under that of the right valve.

The surface is covered with very delicate, somewhat irregular, but dominantly longitudinal, anastomosing ribbing. The most characteristic feature is the very fine, dense pitting as noted by Müller in his adults.

Instar 8 (length 0·377–0·435 mm.) *and adult stage* (length 0·441–0·493 mm.). The most notable feature in these stages is the accentuation of the ribbing. In particular, a strong ventral rib is developed which starts anteriorly a short distance above the ventral margin and gradually converges with the margin until it forms the ventral outline behind mid-length in the left valve. In the right valve this rib does not hide the ventral margin in the posterior part of the valve and it does not form part of the outline. Posteriorly the ventral rib turns upwards and forms a short vertical section delimiting the body of the valve from the caudal part, before swinging round antero-dorsally to form the prominent postero-dorsal rib. This continues as the dorsal rib which runs generally parallel to the dorsal margin and a short distance inside it. This finally fades away anteriorly at about the mid-height just dorsal of the most prominent longitudinal rib.

The latter is one of the most characteristic features of the last two stages. This is a predominantly longitudinal rib which lies at or a little below mid-height and it runs from the anterior margin to join the posterior rib. Unlike *H. anomala*, this mid-rib follows a slightly sinuous or zig-zag course, with a prominent "V" downwards just behind mid-length (well seen in Plate IIj). This is also seen in Müller's figure (1908, pl. XVIII, fig. 2) and it forms the easiest means of differentiating this species from its allies. It should be emphasized, however, that this is not easy to see or well marked in instar 7, or presumably in earlier instars. From the bottom of the "V" the rib runs postero-dorsally to a little above its former level before continuing to join the posterior rib and sending off an offshoot (often more easily seen and more prominent than the continuation to the posterior rib) to the postero-dorsal rib. Ornamentation is completed by a plexus of ribs which vary in the degree of development as well seen in the adult (? gerontic) specimen figured as Plate IIj. The reticules between the ribs are finely pitted as in instar 7.

The shape of the right valve is very characteristic, with the greatest height at about one-quarter the length of the valve. The long sloping antero-dorsal margin is concave, the anterior margin very steep and almost vertical, whilst the ventral margin is long and straight, rounding into a steeply inclined postero-ventral margin which delimits the small, upturned, rounded-triangular caudal process ventrally. The dorsal part of the latter is defined by the concave postero-dorsal margin which runs into the gently convex dorsal margin. Sexual dimorphism is very marked, but the male differs from the female only in its lesser height in proportion to its length, and the whole outline has an elegant raked appearance well figured by Müller (1908, p. 109) in his text-figs. 1 and 2.

The hinge is characteristically hemicytherurid. Marginal areas are also typically hemicytherurid being broad with a large anterior vestibule and a small elongate postero-ventral vestibule. Marginal pore canals are difficult to see but in at least one specimen there appear to be about a dozen in the anterior part of the valve which follow a sinuous course across the marginal area and are bundled into three or four groups. Posteriorly, there are six or seven canals.

In dorsal view the shape is approximately hexagonal with the greatest width at the anterior cardinal angle, this width being maintained until about one-fifth of the length from the posterior end. Anteriorly, the valves are somewhat compressed and the anterior part of the outline in this view is gently concave. Similarly, the outline is concave posteriorly where the valve falls steeply to the caudal process and the mid-line.

Remarks: This was one of the commonest podocopids at "Gauss station" and Müller found almost 100 individuals. At Halley Bay it is relatively common with 19 individuals. The most closely related species appears to be *H. lilljeborgii* (Brady) 1880 from "Balfour Bay", Iles de Kerguelen, which lacks the distinct "V" in the mid-rib but is otherwise similar.

Tribe Cytheropterini Hanai 1957

Genus *Cytheropteron* Sars 1866

Cytheropteron abyssorum Brady 1880

Figs. 8a–d, i–l.

Cytheropteron abyssorum Brady 1880, p. 138, pl. XXXIV, fig. 3a–d.
Cytheropteron abyssorum Brady; Chapman, 1910, p. 437.
Cytheropteron abyssorum Brady; Chapman, 1915, p. 47.
Cytheropteron abyssorum Brady; Chapman, 1919, p. 35.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve, instar 7 (HU.13.R.12.83).	0·467	0·293	0·150
Left valve, instar 7 (HU.13.R.12.84).	0·526	0·293	0·176
Adult left valve (HU.13.R.12.99).	0·623	0·377	0·267
Adult right valve (HU.13.R.12.100).	0·717	0·448	0·260

Remarks: 23 valves of this species were found belonging to the adult and the last three moult stages, enabling a fuller understanding of this cold-water form to be gained. The holotype, which is only 0·55 mm. long, drew forth the comment from Brady (1880, p. 138) that it was a very well-marked species "if we exclude the possibility of its being a sexual form or the young of that next to be described, *Cytheropteron assimile*, to which it bears considerable resemblance". From its size, Brady's specimen is immature and it would appear to belong to instar 7 or possibly instar 8. The holotype is damaged dorsally but Miss P. D. Lofthouse of the British Museum (Nat. Hist.) informs me that there appear to be no significant differences between this and the Halley Bay material. Irregular longitudinal sulci are present on the ventral surface as noted by Brady, who also mentioned that the surface of the valves was "marked partially on the sides with angular excavations". The Antarctic material is pitted (Fig. 8i, k) but more finely than indicated in Brady's figure. The essential distinguishing characteristic appears to be the marked pit or small sulcus in the middle of the dorsal surface of the alae which is seen in all the present specimens (Fig. 8a, b, k, l), and which is shown in Brady's figure (1880, pl. XXXIV, fig. 3a). The spines at the alar terminations are rather delicate and may either be broken off or not developed in some cases. They are not present in Brady's specimen which can be matched with one of the figured specimens from Halley Bay in this respect (Fig. 8d) and also with unfigured material.

Müller's *Cytheropteron gaussi* is easily differentiated by the absence of the characteristic alar pit and on the shape in side view. The two species are illustrated in Fig. 8a–o and any further description would seem superfluous.

Occurrence: In his work on the *Challenger* ostracods, Brady apparently found only one valve of this poorly known species in 2,600 fathoms (4,755 m.) at lat. 42°42′S., long. 134°10′E. Other authors have found it in deep water and similarly rare. Off Funafuti, Chapman (1910) recorded separate valves as not uncommon at two stations of depths 1,050 and 1,417 fathoms (1,920 and 2,590 m.), and in 1915 he found a single valve at 777 fathoms (1,420 m.) and another valve at 1,122 fathoms (2,055 m.) east of Tasmania. In 1919 the same author recorded it in grey muds near the ice barrier at depths ranging from 110 to 328 fathoms (200 to 600 m.) and west of Tasmania in depths of 1,076 to 1,320 fathoms (1,970 to 2,415 m.).

Clearly, *C. abyssorum* is a cold-water form and *ipso facto* often a deep-water form, so that in many cases Brady's name is singularly appropriate.

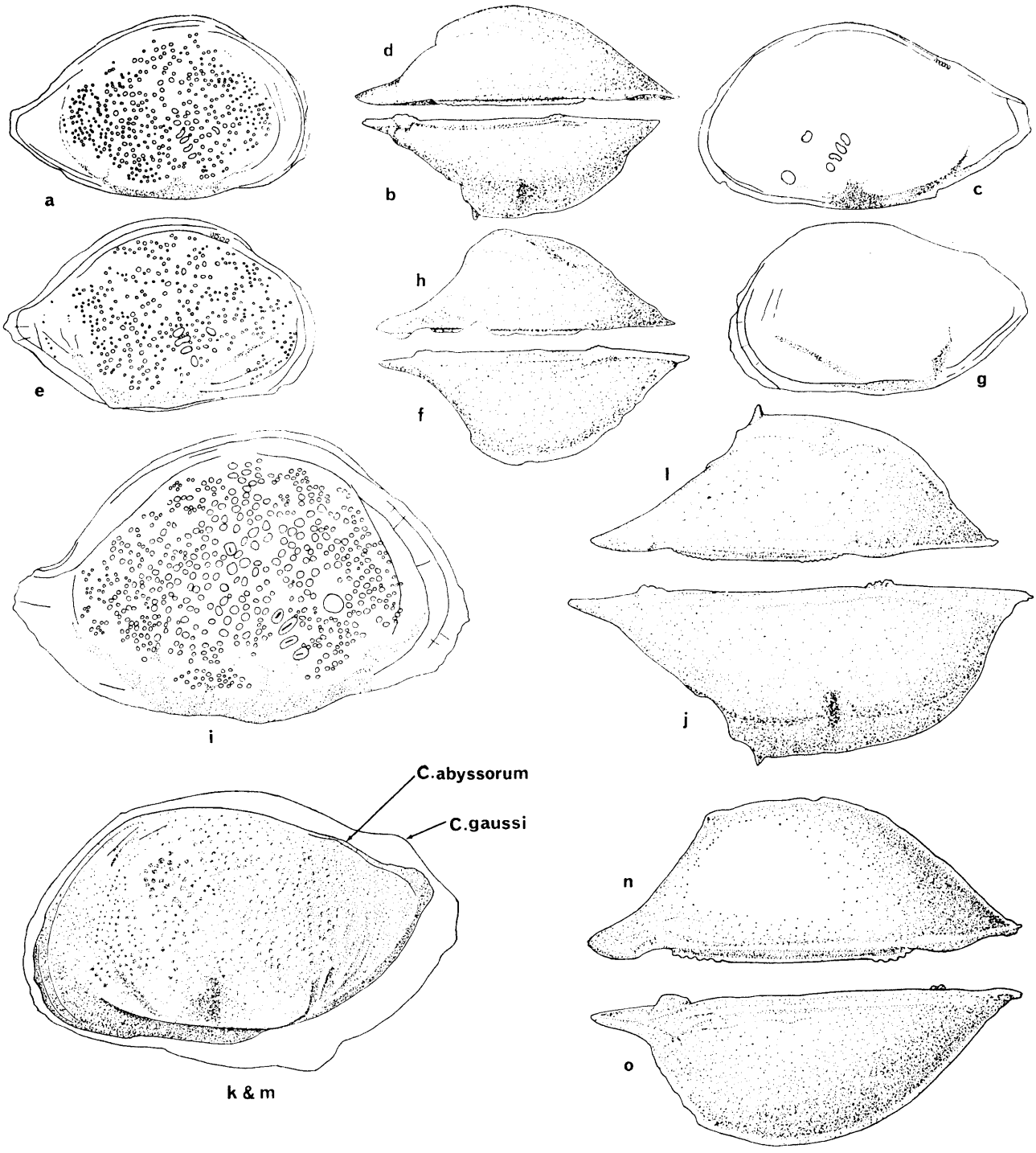


FIGURE 8

Magnification ×105 in all cases.

a and b. *Cytheropteron abyssorum* Brady 1880. Right valve, instar 7 (HU.13.R.12.83).
a. External lateral view in transmitted light. b. Dorsal view.

c and d. *Cytheropteron abyssorum* Brady 1880. Left valve, instar 7 (HU.13.R.12.84).
c. External lateral view in transmitted light. d. Dorsal view.

e and f. *Cytheropteron gaussi* Müller 1908. Right valve, instar 7 (HU.13.R.12.27).
e. External lateral view in transmitted light. f. Dorsal view.

g and h. *Cytheropteron gaussi* Müller 1908. Left valve, instar 7 (HU.13.R.12.26).
g. External lateral view in transmitted light. h. Dorsal view.

i and j. *Cytheropteron abyssorum* Brady 1880. Adult right valve (HU.13.R.12.100).
i. External lateral view in transmitted light. j. Dorsal view.

k and l. *Cytheropteron abyssorum* Brady 1880. Adult left valve (HU.13.R.12.99).
k. External lateral view in incident light. l. Dorsal view.

m and n. *Cytheropteron gaussi* Müller 1908. Adult left valve (HU.13.R.12.74).
m. External lateral outline. n. Dorsal view.

o. *Cytheropteron gaussi* Müller 1908. Adult right valve (HU.13.R.12.70). Dorsal view.

Cytheropteron antarcticum Chapman 1916*a*
Plate IIn, n′, o, o′.

Cytheropteron gaussi, Müller 1908, p. 111, text-fig. 2 *only*.
Cytheropteron antarcticum Chapman 1916*a*, p. 38–39, pl. IV, fig. 4a, b.
Cytheropteron antarcticum Chapman; Chapman, 1919, p. 35–36.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve (HU.13.R.12.68).	0·519	0·319	0·208
Left valve (HU.13.R.12.67).	0·571	0·338	0·286

Description: In side view shape irregularly rhomboidal, posteriorly narrow and pointed. Dorsal margin strongly arched, passing abruptly at a re-entrant angle into the slightly convex, almost straight dorsal margin of the caudal part. Sharp, backwardly directed alae which terminate posteriorly in a sharp outturned point. Posterior surface of alae flat and almost at right-angles to the line of junction of the valves. Alae triangular in ventral view, the alar surface being flat and carrying one main rib which almost bisects this surface and ends posteriorly in a plate-like point which flares and turns in at an angle towards the junction of the valves. Two or three other ribs also occur on each ala but they are faint and do not end in points but fade into the surface of the alae. In side view, the anterior edges of the alae sweep forward into the general valve surface and, from a point about one-sixth the length from the anterior end and about one-quarter the height above the ventral margin, are continued by an almost vertical, gently convex-forward, ridge which runs dorsally to the anterior cardinal angle. This ridge then follows round a little below the strongly arched dorsal margin of the valve until it reaches the caudal part of the shell where it becomes thinner and fainter, and turns steeply antero-ventrally to run across the valve to the posterior point of the main rib on the ala, thus defining the body of the valve from the caudal portion.

On the mid-part of the ala is a small excavation or sulcus immediately behind the adductor muscle scars. In addition, there is a shallow depression below the anterior cardinal angle and a shallow triangular depression behind the ridge in the caudal part postero-dorsally.

In the left valve the hinge consists of a crenulate bar formed by the strongly arched part of the dorsal margin. Anteriorly, this shows some expansion to give three or four larger teeth. Posteriorly, this bar is very sharply recurved where it joins the crenulate, gently convex dorsal marginal bar of the caudal part of the valve. This latter has teeth which are larger than those generally found on the arched portion of the bar, and which resemble those of the extreme anterior part of the bar. Posteriorly, there is an elongate terminal socket with five loculi, whilst anteriorly there is a large terminal socket which shows traces of a three-fold sub-division. In the right valve there is a large, rounded rhomboidal tooth anteriorly which in side view shows very faint traces of having originally been divided into three, whilst the elongate posterior tooth shows clearly the division into about five individual teeth. The dorsal margin in the right valve forms a smooth double curve which fits over the bar in the left valve. The arched portion is open ventrally but the caudal portion is defined ventrally by a bar, thus forming a clear groove.

Anteriorly, six or seven straight, simple radial pore canals are seen, and small vestibules are present anteriorly and posteriorly. There is a vertical row of four elongate adductor scars. Level with the upper two and about the length of an adductor scar in front are a cluster of three equidimensional antennal scars. At the anterior end of the alar ridge at a height about two scars below the adductors, and slightly in front of the antennal scars, is a rounded equidimensional mandibular scar.

Ventrally, the left valve overlaps the right.

Remarks: Only two specimens were found and this is one of the rarer species at Halley Bay. At first it was thought that this might represent an immature stage of one of the other two species of *Cytheropteron* but their development can be traced from sizes much smaller than *C. antarcticum* and it is quite different at comparable sizes.

Chapman originally found the present species fossil in the upthrust muds of Drygalski Glacier, south-east of Mount Larsen, but later he encountered it west of Tasmania and 142 miles (228 km.) south-west of St. Francis Island, South Australia.

Müller (1908, p. 111, text-fig. 2) found a form about 0·53 mm. long which he considered to be a larval form and included in *C. gaussi*, although it certainly does not belong there. In size, Müller's specimen is intermediate between the two specimens in the present fauna and it agrees in the spines at the alar terminations and in the spines set a little distance in from there on the posterior margin of the alae. In addition, the concave posterior margin of the latter in dorsal view is very reminiscent of *C. antarcticum* and there is no doubt in the author's mind that Müller's specimen belongs here and it is included in the synonymy.

Cytheropteron gaussi Müller 1908
Plates IIp, p′, q, q′; IVa, a′; Fig. 8e–h, m–o.

Cytheropteron gaussi Müller 1908, p. 110–11, pl. XVI, figs. 1–5; text-figs. 1, 3.
non *Cytheropteron gaussi* Müller 1908, p. 111; text-fig. 2 (= *C. antarcticum* Chapman).

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve, instar 7 (HU.13.R.12.26).	0·461	0·260	0·182
Right valve, instar 7 (HU.13.R.12.27).	0·487	0·306	0·163
Adult right valve (HU.13.R.12.70).	0·688	0·461	0·234
Adult left valve (HU.13.R.12.71).	0·682	0·428	0·234
Adult right valve (HU.13.R.12.72).	0·792	0·513	0·280
Adult left valve (HU.13.R.12.74).	0·675	0·428	0·234

Description: 28 specimens of this *Cytheropteron* species were recovered from the Halley Bay sediment, of which 12 are adult, eight belong to the penultimate instar and eight belong to earlier instars. The alae are well developed and in side view the shape is affected by the large posterior socket of the left valve and tooth of the right valve which form a conspicuous postero-dorsal bulge. The surface is generally pitted, the pits in the middle of the flanks being about twice the size of the peripheral ones. A small eye tubercle is present. About one-sixth of the height below the dorsal margin is a characteristic thin rib which follows the general line of the dorsal margin, converging with it anteriorly. This rib runs in a series of arcs, convex upwards and postero-dorsally it is joined by two short ribs to form a small triangulate tubercle. Five or six faint oblique ridges run more or less parallel to the posterior termination of the ala in the postero-dorsal half of the valve.

The alae project just below the ventral margin and each has five or six longitudinal ribs developed on the ventral surface. The edge of the ala itself is defined by a thin sharp ridge which is very characteristic. This starts near the anterior margin at about one-third the height and runs straight in a postero-ventral direction, then curving round and following the outer margin of the ala to about two-thirds the length, when ala and bounding ridge turn and cut in to the general valve surface at almost a right-angle to their previous course. On the posterior part of the valve this posterior bounding ridge bifurcates and also gives rise to a number of other small ribs running in a general dorsal direction.

The hingement is well developed, consisting in the left valve of the crenulate, highly arched dorsal margin which expands anteriorly to form four teeth and posteriorly to form six teeth. Posteriorly, there is a large socket to the rear and below the six teeth at the end of the dorsal bar, the dorsal margin looping over the socket to affect the outline of the shell in side view very markedly. Anteriorly, the socket occupying an analagous position is smaller and appears to be divided to accommodate the smaller, more elongate bifid tooth of the right valve. The hinge in the right valve is complementary, the underside of the dorsal margin being locellate to accommodate the dorsal margin of the left valve which fits under it.

Anteriorly, there are about ten simple straight marginal pore canals and a small vestibule. As shown in Müller's excellent figure, the muscle scars are often clearly visible and consist of a vertical row of four rather equidimensional rounded adductor scars with a single equidimensional scar in front.

Remarks: Müller's specimens came from "Gauss station" (lat. 65°S., long. 90°E.) and this species is quite common at Halley Bay but so far it has not been recorded from elsewhere in the Antarctic. *C. assimile* Brady, from Iles de Kerguelen and off Heard Island, is similar and it is possible that the two species are merely geographical variants in the same way as *Loxoreticulatum foveolatum* and *L. fallax*.

Examination of the *Challenger* material in the British Museum (Nat. Hist.) shows that the Iles de Kerguelen specimen is lower, the dorsal margin more evenly rounded and the outline in side view not affected to the same extent by the posterior tooth and socket. In dorsal view the alae in Brady's species also appear to terminate more abruptly posteriorly, although in other respects the species agree closely. *C. patagoniense* Brady is similar in many respects, but the anterior part of the rib defining the ala is thicker and straighter, and postero-dorsally there is a thickened rib which slightly hides the dorsal margin in side view, compared with the situation in *C. gaussi.*

Subfamily Neocytherideidinae Puri 1957*b*

Genus *Copytus* Skogsberg 1939

Copytus elongatus Benson 1964
Plate Iq, q′, r, r′.

Copytus elongatus Benson 1964, p. 16–17, text-fig. 9.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Carapace (HU.13.R.12.97).	0·792	0·329	0·273
Carapace (HU.13.R.12.96).	0·864	0·377	0·341

Remarks: This easily recognizable species with the parallel dorsal and ventral margins, evenly rounded posterior and asymmetric anterior margins is rare at Halley Bay, being represented by only three carapaces and a single right valve. These agree in all respects with the Sulzberger Bay species, particularly notable being the deep anterior vestibule and wide anterior marginal area together with the well-developed adont hinge. In both Halley Bay and Sulzberger Bay the height of the specimens varied between 41 and 43 per cent of the length, compared with about 33 per cent for Skogsberg's *C. caligula* from South Georgia. Brady's *Cytherideis laevata* from a depth of 75 fathoms (137 m.) off Heard Island has a height between 33 and 39 per cent of the length and, whilst the ventral part of the marginal area seems to show slight differences, the shape and general nature of the valves and marginal areas leaves little doubt that Skogsberg's species is a synonym. The specimen from the upthrust muds above Drygalski Glacier, south-east of Mount Larsen, referred to Brady's *Cytherideis laevata* and figured by Chapman (1916*a*) has a height approximately 37 per cent of the length and, as far as can be ascertained, is correctly assigned to Brady's species.

Subfamily Cytherinae Baird 1850

Genus *Loxocythere* Hornibrook 1952

This genus was established with *Loxocythere crassa* Hornibrook as the type for a characteristic group of New Zealand forms, although it has since been reported more widely afield from the Japanese Tertiary deposits (Hanai, 1959), the Adriatic (Ascoli, 1965) and questionably from Western Australia (McKenzie, 1965). Regarded by Hanai as intermediate between *Cythere* and *Cytheropteron* in many respects, it differs from *Cythere* in the round, instead of horseshoe-shaped, antennal muscle scar, in the absence of marked concavity in the ventral margin, and in the straight pore canals. From *Cytheropteron* it differs in the robust, straight hinge line and the rounded antennal muscle scar, as well as in the lack of alae. *Rotundracythere* Mandelstam 1958 resembles *Loxocythere* in some respects, especially in some features of shape and ornament but it differs in detail and especially in the presence of a horseshoe-shaped antennal scar.

The present *Loxocythere frigida* agrees with Hanai's Tertiary form from Japan in having a crenulate median element, and this does not form a satisfactory distinguishing feature from *Cythere.*

Loxocythere frigida sp. nov.
Plate IIa, b; Fig. 9a–d.

Derivation of name: *Frigidus* (L.)—cold, a reference to its habitat.

Holotype: An adult right valve (HU.13.R.13.63).

Paratypes: Nine valves mounted as HU.13.R.13.10–15,41–43.

Other material: An adult left valve and a right valve of instar 8 in the author's collection.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Holotype; adult right valve (HU.13.R.13.63).	0·444	0·302	0·149
Paratype; right valve, instar 8 (HU.13.R.13.43).	0·358	0·250	0·137
Paratype; adult right valve (HU.13.R.13.42).	0·473	0·312	0·182
Paratype; adult left valve (HU.13.R.13.41).	0·415	0·263	0·143

Diagnosis: A species of *Loxocythere* with *Cytheropteron*-like outline in external lateral view, asymmetrically rounded anterior margin, typically pitted ornamentation which is more or less concentrically arranged, especially ventrally where there is an indication of concentric ribbing somewhat reminiscent of the fossil genus *Neocythere*, and about 24 large sieve-type normal pore canals on the surface of each valve. In dorsal view the outline is evenly rounded.

Description: The external lateral view with the convex ventral outline is seen in Plate IIa, b. The internal lateral view (Fig. 9a, c) shows that the ventral margin is slightly concave in the left valve and more so in the right valve. Ornamentation consists of pits, arranged more or less concentrically, the longitudinal parts of the rims to the pits being accentuated in the ventral region to give four or five ridges which run

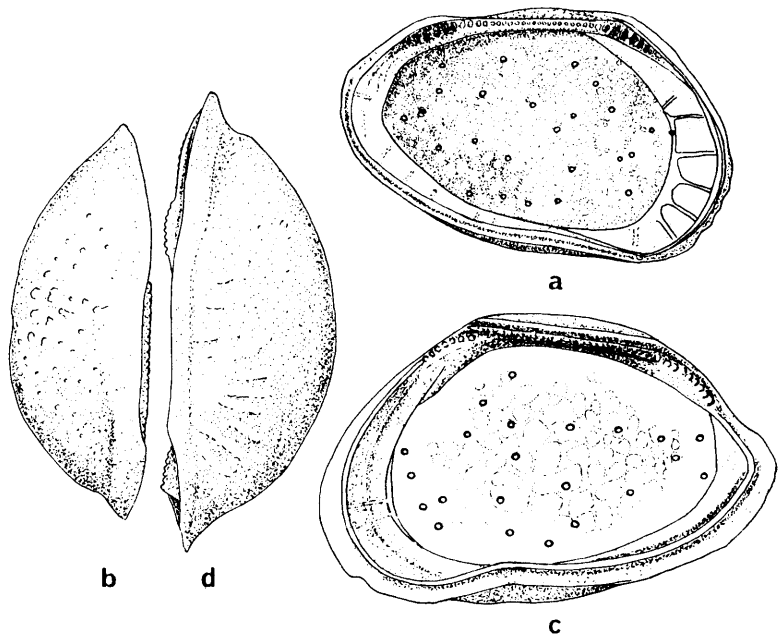


FIGURE 9

Loxocythere frigida sp. nov. (×126).

a and b. Paratype. Adult left valve (HU.13.R.13.41).
  a. Lateral view from the inside seen cleared in clove oil and by transmitted light.
  b. Dorsal view.

c and d. Paratype. Adult right valve (HU.13.R.13.42).
  c. Lateral view from inside, seen dry, lightly stained with malachite green.
  d. Dorsal view.

parallel to the ventral outline. About two dozen sieve-type normal pore canals are present. The hinge is strong, straight and antimerodont in the sense of Scott (1961), with 5–7 teeth in the anterior tooth plate and 6–8 in the posterior one.

The selvage is well developed and the marginal areas are moderately broad, the relatively sparse, straight radial pore canals widening slightly at their bases where they run into the small vestibules. In dorsal view (Fig. 9b, d) the valves are evenly rounded, the greatest width, which amounts to about one-third of the length in each valve, lying at about the mid-point. In anterior view the greatest width is situated ventrally.

Remarks: This small species is not common at Halley Bay. Of the 12 specimens recovered, four are regarded as adult with lengths from 0·402 to 0·473 mm., which corresponds closely with the length of *L. kingi* Hornibrook from New Zealand and is a little shorter than the type species. The five valves interpreted as instar 8 vary between 0·332 and 0·377 mm. in length, and the length of the three valves of instar 7 lies between 0·286 and 0·299 mm.

Subfamily Trachyleberidinae Sylvester-Bradley 1948

Genus *Cativella* Coryell and Fields 1937

Cativella bensoni sp. nov.

Plates IIIa, b, d, f, f′, f″; IVf, g, h, h′; Fig. 10.

Cythere polytrema Brady; Brady, 1880, p. 87, pl. XXI, fig. 5a–h.
Cythere polytrema Brady; Chapman, 1916*b*, p. 50, pl. VI, fig. 3.
Cativella sp. Benson 1964, p. 32–33; text-fig. 23.
non *Cythere polytrema* Brady 1878, p. 393, pl. LXVI, fig. 1a–d.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Holotype; adult female carapace (HU.13.R.12.1).	1·117	0·649	0·545
Paratype; right valve, instar 8 (HU.13.R.12.2).	0·909	0·532	0·247
Paratype; right valve, instar 7 (HU.13.R.12.3).	0·766	0·461	0·195
Paratype; right valve, instar 6 (HU.13.R.12.4).	0·597	0·377	0·169
Paratype; right valve, instar 7 (HU.13.R.12.5).	0·727	0·441	0·260
Paratype; right valve, instar 8 (HU.13.R.12.6).	0·844	0·493	0·247

Derivation of name: In honour of Dr. R. H. Benson who first drew attention to this species in the fauna from Sulzberger Bay in the eastern part of the Ross Sea.

Diagnosis: A species of *Cativella* which in the adult shows a heavy reticulate ornament in which small tubercles develop at the junctions of the ridges, forming the net-like pattern with a tendency for the ridges between the tubercles to atrophy giving a tuberculate ornament. There is a main row of some seven squarish spines antero-ventrally, whilst posteriorly there are about ten prominent spines which lie sub-parallel to the length of the valve and of which the postero-ventral are the longest. Dorsal margin straight and not strongly arched.

Material: 68 valves and carapaces, of which the holotype and 19 paratypes are mounted and catalogued in the University of Hull collection as HU.13.R.12.1–20, and 16 paratypes are deposited in the collection of the British Museum (Nat. Hist.) (registered numbers 1966.7.13.1). The material consists of varying stages as follows: 11 adults (seven female, four male), 21 specimens instar 8, 16 specimens instar 7, ten specimens instar 6, eight specimens instar 5 and two fragmentary specimens.

Description: The growth and development of this species was studied in representatives of the last four moult stages and the adult.

Instar 5 (length less than 0·532 mm.; 8 specimens). Valves thin and triangular, tapering markedly posteriorly, with a delicate, fluted, easily broken marginal frill along the anterior third of the dorsal margin, the anterior margin and the anterior two-thirds of the ventral margin. This "frill" is continued in the posterior part of the dorsal margin but offset, and set a little below the dorsal margin on the surface of the valve. This is a constant and very characteristic feature. The postero-dorsal frill terminates in a backwardly projecting point or hook. As in all stages, this postero-dorsal part of the frill is straight, or at the very most gently convex upwards, and not strongly arched as in the case of *C. polytrema* from the Antwerp Crag.

The dorsal margin is straight, the anterior margin widely and evenly rounded and the ventral margin straight or slightly concave. A thin, sharp flange-like ventral rib occupies the middle three-quarters of the length about one-fifth of the height above the ventral margin and ends in a backwardly directed sharp point. The rest of the valve is smooth and glassy, and devoid of ornament except for two backward and outwardly directed short conical/pyramidal spines posteriorly. The hinge is simple, being formed in the left valve by the thin straight bar of the dorsal margin with elongate terminal sockets, which are open ventrally. The anterior one is shallow and simple, the posterior one shows the presence of three loculi. In the right valve is a scarcely differentiated tooth anteriorly which is triangular in dorsal view; the posterior tooth is much better developed, is triangular and highest posteriorly in dorsal view and shows division into three elongate denticles. The groove between the terminal tooth plates is locellate. The muscle-scar pattern consists of four elongate adductor scars in a vertical row on the posterior side of a muscle-scar pit set slightly posterior of the mid-length (59 per cent of the length from the anterior end*), a V-shaped antennal scar in front, and a dorsal V-shaped scar in which the bottom of the "V" points anteriorly. About 16–20 short, simple radial pore canals are present anteriorly. A little anterior of the antennal scar is a rounded muscle scar which lies vertically above the anterior termination of the ventral rib.

In dorsal view, the ventral rib curves round following the run of the valve surface and forming a sort of curved hook.

Instar 6 (length 0·532–0·662 mm.; ten specimens). Apart from increase in size there is little change in the valves. Postero-ventrally five or six small terminal spines are developed instead of just the two in instar 5, and one or two make their appearance postero-dorsally. The hinge is more robust, the anterior tooth being triangular and widest anteriorly in dorsal view, and the posterior tooth knob-like. The four adductor scars have now shifted forward to lie just behind the mid-length at 55 per cent of the length from the anterior end and large normal pore canals are scattered sparsely over the surface of the valve. There is no trace of the mid-rib in this instar.

Instar 7 (length 0·662–0·779 mm.; 16 specimens). The postero-ventral spines have now become longer and better developed; on the surface of the valve are about 30 normal pore canals which are as large as in instar 6, but they are relatively smaller in proportion to the size of the valves. The hinge has now become much more differentiated and both terminal elements in the right valve in dorsal view are oval and set obliquely to the line of the dorsal margin. The adductor muscles have moved a little further forward and are now exactly at the mid-point at 50 per cent length. There is still normally no trace of the mid-rib, although an occasional specimen may show a trace in the extreme posterior part of the shell.

Instar 8 (length 0·779–1·000 mm.; 21 specimens). Principal new features are the first appearance of a small glassy eye tubercle and the mid-rib. The latter runs obliquely from postero-dorsally to antero-ventrally and is thin and knife-like, being buttressed periodically to give a fluted appearance in the same way that the ventral rib and marginal frill are buttressed. This buttressing or fluting becomes more pronounced as size increases. There appears to be a tendency for the third quarter of the rib, i.e. immediately behind the mid-point, either not to develop or, more likely, to become broken off. The hinge is still tripartite with a locellate groove in between the two teeth in the right valve. In side view, the anterior tooth is elongate, rounded and highest anteriorly, whilst the posterior tooth is rounded rhomboidal. The adductor scars now lie in front of the mid-point at 48 per cent length. About 22 radial pore canals are present anteriorly. Six or seven marginal spines are also developed anteriorly between the selvage and the marginal frill.

* In calculating this the length of the posterior spines is not taken into consideration here, or subsequently.

Adult stage (length more than 1·000 mm.; 11 specimens). Valves large and robust, quadrate, tapering posteriorly. Sexual dimorphism marked, the males tapering much more posteriorly in side view than the females. Externally, the most notable feature is the development of a coarse ornamentation which is basically reticulate but in which the junctions of the ridges are accentuated to give small tubercles, the rest of the ridge between tubercles tending to disappear. There appear to have been four rows of pits forming the basic reticular pattern between both the dorsal frill and the mid-rib, and between the mid-rib and the ventral rib. The buttresses supporting the fluted frills and ribs are accentuated, especially anteriorly, whilst posteriorly the body of the valve is marked off from the caudal portion by a shallow sulcus. Anteriorly, the ventral spination coarsens to give seven (occasionally more) solid squarish to rather pyramidal (sometimes distally expanded) spines between the frill and the selvage. These are disposed radially in the mid-part of the anterior margin, but they become progressively more ventrally directed antero-ventrally to give a characteristic sequential disposition. A second row of small spines is also developed between these and the marginal frill.

The posterior margin of the shell is rather steep and usually carries about ten prominent spines. These are directed posteriorly, parallel or sub-parallel to the length of the valve, rather than radially (fanwise) as is the case in *C. polytrema*. The postero-ventral spines are the longest. The hinge develops the full quadripartite arrangement, the finely crenulate bar in the left valve developing a tooth anteriorly which is oval in side view and rounded conical in dorsal view. In the right valve, the anterior tooth is stirpate and the posterior is oval in dorsal view, whilst in side view they are respectively round and rhomboidal. About 36 simple radial pore canals, which have a slight expansion about one-third of the distance across the marginal area from the exterior, are present anteriorly and about half that number posteriorly. Inner margin and line of concrescence coincide throughout. There is a sub-central muscle-scar pit and the adductors now lie at 47 per cent of the length. Fairly large normal pore canals occur sparingly.

Affinities and differences: Benson's form is clearly an adult, the dimensions corresponding closely with those of the adults from Halley Bay. It is difficult to reconcile his figure (1964, fig. 23, p. 32) with his statement that the hinge is immature (protodont). Chapman (1916*b*) found a large number of specimens in elevated deposits on the slopes of Mount Erebus on Ross Island, McMurdo Sound, which belong here and not in *Cythere polytrema* Brady as he suggested. The present species differs from the true *C. polytrema* Brady, the types of which came from the Antwerp Crag, in that the posterior spines in *C. bensoni* are parallel or sub-parallel to the length of the valve in side view, in that the mid-rib runs straight in its anterior part and does not run antero-ventrally during the anterior third of its course as in Brady's figure, and in that the dorsal rib is scarcely arched, compared to the strong arching seen in Brady's Antwerp Crag specimen. In dorsal view the Antarctic specimens are more parallel-sided and lack the spinose terminations of the alae of *C. polytrema* seen in this view. Brady's *C. polytrema* from the Prince Edward Islands at a depth of 50 to 100 fathoms (91 to 183 m.) differs from the European species but it agrees well with this form from Halley Bay and is included here in the synonymy. It is interesting to note that the adult stage is reached at a slightly smaller length as judged from the ornamentation, the adults measuring 0·99 and 0·92 mm. The Iles de Kerguelen specimen of *C. polytrema*, which is also in the *Challenger* Collection, shows a more radial or fan-like disposition of the posterior spination and, whilst a certain amount of variation no doubt occurs in this respect, it should perhaps only be tentatively included here.

Genus *Robertsonites* Swain 1963

Established with the Alaskan Quaternary *R. gubikensis* Swain as the type species, the genus is characterized by the rounded subquadrate outline in side view, the compressed posterior fifth of the valves in dorsal view, the holamphidont hinge with crenulate bar in the left valve, fairly broad marginal zone with moderately numerous radial pore canals but with only narrow separation of the inner margin and line of concrescence both anteriorly and posteriorly.

Among the Trachyleberidinae it appears to be most closely related to the genus *Costa* Neviani 1928 but it is immediately differentiated by both shape and ornament. It is similarly separated from *Hermanites* Puri 1955 and differs from *Henryhowella* Puri 1957*a* in ornamentation. Comparisons with other genera are not close.

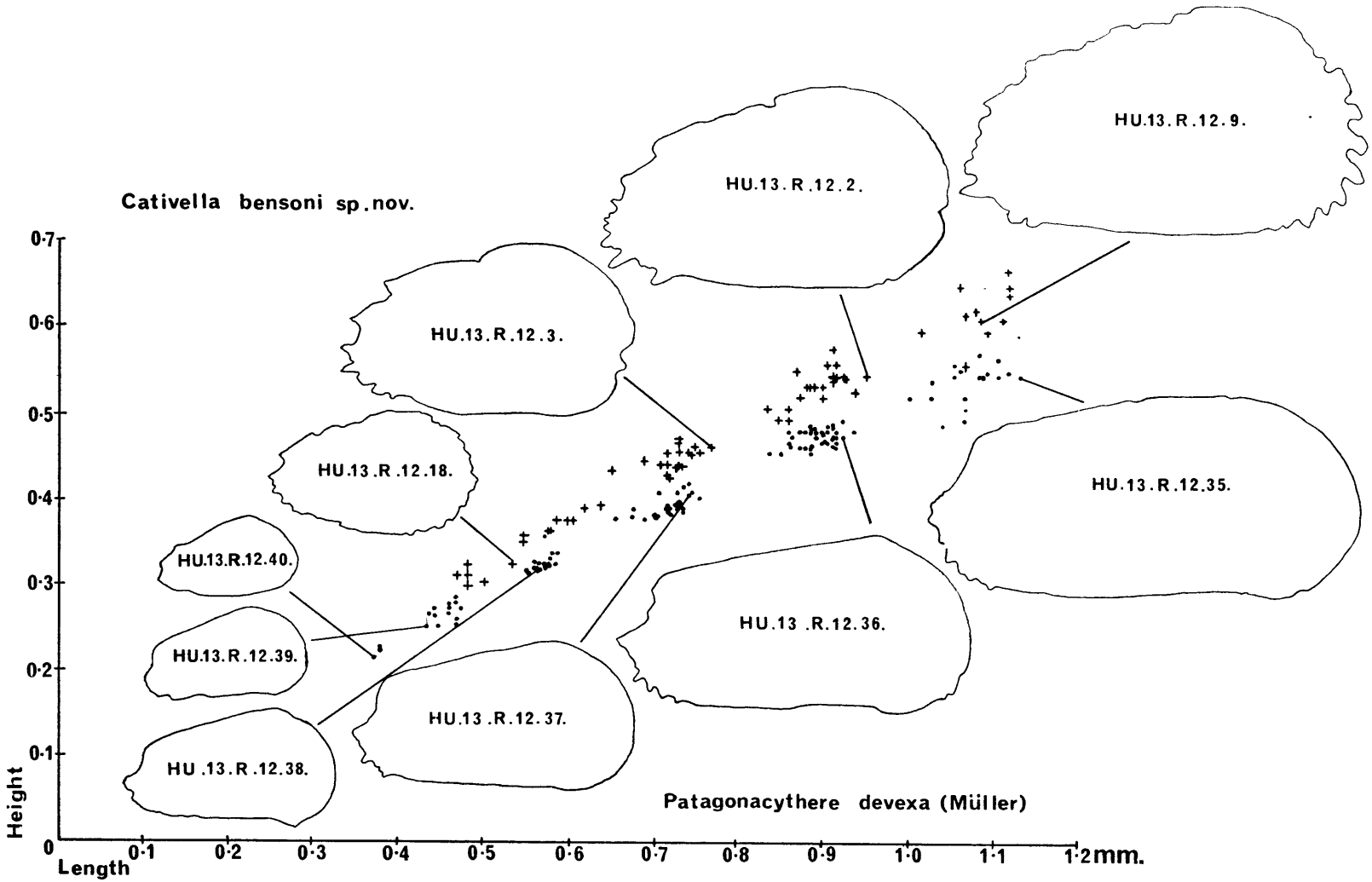


FIGURE 10
Development of size and shape in *Cativella bensoni* sp. nov. and *Patagonacythere devexa* (Müller).

Robertsonites antarcticus sp. nov.
Plate IIh, h′, k, k′, l, l′; Fig. 11a, b.

Cythere cristatella Brady; Chapman, 1919, p. 24, pl. XXI, figs. 7, 7a.
non *Cythere cristatella* Brady 1880, p. 90, pl. XIX, fig. 6a–d.

Holotype: An adult right valve (HU.13.R.12.61).

Paratypes: Seven valves ranging from instar 4 to the adult, mounted as HU.13.R.12.28–30, 62–65.

Other material: 11 valves in the author's collection.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Holotype; adult right valve (HU.13.R.12.61).	0·773	0·441	0·221
Paratype; adult right valve (HU.13.R.12.62).	0·786	0·441	0·234
Paratype; left valve, instar 8 (HU.13.R.12.63).	0·662	0·431	0·241

Diagnosis: A species of *Robertsonites* with very subdued ornamentation which is generally reticulate. In the posterior part of the valve the ornament consists dominantly of thin vertical ribs, while the prominent postero-ventral ridge or small "ala" has two longitudinal ribs and reticulate ornamentation.

Description:

Instar 4 (length 0·341 mm.). Only a single left valve of instar 4 (possibly instar 5) was found and even at this stage the species is easily recognized by its shape and the postero-ventral ridge or ala which is already well developed.

Instar 7 (length 0·535–0·548 mm.). Six valves of this stage were found and this differs from the penultimate instar only in size and hingement, the latter being merodont, whilst the next moult stage has a less robust version of the adult holamphidont hinge.

Instar 8 (length 0·610–0·665 mm.). Ten valves of this stage were present. In side view (Plate IIk) the greatest height is at the anterior cardinal angle close to the anterior end. Anterior margin steep and evenly rounded, running smoothly into the ventral margin which is straight to gently convex and converges posteriorly with the dorsal margin before again running smoothly into the rounded posterior margin. The straight dorsal margin is affected in side view by the medio-dorsal and postero-dorsal tubercles. In dorsal view the middle half of the outline is markedly affected by the ventral expansion which arches out about one-third of the length from the anterior end and terminates rather abruptly about one-fifth of the length from the posterior end.

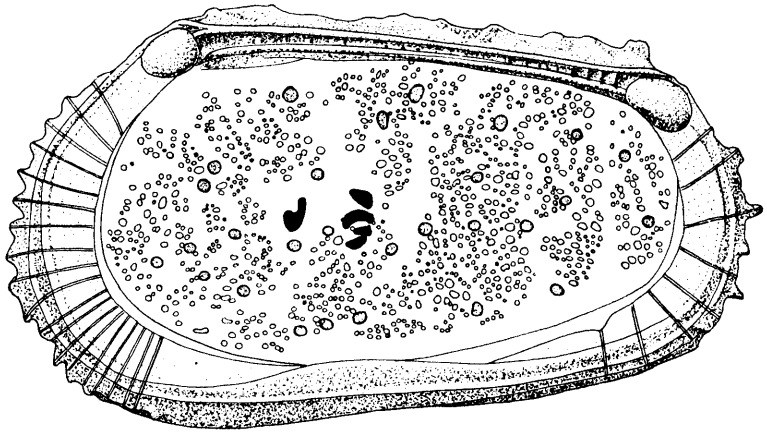
The most striking feature is the small ala. This starts at between one-third the length of the valve and the mid-length, and it is bounded by a sharp ridge separating the lateral and ventral surfaces, and lying about one-eighth of the valve height above the ventral margin. This ridge is gently convex downwards and follows the ventral outline of the valve; it ends at about one-sixth the length from the posterior end where it meets the ridge bounding the posterior margin of the ala at approximately 90°. A second longitudinal ridge occurs above the first, the two ridges running a short distance apart and being linked by four short ribs at right-angles to give five rectangular "boxes". Traces of another row of rectangular fossae occur immediately dorsally of this row. Behind the ala the surface of the valve falls steeply to the posterior marginal rim. The ventral surface of the ala is fairly flat. The thin ridge forming the posterior boundary of the ala is slightly convex forwards and runs dorsally to the postero-dorsal tubercle which has a right-angled appearance, giving a quadrangular look to the posterior part of the valve. From the postero-dorsal tubercle this thin ridge continues anteriorly, following a gently concave upwards course just below the dorsal outline to the medio-dorsal tubercle. Thence it continues parallel to the dorsal margin until at about mid-height it forms the outline and continues in this fashion to form the ventral outline, so separating the ventral and lateral surfaces of the marginal rim which is particularly well-marked anteriorly. Posteriorly, this ridge turns dorsally following the posterior outline very closely and fades as it approaches and converges with the extreme postero-dorsal corner. Ventrally, at about mid-length, another thin ridge leaves

this marginal ridge and diverging anteriorly, it runs along the ventral surface midway between this and the selvage and joins the antero-dorsal tubercle. In the anterior and antero-ventral part this is beset with 13 or 14 small pustules.

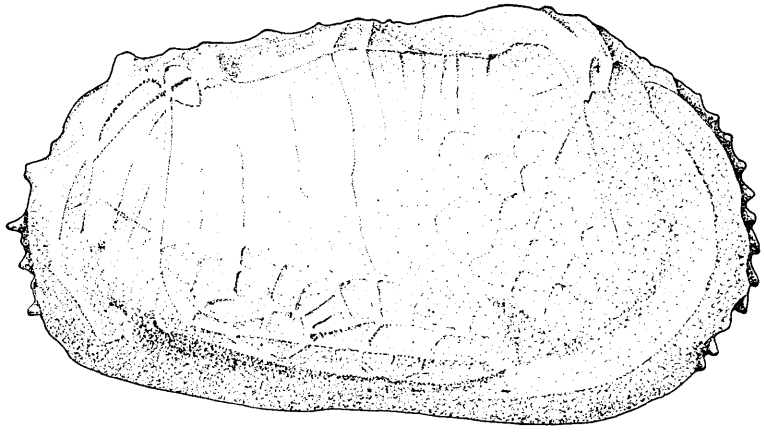
The valve surface appears generally smooth on casual inspection but it is faintly reticulate and ornamented with fine ribbing, mainly running in a dorso-ventral direction. Between the dorsal part of the marginal ridge and the mid-line a somewhat stronger reticulum tends to develop dorsally.

Normal pore canals are rather few and large. Zone of concrescence is very narrow and line of concrescence and inner margin coincide throughout. Some 18 or 19 short, straight, simple marginal pore canals occur anteriorly and fewer posteriorly. A subdued sub-central tubercle is present.

Adult (length 0·735–0·786 mm.). In the adult (Fig. 11a, b) the valve becomes more oblong in side view, the marginal rib develops into a more prominent flange, whilst the anterior and antero-ventral pustules on the rib between this and the selvage develop into 14 to 18 small spines or marginal teeth, of which the more ventrally placed are directed more ventrally than the more dorsal ones. The marginal rim is well developed and there is a marked anterior sulcus separating it from the body of the valve. In the posterior part of the valve, small marginal spines or teeth occur at two levels, four occurring on the valve margin



a



b

FIGURE 11

Robertsonites antarcticus sp. nov. (×126). Holotype. Adult right valve (HU.13.R.12.61).

a. Internal lateral view in clove oil in transmitted light.

b. External lateral view in incident light.

and up to four on the marginal ridge. The dorsal reticulation above the marginal rib is easier to observe and the ridges break up the outline dorsally as in the type species of the genus. With increased size the postero-dorsal tubercle and the postero-ventral termination of the ala are relatively less marked. The faint ribbing on the surface, which is dominantly vertical, is a little easier to see while the row of box-like fossae along the margin of the ala is relatively less noticeable. The hinge is better developed than in instar 8 and is holamphidont, although the bar in the left valve (only adult right valves were found) would not appear to develop a very prominent anterior tooth, judging from the very modest expansion in width of the locellate groove in the right valve at its anterior termination. In the right valve, the teeth are large and rounded in side view, whilst in dorsal view the anterior tooth is equidimensional and squarish, the posterior one being more elongate and rounded.

Compared with the penultimate instar, the zone of concrescence is much broader, and the inner margin and line of concrescence are separated over much of their course, albeit narrowly. Between 18 and 21 radial pore canals cross the anterior marginal area, and about half that number posteriorly, the canals being simple and straight. The sieve-type normal pore canals are relatively sparse and number about 27 to 30. The sub-central muscle pit shows a row of four adductor scars with a large, hook-shaped antennal scar anteriorly at the level of the upper middle adductor scar.

Remarks: The Antarctic specimens show some resemblance to Brady's *Cythere cristatella* which came from shallow water off Booby Island (lat. 10°36′S., long. 141°55′E.). Brady's specimen, however, differs from *Robertsonites antarcticus* of similar size in being more elongate in side view, in having a concave rather than convex ventral outline in this view, a dorsal outline unbroken by medio- or postero-dorsal tubercles and in the more angular posterior margin.

There can be no question of the identity of the present species with Chapman's figured specimen and this author recorded its presence at four stations—in deep water (1,320 fathoms; 2,415 m.) at lat. 42°38·5′S., long. 148°41·5′E., and at depths between 157 and 220 fathoms (290 and 405 m.) from three stations between lat. 66° and 67°S. and longitude varying from 94°15′ to 141°39′E.

Subfamily Hemicytherinae Puri 1953

Genus *Australicythere* Benson 1964

Hitherto a monotypic genus; Brady's *Cythere subrufa* found off Iles de Kerguelen belongs here.

Australicythere polylyca (Müller) 1908

Plate IVe, k–n″; Fig. 12.

Cythereis polylyca Müller 1908, p. 135–37, pl. XVII, figs. 1, 5, 6; 4 text-figs.
Cythere normani Brady; Chapman, 1916*b*, p. 50, pl. IV, fig. 2.
Cythere davisi Chapman 1916*c*, p. 72, pl. VI, fig. 46a–c.
Australicythere polylyca (Müller) 1908; Benson (n. comb.); Benson, 1964, p. 23–26, pl. 2, fig. 10; pl. 4, figs. 1–7, 9; text-figs. 15, 16, 17.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Right valve, instar 6 (HU.13.R.12.21).	0·545	0·345	0·175
Left valve, instar 7 (HU.13.R.12.22).	0·688	0·428	0·205
Left valve, instar 8 (HU.13.R.12.23).	0·948	0·545	0·312
Right valve, instar 8 (HU.13.R.12.24).	0·902	0·519	0·260
Carapace, adult (HU.13.R.12.25).	1·098	0·636	0·587

Remarks: This species has been fully described only recently and there is nothing of consequence to add to Benson's (1964) description. Excellent material of the last six growth stages was present and the change of size and the outline in dorsal view at the various stages is shown in Fig. 12.

With 396 individuals this proved by far the commonest ostracod at Halley Bay, being three times more abundant than the next commonest species *Xestoleberis rigusa*, and accounting for 39 per cent of all the specimens obtained. It was one of the five commonest ostracods in Müller's fauna at "Gauss station" (Table IV) and the second commonest in the fauna from the Ross Sea and McMurdo Sound (Benson, 1964). In the absence of his original specimens, the fauna from the South Orkney Islands (about 950 miles (1,530 km.) away to the north-north-west) described by Scott (1912) has proved particularly difficult to interpret from his illustrations, but his new species *Cythere latibrosa* (Scott, 1912, p. 582, pl. XIV, figs. 3, 4) probably belongs here. His dimensions (length 0·74 mm.) suggest that his specimens were immature, corresponding to instar 7 of the present fauna which would explain the apparently coarser ornamentation.

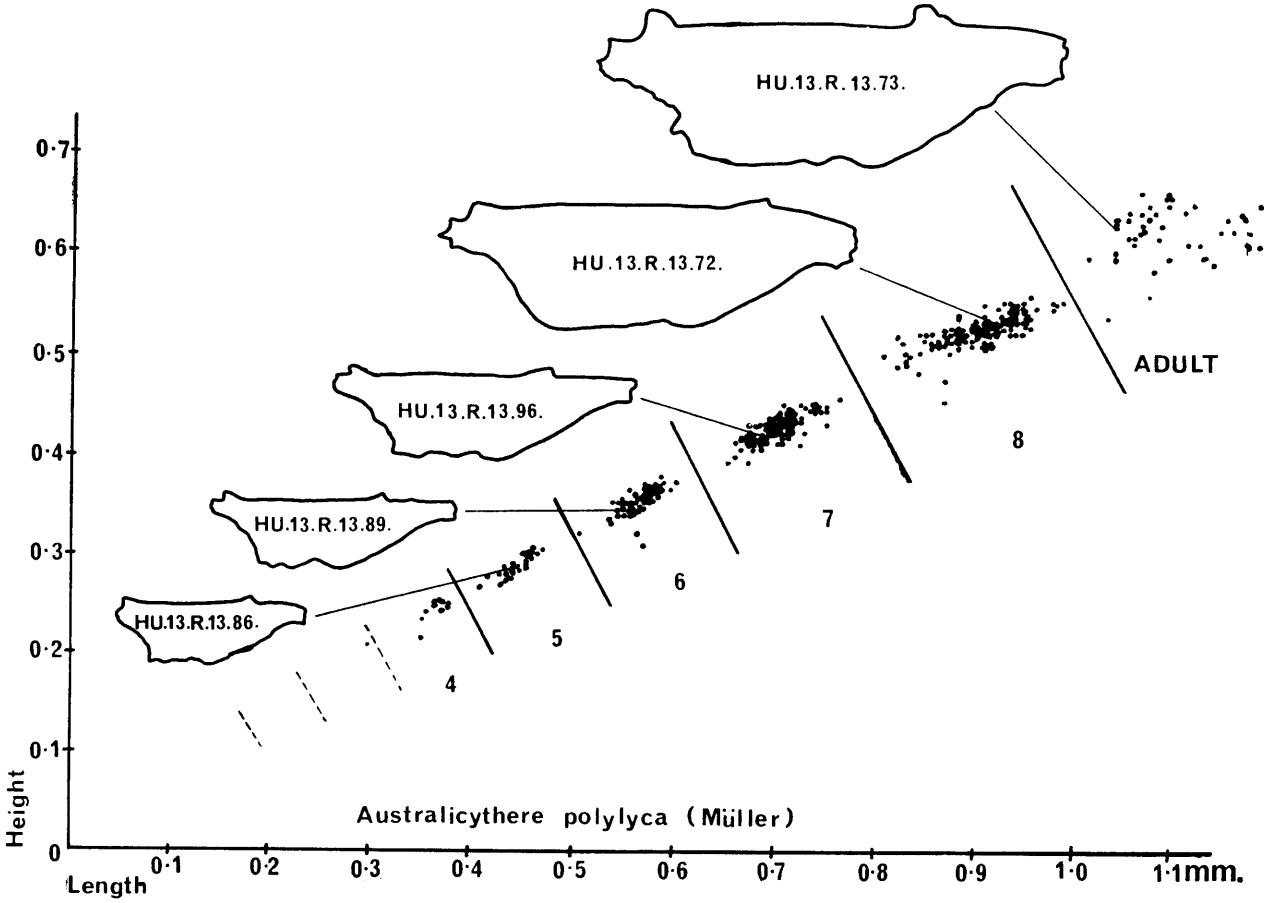


FIGURE 12

Development of size and shape in the dorsal view in *Australicythere polylyca* (Müller).

Skogsberg (1928) did not record *A. polylyca* from South Georgia, although in dealing with "*Cythereis*" he may not have regarded it as coming within his purview. In the southern South America area it appears to be unrepresented judging from the works of Brady (1867–71, 1880) and Hartmann (1962, 1965), and in fact there seems curiously little link altogether between this area and that of the present study. Examination of *Cythere subrufa* Brady from "Balfour Bay", Iles de Kerguelen, shows that it is congeneric agreeing in ornament, normal pore canals and marginal areas and other features, but differing principally in dorsal view with its much more evenly rounded posterior part and in the lesser development of the horizontal ventral rib. *Australicythere polylyca* can be regarded as a characteristic high Antarctic species.

Genus *Bradleya* Hornibrook 1952

Hornibrook established the genus *Bradleya* for a group of New Zealand species with *B. arata* (Brady) 1880 as the type. The genus was originally separated from *Cythereis* and *Trachyleberis* by the intermediate nature of the hinge—the anterior tooth in the right valve being simple and the posterior crenulate or lobed. The two anterior muscle scars, which differ from the characteristic crescentic scar seen in the Trachyleberidinae, immediately assign it to the Hemicytherinae and they were also noted in the original diagnosis. The present form differs from the original diagnosis of the genus principally in the unimpressive anterior expansion of the hinge bar in the left valve which does not form a notable tooth, probably because the largest Halley Bay specimen is still immature. The pattern of ornament, however, is so distinctive, being intermediate between that of *B. arata* and *B. dictyon*, that it is inconceivable this is a case of homoeomorphy or that the Antarctic specimens should be placed in a different genus.

Bradleya cf. *B. dictyon* (Brady) 1880

Figs. 13a–c, 14.

cf. *Cythere dictyon* Brady 1880, p. 99–101, pl. XXIV, fig. 1a–y. See Hornibrook (1952) for full synonymy.
Bradleya ? *dictyon* (Brady) 1880; Benson, 1964, p. 34–35; text-fig. 24.
non *Bradleya dictyon* (Brady) Hornibrook 1952, p. 39–41, pl. 6, figs. 81, 82, 84, 85.

Dimensions of figured specimen:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Left valve, instar 8 (HU.13.R.12.37).	0·786	0·480	0·228

Material: Only three specimens were obtained. The largest of these, the left valve figured here, is 0·786 mm. long compared with Brady's dimensions of 1 mm. and Benson's of 1·09 mm. Since the anterior tooth is not developed in the left valve, this specimen is here regarded as belonging to the penultimate instar. The other two specimens, a left and right valve of respective lengths 0·636 and 0·61 mm. are regarded as belonging to instar 7.

Description: Largest specimen (Fig. 13a–c) typically rounded, sub-rectangular in side view, highest at the anterior cardinal angle and with convex ventral margin, and prominent ventro-lateral ridge—altogether reminiscent of the immature form of about the same length figured by Brady (1880, pl. XXIV, fig. 1l). Dorsally, a rather marked triangular sulcus is present in the post-ocular region. The ornament is well developed and is intermediate between that of *B. dictyon* and *B. arata*. It is reminiscent of *B. arata* in the accentuation of the eight more or less vertical ribs in the dorsal half of the valve behind the post-ocular sulcus, and in the six well-marked pits along the dorsal side of the ventro-lateral ridge. The reticulate pattern elsewhere recalls *B. dictyon*, and examination in clove oil in transmitted light shows that the specimen is generally reticulate, even postero-dorsally where no horizontal ribbing can be detected when stained or examined dry. A prominent oblique dorsal ridge is present; this forms the lateral outline dorsally in the posterior part of the valve, whilst anteriorly it curves down to form a vertical rim which reaches almost the mid-height of the valve and forms the posterior boundary of the post-ocular sulcus. A ridge runs from the ocular region in the direction of the scarcely perceptible sub-central tubercle and it forms the anterior margin of the post-ocular sulcus. A number of transverse ribs on the dorsal surface of the valve break up the dorsal outline in side view. The anterior margin carries about 14 spines or projections of varying development in the antero-ventral part, and the posterior margin carries about seven. The hinge (Fig. 13c) consists of a straight, finely crenulate hinge bar in the left valve, the bar expanding anteriorly but without forming a well-defined tooth at this stage. There are terminal sockets of which the posterior is the larger and better developed. Marginal areas are narrow but well defined, without vestibules, and with about two dozen simple, straight, radial pore canals anteriorly and a little less than half that number posteriorly. About 30 large, sieve-type normal pore canals are present and unlike Benson's specimens these are all associated with the ridges between the excavations.

Muscle-scar pattern is of hemicytherid type with four adductor scars in a vertical row, the upper two being particularly elongate and binodal. Two rounded antennal scars occur in front of the top adductor

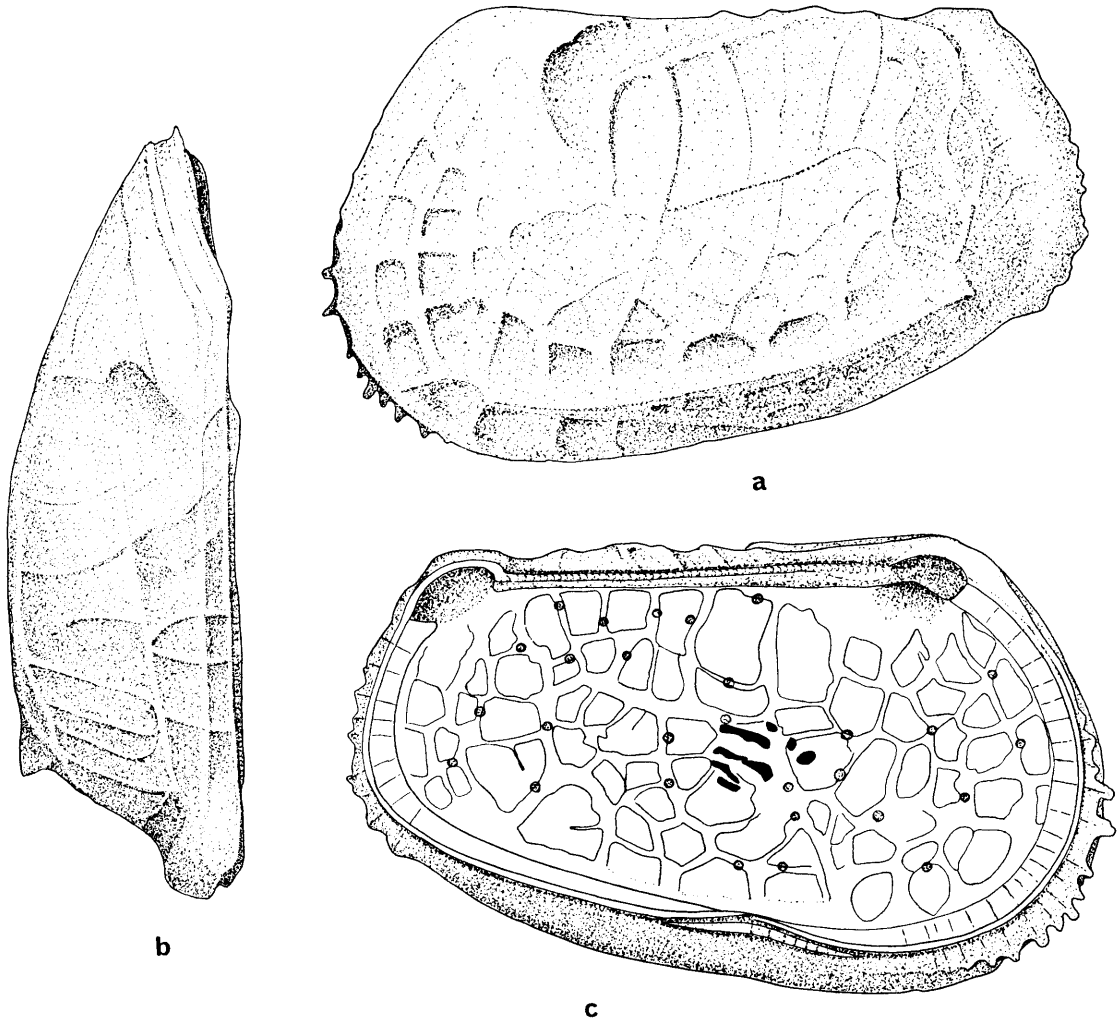


FIGURE 13

Bradleya cf. *B. dictyon* (Brady) 1880 (×127). Left valve, penultimate instar (HU.13.R.12.37).

a. External lateral view.
b. Dorsal view.
c. Internal lateral view, transmitted light in clove oil, marginal areas in incident light and dry.

scar. In dorsal view, the greatest width is reached a little before the mid-length, the outline being then parallel-sided until about three-quarters length when the ventro-lateral ridge which forms the outline ends in a blunt projecting point. Thence the outline falls steeply to the posterior rim.

In instar 7, apart from its smaller size, the main difference is in the hinge structure which in the right valve consists of two elongate, terminal tooth plates, which are triangular in dorsal view, and which have a locellate groove between them (the antimerodont hinge of Scott (1961)).

Remarks: The variability of ornament in this species has been remarked on by many previous workers. Brady (1880, pl. XXIV) figured a wide variation in this feature and he recorded it from 25 stations ranging from lat. 38°37′N. to 52°4′S. This is a very widely distributed species preferring deeper or cooler waters. Apparently never very common, the variation causes considerable difficulty in interpretation. Whilst immature, the Halley Bay specimens appear to differ from the *Challenger* specimens in the greater development of the post-ocular sulcus and in the accentuation of the vertical ribs postero-dorsally, a feature which also seems to be present in the single specimen from about 2,000 fathoms (3,660 m.) at lat. 48°45′S., long. 114°33′W. figured by Benson (1964, text-fig. 24).

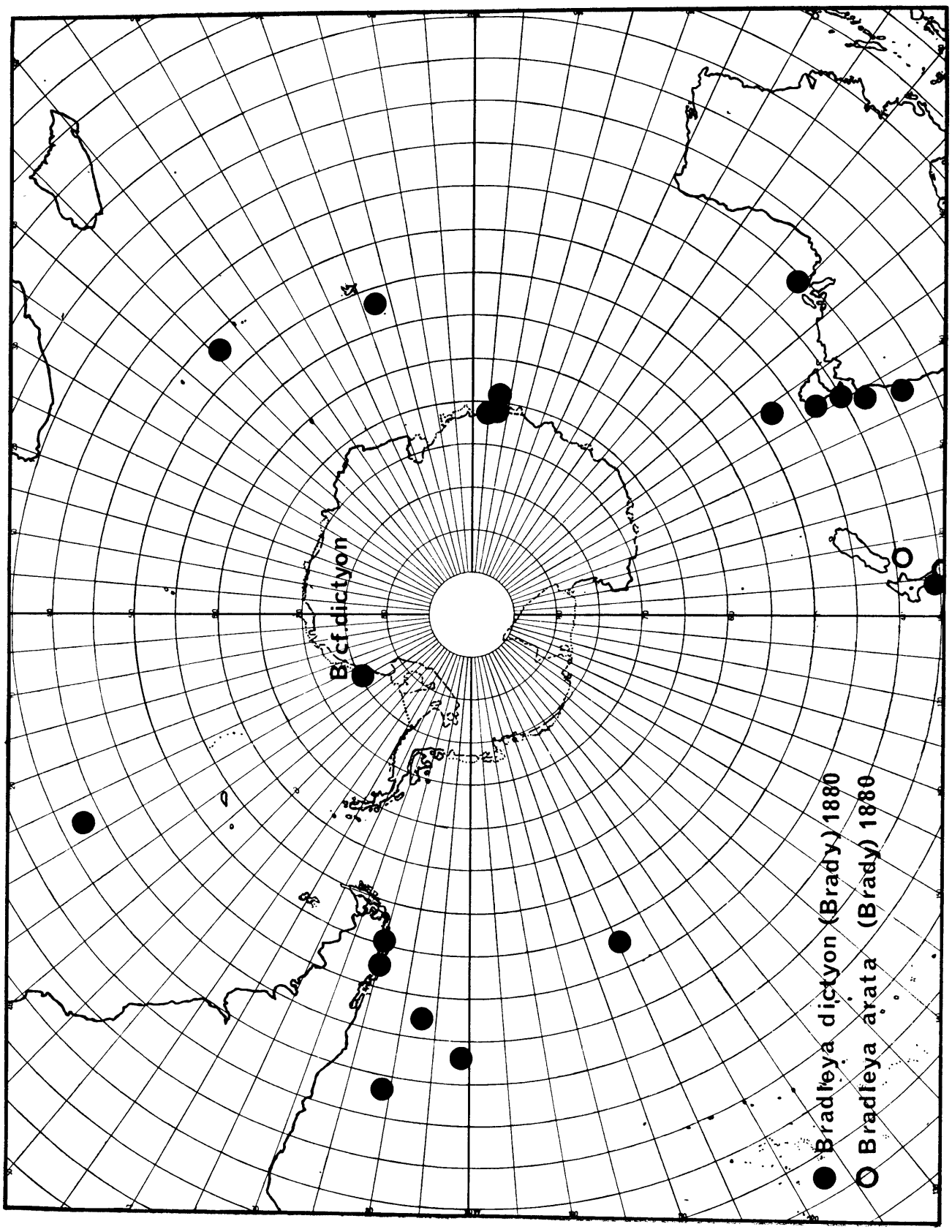


FIGURE 14
The known distribution of Recent *Bradleya dictyon* (Brady), *Bradleya* cf. *B. dictyon* (Brady) and *B. arata* (Brady) south of approximately lat. 30°S.

Attention has already been drawn to the intermediate nature of the ornament, and with sufficient material it may be found that this should be regarded as a separate cold-water species or subspecies. I agree with Benson in removing the New Zealand specimen of Hornibrook from *B. dictyon*, and many of the widely distributed Tertiary specimens assigned here by various authors need re-investigation. The known distribution of Recent *B. dictyon* and *B. arata*, south of approximately lat. 30°S., is shown in Fig. 14.

Genus *Patagonacythere* Hartmann 1962

Patagonacythere devexa (Müller) 1908

Plates IIIc, c′, e; IVi, j; Fig. 10.

Cythereis devexa Müller 1908, p. 137, pl. XVII, figs. 4, 8; text-fig.
Cythere parallelogramma Brady; Chapman, 1916*a*, p. 38, pl. IV, fig. 3.
Cythere parallelogramma Brady; Chapman, 1916*b*, p. 49.
Cythereis (*Cythereis*) *frequens* Skogsberg 1928, p. 95–100, pl. II, fig. 5; pl. V, fig. 1.
Aurila frequens (Skogsberg); Hartmann 1962, p. 236.
Patagonacythere devexa (Müller) 1908; Benson (n. comb.); Benson, 1964, p. 27–30, pl. 2, fig. 11; pl. 3, figs. 4, 5, 7–11; text-figs. 18–20.
non *Cythereis devexa* Müller; Daday, 1913, p. 179–83, pl. II, figs. 6–20 (= *P. longiducta* (Skogsberg)).
non *Cythere parallelogramma* Brady 1880, p. 82–83, pl. XV, fig. 1a–e.

Dimensions of figured specimens:

	Length (mm.)	*Height* (mm.)	*Width* (mm.)
Adult male carapace (HU.13.R.12.31).	1·065	0·506	0·467
Adult female right valve (HU.13.R.12.32).	1·104	0·545	0·260+0·039
Right valve, instar 6 (HU.13.R.12.33).	0·584	0·325	0·169
Right valve, instar 8 (HU.13.R.12.34).	0·912	0·467	0·211+0·026

Remarks: In view of recent work, no description is necessary as regards the shell. The soft parts deserve thorough re-examination. This species was the third most abundant at Halley Bay, yielding 119 individuals of the last six growth stages (Fig. 10). Müller (Table IV) found that this was not a common species at "Gauss station" where he found only four adults and a number of juveniles. Conversely, in the Ross Sea and McMurdo Sound this proved to be the commonest species with 300 individuals (Benson, 1964).

In connection with the specific identification and synonymy of this species there is no problem. Besides the authors already quoted, Chapman (1916*a*, *b*) found it in elevated deposits south-east of Mount Larsen and on the slopes of Mount Erebus, and figured it as *Cythere parallelogramma* Brady. Skogsberg (1928) found it in South Georgia where he named it as a new species *C.* (*Cythereis*) *frequens*, whilst noting (Skogsberg, 1928, p. 99) that the differences with *P. devexa* were fairly small. I agree with Benson in regarding the differences as insufficient to justify the separation of the two forms. Hartmann (1962) found Skogsberg's species at Las Cañas near Constitucíon in Chile and in the Magellan Straits area where he assigned it to the genus *Aurila* Pokorny 1955. This species does not appear to fit happily in *Aurila* and Benson (1964) placed it in *Patagonacythere* (a genus established by Hartmann in the work quoted above), and published a diagnosis in English which differs somewhat from Hartmann's. The valves agree well with Hartmann's diagnosis, especially in the lattice work of ribs, the muscle scars and the nature of the marginal areas, but they differ from that part of his diagnosis which, in dealing with the reticulation, states "Unter ihnen tritt eine Ventralrippe, eine Mittelrippe und eine Dorsalrippe deutlich hervor". The ventral rib is obviously present; the other two ribs are not plain as in the type species and should perhaps be omitted from the diagnosis. Nevertheless, in spite of this difference, the species is best placed here. The significance of the limbs and soft parts is difficult to assess for Müller only dealt with the penis, and whilst Skogsberg (1928) gave detailed descriptions of the limbs in *P. frequens* he gave not a single figure, and the same is true of Hartmann (1962). From the rather different descriptive approaches of these two authors, it is difficult to say whether any significant differences exist between *Cythereis frequens* Skogsberg and *Patagonacythere tricostata* Hartmann in this respect. I have accordingly followed Benson in placing Müller's species firmly in *Patagonacythere* on the evidence of the valves.

The form recorded from Petermann Island (lat. 65°10′34″S., long. 66°32′30″W.), in 6 m. (3·2 fathoms) of water, by Daday (1913) is not Müller's species, but on the evidence of the dorsal view and the humped dorsal margin in side view, as well as on ornamentation, belongs to *P. longiducta* (Skogsberg). Most probably it is Benson's subspecies *antarctica* but it is not possible to be sure of this without reference to the original specimens.

III. DISCUSSION AND CONCLUSIONS

THE relative abundance of the various species and the distribution of the individuals between the various instars is shown in Tables I and III. Adults account for 22 per cent of the total population and as might be expected the percentage of individuals that can be assigned to the various instars decreases from instar 8 (32·6 per cent) back to instar 4 (1·8 per cent). This decrease is probably more the expression of the factors governing processing of the sediment in the laboratory and picking than those controlling the preservation

TABLE III

DISTRIBUTION OF INDIVIDUALS RECOVERED FROM HALLEY BAY BETWEEN THE VARIOUS GROWTH STAGES

	Adult			*Instar 8*			*Instar 7*			*Instar 6*			*Instar 5*			*Instar 4*		
	L	R	C	L	R	C	L	R	C	L	R	C	L	R	C	L	R	C
Australicythere polylyca (Müller) 1908	13	14	20	63	69	1	49	59	1	33	34	2	12	15	—	9	2	—
Xestoleberis rigusa Müller 1908	17	13	—	17	26	—	15	19	—	6	5	—	2	3	—	1	—	—
Patagonacythere devexa (Müller) 1908	5	10	4	16	24	—	9	18	—	9	8	—	5	8	—	2	1	—
Loxoreticulatum fallax (Müller) 1908	14	12	4	Juvenile valves—32 left, 32 right, 1 carapace; not differentiated														
Cativella bensoni sp. nov.*	5	5	1	12	9	—	6	10	—	5	5	—	4	4	—	—	—	—
Sclerochilus meridionalis Müller 1908	2	3	—	7	6	—	9	7	—	2	1	—	—	—	—	—	—	—
Cytheropteron gaussi Müller 1908	8	4	—	4	4	—	4	4	—	—	—	—	—	—	—	—	—	—
Cytheropteron abyssorum Brady 1880	7	2	—	4	3	—	2	3	—	1	1	—	—	—	—	—	—	—
Sclerochilus reniformis Müller 1908	3	5	—	5	3	—	2	4	—	—	1	—	—	—	—	—	—	—
Robertsonites antarcticus sp. nov.	—	4	—	7	1	—	3	3	—	—	—	—	—	—	—	1	—	—
Hemicytherura irregularis (Müller) 1908	4	3	—	6	—	2	2	2	—	—	—	—	—	—	—	—	—	—
Loxocythere frigida sp. nov.	2	2	—	1	4	—	3	—	—	—	—	—	—	—	—	—	—	—
Pseudocythere cf. *P. caudata* Sars 1866	3	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Antarcticythere laevior (Müller) 1908	2	—	—	—	3	—	1	2	—	—	—	—	—	—	—	—	—	—
Macrocypris cf. *M. similis* Brady 1880	2	3	—	1?	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hemicytherura anomala (Müller) 1908	3	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Paradoxostoma hypselum Müller 1908	2	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Xestoleberis setigera Brady 1880	—	—	1	1	1	—	—	—	—	—	2	—	—	—	—	—	—	—
Copytus elongatus Benson 1964	—	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sclerochilus antarcticus Müller 1908	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
Bradleya cf. *B. dictyon* Brady 1880	—	—	—	1	—	—	1	1	—	—	—	—	—	—	—	—	—	—
Cytheropteron antarcticum Chapman 1916	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bairdia labiata (Müller) 1908	1?	—	—	—	—	—	1?	—	—	—	—	—	—	—	—	—	—	—
Myrena meridionalis (Müller) 1908	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Xiphichilus gracilis (Chapman) 1915	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Bythoceratina dubia (Müller) 1908	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	83	85	29	145	154	3	107	132	1	56	57	2	23	30	—	13	3	—
	197			302			240			115			53			16		
Percentage	21·3			32·6			26·0			12·5			5·8			1·8		
Loxoreticulatum fallax (Müller) 1908	14	12	4	65 Juveniles														
	97	97	33															
* + 2 fragments				+ 2 fragments														
Total	227 adults			793 juveniles														
OVERALL TOTAL	1,020																	

L Left valve.
R Right valve.
C Carapace.

at Halley Bay. The growth graphs of different species (Figs. 6, 10 and 12) show that the moult stages are well separated, indicating that they belong to one population, but material is only really adequate for the construction of such graphs in the case of the five or six more abundantly represented species. As with the most closely comparable faunas, a few species dominate the fauna—in this case *Australicythere polylyca* makes up no less than 39 per cent of the individuals recovered, followed by *Xestoleberis rigusa* (12 per cent), *Patagonacythere devexa* (12 per cent), *Loxoreticulatum fallax* (9 per cent) and *Cativella bensoni* (7 per cent); these five species together comprise 77 per cent of the fauna.

At "Gauss station" Müller found the commonest species with their percentage abundance (for my estimations, see note on Table IV) were *L. fallax* (20 per cent), *Hemicytherura irregularis* (12 per cent), *Macrocypris turbida* (8 per cent), *A. polylyca* (6 per cent), *Xestoleberis meridionalis* (6 per cent), *Bairdia labiata* (6 per cent), *Pseudocythere similis* (6 per cent) and *Sclerochilus reniformis* (6 per cent), these eight species accounting for about 70 per cent of the fauna. In the Ross Sea and McMurdo Sound, Benson found that *P. devexa* (42 per cent) was by far the commonest species, *A. polylyca* being second with 21 per cent of the individuals, then *Xestoleberis* sp. (17 per cent) followed at a considerable remove by *L. fallax* (5 per cent) and *Patagonacythere longiducta antarctica* (5 per cent), these five species making up 90 per cent of the fauna recorded.

In all these faunas *A. polylyca* and *L. fallax* are present and they form an important element, while also present in all three but of varying importance are *P. devexa*, *Xestoleberis rigusa* and the same species of *Pseudocythere* (see systematic descriptions for a full discussion of the last two).

At Halley Bay ten species (38 per cent) out of 26 are represented by five specimens or less, a similar situation prevailing at "Gauss station"—20 species (53 per cent) out of 38, and in McMurdo Sound and the Ross Sea—four species (31 per cent) out of 13.

The proportions of males to females is fairly uniform in most groups where enough information is available. In *L. fallax* (11 males out of 30 adults), *C. bensoni* (four males out of 11 adults), *A. polylyca* (18 out of 47) and *P. devexa* (seven out of 19) the proportion of males in the total adult population was about one-third. This is also the case in the Cytherurini where six specimens of *H. anomala* contain two males and four females, and out of seven adult *H. irregularis* two again are male. On the other hand, all 30 specimens of adult *X. rigusa* were female, and the single adult of *X. setigera* was also a female.

There appeared to be no significant difference between the numbers of left and right valves recovered (Table III). There were, however, few carapaces and the absence of limbs and soft parts was disappointing.

Faunal regions or realms

These have been reviewed by Ekman (1953). The Antarctic, where the shelf region has surface water temperatures of 0°C or below all the year round, is much more easily separated from the contiguous anti-boreal (= sub-Antarctic = cold temperate) region than the Arctic, since the shelf (averaging 200 fathoms (366 m.) near the ice front) is not continuously connected with any temperate shelf, and can be regarded as bounded by the Antarctic Convergence. This is the northern boundary of Antarctic surface water which sinks below warmer and lighter water, the boundary lying generally at about lat. 50°S. but reaching down to lat. 60°S. in the South American area and south of New Zealand. It thus includes the Antarctic continent, the South Shetland Islands, South Orkney Islands, South Georgia and the South Sandwich Islands, Bouvetøya and Heard Island. Comparable with this region as regards temperature are the deeper parts of the contiguous oceans, Brady's "abyssal region" below 1,500 fathoms (2,745 m.).

South Georgia, which has water temperatures of 2° to 3°C in February–March (the warmest time of the year), can be separated off from the rest of Antarctica as the low Antarctic compared with the high Antarctic. In South Georgia 21 per cent of the echinoderms and 22 per cent of the fish are endemic, but 64 per cent of the echinoderms and 69 per cent of the fish are found in the high Antarctic, to which it is much more closely related than to anti-boreal South America which has only 32 per cent of the South Georgia echinoderms and 13 per cent of the fish.

Iles de Kerguelen lie on the Antarctic Convergence and may be considered separately.

Northwards lies the anti-boreal region, which is defined to the north by the Subtropical or Anti-boreal Convergence lying mainly between lat. 38° and 40°S. with winter surface temperatures of 10–12°C. This region includes the Falkland Islands and southern South America (the Magellan fauna of some authors) on the one hand, and the South Island of New Zealand (Forsterian Province), Chatham Islands (Moriorian Province) and the sub-Antarctic islands—Auckland, Campbell and Macquarie Islands (the

TABLE IV

SPECIES PRESENT AT "GAUSS STATION" (MÜLLER, 1908), ROSS SEA AND McMURDO SOUND (BENSON, 1964), AND HALLEY BAY WITH THEIR RELATIVE ABUNDANCE

	"Gauss station" (Müller, 1908)		*Ross Sea and McMurdo Sound (Benson, 1964)*		*Halley Bay*	
	Number	*Percentage**	*Number*	*Percentage*	*Number*	*Percenta*
Bairdia labiata (Müller) 1908	f.c.	6	—	—	2	<1
Macrocypris inaequalis Müller 1908	3?	<1	—	—	—	—
Macrocypris tensa Müller 1908	1?	<1	—	—	—	—
Macrocypris turbida Müller 1908	58	8	—	—	—	—
Macrocypris cf. *M. similis* Brady 1880	—	—	—	—	6	<1
Pontocypris inflata Müller 1908	5	<1	—	—	—	—
Anchistrocheles aculeata Müller 1908	11	2	—	—	—	—
Bythocypris sp. Müller 1908	1?	<1	—	—	—	—
Xiphichilus gracilis (Chapman) 1915	—	—	—	—	1	<1
Paradoxostoma antarcticum Müller 1908	3	<1	10	1	—	—
Paradoxostoma hypselum Müller 1908	9	<1	4	<1	5	<1
Paradoxostoma sp. Müller 1908	1	<1	—	—	—	—
Sclerochilus antarcticus Müller 1908	12	2	—	—	3	<1
Sclerochilus compressus Müller 1908	5	<1	—	—	—	—
Sclerochilus meridionalis Müller 1908	10	1	—	—	37	4
Sclerochilus reniformis Müller 1908	f.c.	6	—	—	23	2
Antarcticythere laevior (Müller) 1908	1	<1	—	—	8	<1
Bythoceratina dubia (Müller) 1908	1	<1	—	—	1	<1
Pseudocythere similis Müller 1908	ca.40	6	—	—	—	—
Pseudocythere sp. aff. *P. caudata* Sars 1866	—	—	10	1	—	—
Pseudocythere cf. *P. caudata* Sars 1866	—	—	—	—	10	1
Xestoleberis meridionalis Müller 1908	ca.40	6	—	—	—	—
Xestoleberis rigusa Müller 1908	34	5	—	—	124	12
Xestoleberis setigera Brady 1880	—	—	—	—	5	<1
Xestoleberis sp. Benson 1964	—	—	120+	17	—	—
Myrena meridionalis (Müller) 1908	4	<1	—	—	1	<1
Loxoreticulatum fallax (Müller) 1908	c.	20	35	5	95	9
Cytherura notalis Müller 1908	1	<1	—	—	—	—
Eucytherura ? *antarctica* Müller 1908	3	<1	—	—	—	—
Eucytherura punctata Müller 1908	4	<1	—	—	—	—
Semicytherura sp. aff. *S. costellatum* (Brady) 1880	—	—	24	3	—	—
Hemicytherura anomala (Müller) 1908	5	<1	—	—	6	<1
Hemicytherura irregularis (Müller) 1908	ca.100	12	—	—	19	2
Cytheropteron abyssorum Brady 1880	—	—	—	—	23	2
Cytheropteron antarcticum Chapman 1916*a*	—	—	—	—	2	<1
Cytheropteron gaussi Müller 1908	22	3	—	—	28	3
Cytheropteron stationis Müller 1908	35	5	—	—	—	—
Cytherois ovalis Müller 1908	6	<1	—	—	—	—
Cytherois minor Müller 1908	2	<1	—	—	—	—
Paracytherois similis Müller 1908	3	<1	—	—	—	—
Paracytherois vanhoffeni Müller 1908	3	<1	—	—	—	—
Paracytherois parallela Müller 1908	3	<1	—	—	—	—
Paracytherois larvae (2 species) Müller 1908	2	<1	—	—	—	—
Microcythere frigida Müller 1908	7	1	—	—	—	—
Copytus elongatus Benson 1964	—	—	5	<1	4	<1
Krithe sp. Benson 1964	—	—	1	<1	—	—
Loxocythere frigida sp. nov.	—	—	—	—	12	1
Cativella bensoni sp. nov.	—	—	1	<1	68	7
Robertsonites antarcticus sp. nov.	—	—	—	—	19	2
Australicythere polylyca (Müller) 1908	f.c.	6	150	21	396	39
Bradleya cf. *B. dictyon* (Brady) 1880	—	—	—	—	3	<1
Hemicythere sp. aff. *H. kerguelenensis* Brady 1880	—	—	11	2	—	—
Patagonacythere devexa (Müller) 1908	4+larvae	1?	300	42	119	12
Patagonacythere longiducta antarctica Benson subsp. 1964	—	—	35	5	—	—
TOTAL INDIVIDUALS	About 700		About 706		1,020	

* For purposes of calculation of percentages of individuals at "Gauss station" arbitrary figures have been assumed for Müller's rema "fairly common" (f.c.) against three species, and in the case of *L. fallax* noted as "the commonest" (c.), due regard being paid to the inter evidence contained in a careful reading of his text. In this case the percentages should be regarded as indicative rather than mathematically exa

Rossian Province), on the other. Farther north still, in the subtropical area, lie South Africa, the mainland of Australia and the North Island of New Zealand.

More recently Benson (1965) has listed ostracods from 11 biogeographic realms in the Pacific Ocean as well as a cosmopolitan group.

Comparisons with high Antarctic faunas

The faunas described by Müller (1908) and Benson (1964) have already been mentioned many times, and with 26 species the Halley Bay fauna is intermediate between the 38 species (four under open nomenclature) of "Gauss station" and the 13 species (six left under open nomenclature) of McMurdo Sound.

16 of the Halley Bay species (62 per cent) are species recorded by Müller (42 per cent of his fauna) over 2,000 miles (3,220 km.) away at "Gauss station", assuming for this purpose the equivalence of *Pseudocythere* cf. *caudata* of this paper and the *P. similis* of Müller. Again, eight of the species found by Benson (62 per cent of his species) about 1,500 miles (2,415 km.) away are represented at Halley Bay, forming 31 per cent of the present fauna, again assuming the equivalence of my *Pseudocythere* cf. *P. caudata* with his Ross Sea *P.* sp. aff. *P. caudata* and that some, if not all, of Benson's *Xestoleberis* sp. belong in *X. rigusa* (p. 17).

Other high Antarctic faunas are either poorly known or difficult to compare. In the latter category the fauna dealt with by Scott (1912) from the South Orkney Islands 950 miles (1,530 km.) away is particularly tantalizing. His specimens have not been traced after extensive search and his figures leave much to be desired. His new *Cythere ornata* is clearly *Hemicytherura anomala* (p. 22) and his *Cythere foveolata* is part of the *Loxoreticulatum foveolatum—L. fallax* plexus (p. 21), whilst his new *Cythere latibrosa* is probably to be placed in *A. polylyca* and his new *Cythere quadridens* in *P. devexa*. His *Cythere peregrina*, also a new species, bears some resemblance to *Antarcticythere laevior* (Müller) in dorsal view and it is just possible that they are synonyms. His *Paradoxostoma antarcticum* sp. nov. is not found at Halley Bay and it is a junior homonym of *P. antarcticum* Müller 1908; in consequence the South Orkney Islands species has recently been re-named *P. scotti* by Hartmann (1962, p. 216). Scott's other six new species still require even provisional interpretation.

The fauna from the first Expédition Antarctique Française, 1903–05, described by Daday (1908) is of no help for comparative purposes. Of the three species described, two are new species placed in the myodocopid genus *Philomedes*, the third is the new *Cythereis bouvieri*, a *Hemicythere* probably identical with Benson's from McMurdo Sound but not present at Halley Bay. Similarly, the fauna from the Deuxième Expédition Antarctique Française, 1908–10, also has more in common with McMurdo Sound than Halley Bay. Only one of the three species described by Daday (1913), *Paradoxostoma gaini* (probably = *P. hypselum* Müller; p. 9), is probably present in the Weddell Sea at Halley Bay. His *Cythereis consors* is another *Hemicythere* close to the preceding "*Cythereis*" *bouvieri*, whilst his *Cythereis devexa* Müller is *Patagonacythere longiducta* (Skogsberg), probably Benson's subspecies *antarctica*.

In 1916 Chapman described the faunas in upthrust muds in two areas on the other side of Antarctica (1916*a*, *b*) as well as a recent fauna from soundings in the Ross Sea (1916*c*). His fauna of five ostracods from muds above Drygalski Glacier, south-east of Mount Larsen, shows a great correspondence with the present one. *Cytheropteron antarcticum* was first described from here, *Loxoreticulatum foveolatum* or *L. fallax* occurs (as *Cythere foveolata*), *P. devexa* is present (as *Cythere parallelogramma*), whilst the valves called *Cytherideis laevata* Brady are probably correctly assigned to Brady's species but may be *Copytus elongatus* Benson. Chapman's *Pontocypris reniformis* Brady needs re-investigation and it is the only species which apparently shows no relationship with the present fauna.

The Ostracoda from the elevated deposits on the slopes of Mount Erebus (Chapman, 1916*b*) show an analagous close similarity. Of the eight species noted by Chapman, "*Cythere foveolata*" and "*Cythere parallelogramma*" have been dealt with above, his *Cythere normani* Brady is *A. polylyca* (Müller) and his *Cythere polytrema* Brady is *Cativella bensoni* sp. nov. Of his remaining species, *Cytherura costellata* Brady appears to be the same as the form found by Benson in McMurdo Sound, whilst *Bairdia victrix* Brady may be the same as Müller's *Nesidea labiata* but it cannot be interpreted at present. The true standing of *Xestoleberis davidiana* and *Loxoconcha mawsoni* is also impossible to assess without recourse to the original material. It is clear, however, that at least 50 per cent of Chapman's fauna is present in the Halley Bay area, and the percentage may well be higher.

From the Ross Sea, Chapman (1916*c*) recognized 11 podocopid species, many of them difficult to interpret. Of species already noted, "*Cythere foveolata*" and "*Cythere normani*" occur, whilst in addition "*Cythere davisi*" (also = *A. polylyca*) and *Xestoleberis setigera* also occur both here and in the present fauna. The other seven species are not clear, although the specimen assigned to *Cytherura obliqua* Brady (Chapman, 1916*c*, pl. VI, fig. 50) may turn out to be *Hemicytherura irregularis* (Müller). The conclusion reached is that about 40 per cent of Chapman's Ross Sea forms occur at Halley Bay (compare this with 62 per cent of Benson's fauna from the same general area).

The material from the Australasian Antarctic Expedition, 1911–14, was also described by Chapman (1919) and it covered a wide range of stations, ranging from off Tasmania and South Australia to the high Antarctic close to Müller's "Gauss station" and almost mid-way between there and the Ross Sea (Fig. 1). Of the 118 samples only 27 contained Ostracoda and only 11 of these came from positions higher than lat. 63°S. Between lat. 63° and 50°S. only one station (No. 74 at lat. 58°12′S., long. 146°47′E.) was dredged at a depth of 1,900 fathoms (3,475 m.) and yielded only one species, *Cythere dasyderma* Brady (cf. the isolated station of Benson (1964)). The 11 high-latitude stations yielded 39 species of Podocopida including *Cytheropteron armatum* var. *spinosa* (= *Bythoceratina dubia*), *Cytheropteron abyssorum*, *Cythere cristatella* (= *Robertsonites antarcticus*), *Cythere polytrema* (= *Cativella bensoni*) and *Cythere foveolata* whose affinities have already been discussed, and *Cythere dictyon* and *Pseudocythere caudata* whose affinities need no further discussion. Seven species are thus found at Halley Bay and, since Chapman assigned the *Paradoxostoma* and *Sclerochilus* to European species and since his *Cytheropteron assimile* is probably the same as *C. gaussi* Müller and his *Cytherura lilljeborgi* is probably *Hemicytherura irregularis* (Müller), the community of character between this fauna and the present one is probably greater than the figure of 18 per cent would suggest (cf. 42 per cent of Müller's fauna found at Halley Bay).

Benson (1965) listed 27 species in his Antarctic realm. Seven of these species were found in the present fauna but there are some notable absences from Benson's list and *Antarcticythere laevior*, *Cytheropteron gaussi* and *Myrena meridionalis* should certainly be included. The present author would also omit *Cythere lactea*, *C. moseleyi*, *C. normani* and *Bythocythere ilex* from any list of Antarctic species.

Comparisons with abyssal faunas

In his 1880 memoir on the *Challenger* ostracods, Brady covered 195 species of Podocopida. On p. 2 he listed the abyssal fauna found in 13 dredgings below 1,500 fathoms (2,745 m.). Only 19 species (two of them halocyprids which may have got in by mistake) occur in this cold environment and it seems significant that three of the Podocopida species or forms closely allied to them, namely *Cytheropteron abyssorum*, *Bradleya* cf. *B. dictyon* and *Pseudocythere* cf. *P. caudata* occur at Halley Bay.

A number of species recorded by Chapman (1915) from the deeper waters east of Tasmania are common to the two areas, notably *Cytheropteron abyssorum* (from 777 and 1,122 fathoms (1,420 and 2,055 m.)), *Pseudocythere caudata* (one valve from 100 fathoms (183 m.) but common at 777 fathoms (1,420 m.)) and *Xiphichilus gracilis* (777 fathoms; 1,420 m.). Probably also to be included are the species he listed as *Cythere dictyon* and *Cythere foveolata*. In the case of the former it is interesting to note that the shallower occurrence in 100 fathoms (183 m.) 40 miles (64 km.) south of Cape Wiles had stronger ornamentation than the deeper-water forms from 777 fathoms (1,420 m.). With the deeper-water faunas off Tasmania, the Halley Bay fauna has more in common than with the much nearer faunas of southern South America. In part this is to be attributed to the fact that most of the faunas described from the latter area have been much farther north than the Halley Bay faunas and in shallow, and hence warmer, water. Only the *Challenger* investigated the deeper waters of this area and the stations covered show that *Bradleya dictyon* was found not only at the deep-water stations 296, 300, 302 and 332 at depths ranging from 1,375 to 2,200 fathoms (2,515 to 4,025 m.) and bottom temperatures of 0·4° to 1·6°C, but also from the shallower-water stations 305 and 308 at 160 and 175 fathoms (290 and 320 m.), respectively. The only other comparable species in this area were *Pseudocythere caudata* from 1,900 fathoms (3,475 m.) (bottom temperature 0·0°C) at station 323, and *Macrocypris similis*, to which the Halley Bay *Macrocypris* was tentatively compared, from 160 fathoms (290 m.) at station 305. The isolated station of Benson (1964) of approximate depth 2,000 fathoms (3,660 m.) (Fig. 1), yielding the two species *Bradleya dictyon* and *Echinocythereis dasyderma*?, also belongs in the abyssal region.

Comparisons with low Antarctic faunas

The South Georgia fauna is only partially known from two papers by Skogsberg (1928, 1939) which dealt with a very limited group of forms. His 1939 paper dealt only with *Copytus caligula* which is most probably a synonym of Brady's *Cytherideis laevata* and does not occur at Halley Bay, where it is replaced by *Copytus elongatus*. In 1928 he described 21 new species together with a new variety of one of his new species belonging to the genus "*Cythereis*", from South Georgia, the Falkland Islands, Tierra del Fuego and California. The five Californian species are not considered further. It is curious that not one of the six South Georgia species occurs in the Falkland Islands or Tierra del Fuego, and that of the five species in the Falkland Islands only one also occurs in Tierra del Fuego. The latter area has five unique species, together with a new variety of one of the Falkland Islands species and *Procythereis radiata* which is common to both areas. This apparent isolation of three relatively closely situated areas has been somewhat modified recently by Hartmann's discovery of Skogsberg's *Cythereis frequens* in the Magellan Straits and the recognition by Benson (1964) that this is synonymous with Müller's *Cythereis devexa* from Antarctica. This is still the only species common to both Halley Bay and South Georgia (or for that matter South America), although Benson (1964) recognized a new subspecies of *Patagonacythere longiducta* (Skogsberg) in McMurdo Sound. More recently still Hulings (1966) has reported specimens resembling *Pseudocythereis spinifera* Skogsberg, previously only known from South Georgia, at shallow depths (9 to 20 fathoms; 16 to 37 m.) off the coast of Virginia, but their identity needs validating.

Comparisons with Iles de Kerguelen and Heard Island

In this area we are dependent on the faunas recorded by Brady (1880) from three stations (Nos. 149–151). Among his 32 species of Podocopida, *Bradleya dictyon*, *Pseudocythere caudata* and *Xestoleberis setigera* are represented or have obvious affinities with the fauna under description, the *Sclerochilus contortus* (Norman) from "Balfour Bay", Iles de Kerguelen (but not the specimen so listed from Heard Island) is Müller's *S. reniformis* and not Norman's species, and it also occurs at Halley Bay, as does *S. meridionalis* (listed in "Balfour Bay" as *Paradoxostoma abbreviatum* Sars), whilst the position of *Loxoreticulatum foveolatum* has already been fully discussed (p. 21). Whilst not identical, nevertheless *Hemicytherura lilljeborgi* (Brady) is not far removed from *H. irregularis* (Müller) (p. 23) and *Cytheropteron assimile* Brady is closely akin to *C. gaussi* Müller (p. 27). In addition, reference to Benson's work in McMurdo Sound shows further affinities if not identity in *Hemicythere kerguelenensis* (Brady) and *Semicytherura costellata* (Brady). As previously noted, Brady's *Cyprideis laevata* from off Heard Island would seem to be the same as the specimens from South Georgia called *Copytus caligula* by Skogsberg (1939) so that the trivial name of the latter should be suppressed.

Whilst obviously different in many respects, there is clearly more affinity between the Iles de Kerguelen—Heard Island fauna situated on the Antarctic Convergence and that of the high Antarctic, than between the latter and any other fauna so far described.

Comparisons with anti-boreal faunas

Other than with the abyssal faunas of the anti-boreal region, comparisons are unrewarding. With the anti-boreal faunas of South America the only common species seems to be *Patagonacythere devexa* recorded as *Aurila frequens* by Hartmann (1962) from the Magellan Straits area. None of the other species described by Hartmann (1962, 1965) or by Brady (1867–71) appear comparable.

With anti-boreal New Zealand, comparisons are almost equally unrewarding. The most southerly province, the Rossian, contains *Xestoleberis setigera* which is widely distributed up into the subtropical Auporian Province according to Hornibrook (1952). Restricted to the Rossian Province and adjoining Forsterian Province and not occurring farther north is *L. foveolatum*, whilst the identity of the form described as *Bradleya dictyon* by Hornibrook, and not recorded by him in the Rossian Province, has already been questioned (p. 41).

The subtropical region

The African continent lies north of the Subtropical Convergence and neither the species recorded by Brady (1880) or Müller (1908) show any relationship with Antarctica. In the case of the fauna of Benson and Maddocks (1964) the environment also differs in being estuarine. The Australian mainland and North Island of New Zealand also lie too far north to make comparison profitable.

From the foregoing discussion one may conclude that there is a distinct and easily recognizable high Antarctic fauna with a number of very characteristic species amongst which may be listed *Bythoceratina dubia*, *Myrena meridionalis*, *Cytheropteron gaussi*, *Xestoleberis rigusa*, *Cativella bensoni*, *Robertsonites antarcticus* and *Australicythere polylyca*. As far as is known, this fauna has only one species in common with the, admittedly poorly known, low Antarctic fauna of South Georgia and the anti-boreal fauna of southern South America. It is much more comparable with the fauna of the abyssal regions, Iles de Kerguelen and Heard Island, and the deeper waters east of Tasmania. These regions lie considerably farther away than South Georgia and it is clear that temperature is the principal control. Whilst the evidence must be regarded as tenuous until the ostracod faunas of South Georgia and the Tasmanian areas are known in more detail, and any conclusions put forward as speculative, the close kinship of the "Gauss station" and McMurdo Sound faunas suggest that distribution is controlled largely by the circum-polar East Wind Drift, the Antarctic Peninsula and the Scotia arc on the west side of the Weddell Sea acting as a barrier to the spread towards South America where the shelf waters and lower latitudes give higher temperatures inimical to this fauna.

In this connection, it is imperative that the South Orkney Islands and South Georgia ostracod faunas be examined and fully worked out, and the deep to the east and north of the South Sandwich Islands would seem of particular interest in this respect.

Conclusions

The main conclusions are summarized below:

i. 26 species of podocopid ostracods were present in a single bottom sample from Halley Bay in the Weddell Sea.

ii. The fauna corresponds well with that of Müller's "Gauss station", 42 per cent of whose species were represented, and Benson's McMurdo Sound fauna, 62 per cent of whose species were represented.

iii. The fauna is temperature controlled and it represents a well-defined cold-water high Antarctic fauna, characterized by species such as *Bythoceratina dubia*, *Myrena meridionalis*, *Cytheropteron gaussi*, *Xestoleberis rigusa*, *Cativella bensoni*, *Robertsonites antarcticus* and *Australicythere polylyca*.

iv. Diagnoses are given of the two new genera *Antarcticythere* and *Myrena*.

v. Three new species are present, namely *Loxocythere frigida*, *Cativella bensoni* and *Robertsonites antarcticus*.

vi. Evidence put forward establishes that the species *Pseudocythere caudata* and, in southern latitudes, a form that has so far not been satisfactorily differentiated from it, increases in size with increase in latitude.

vii. There is no significant difference in the incidence of left and right valves. Carapaces are rare.

viii. Plots of simple size measurements show that this is a single population.

ix. Where the number of specimens is sufficient, Trachyleberidinae, Hemicytherinae, Cytherurini and Loxoconchinae show a proportion of males to females of about one to two. In the genus *Xestoleberis* males were not recognized, the adult population apparently consisting entirely of females.

x. It is suggested that the distribution of the ostracod faunas is largely controlled by the East Wind Drift in conjunction with water temperature and that the Antarctic Peninsula and the Scotia arc act as a barrier to their spread into the South American area where shallow water and the lower latitudes come into play and produce a warmer and inimical environment.

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PLATE I

All material from Halley Bay except where stated. Magnification × 51.

a. *Pseudocythere* cf. *P. caudata* Sars 1866. Left valve (HU.13.R.12.42). External lateral view.

b. *Pseudocythere* cf. *P. caudata* Sars 1866. Right valve (HU.13.R.12.41). External lateral view.

c and c′. *Xestoleberis setigera* Brady 1880. Carapace (HU.13.R.12.79).
c. External view from left.
c′. Dorsal view.

d and d′. *Xestoleberis rigusa* Müller 1908. Left valve (HU.13.R.12.80).
d. External view.
d′. Ventral view.

e. *Pseudocythere caudata* Sars 1866. Carapace from left side. Scott's material from Franz Josef Land. Royal Scottish Museum. Lower middle specimen.

f. *Pseudocythere caudata* Sars 1866. Carapace from right side. Scott's material from Franz Josef Land. Royal Scottish Museum. Lowest specimen.

g. *Paradoxostoma hypselum* Müller 1908. Right valve (HU.13.R.12.75). External view.

h. *Myrena meridionalis* (Müller) 1908. Right valve (HU.13.R.12.48). External view.

i. *Loxoreticulatum fallax* (Müller) 1908. Female. Right valve (HU.13.R.12.59). External view.

j. *Loxoreticulatum fallax* (Müller) 1908. Male. Right valve (HU.13.R.12.57). External view.

k. *Paradoxostoma hypselum* Müller 1908. Left valve (HU.13.R.12.76). External view.

l. *Sclerochilus reniformis* Müller 1908. Right valve (HU.13.R.12.85). External view.

m. *Antarcticythere laevior* (Müller) 1908. Instar 7, right valve (HU.13.R.12.77). External view.

n. *Sclerochilus antarcticus* Müller 1908. Left valve (HU.13.R.12.78). External view.

o. *Antarcticythere laevior* (Müller) 1908. Penultimate instar, right valve (HU.13.R.12.95). External view.

p. *Antarcticythere laevior* (Müller) 1908. Adult left valve (HU.13.R.12.94). External view.

q and q′. *Copytus elongatus* Benson 1964. Carapace (HU.13.R.12.97).
q. From right.
q′. Dorsal view.

r and r′. *Copytus elongatus* Benson 1964. Carapace (HU.13.R.12.96).
r. From left.
r′. Dorsal view.

s and s′. *Macrocypris* cf. *M. similis* Brady 1880. Right valve (HU.13.R.12.91).
s. External lateral view.
s′. Dorsal view.

t. *Macrocypris* cf. *M. similis* Brady 1880. Left valve (HU.13.R.12.93). External lateral view.

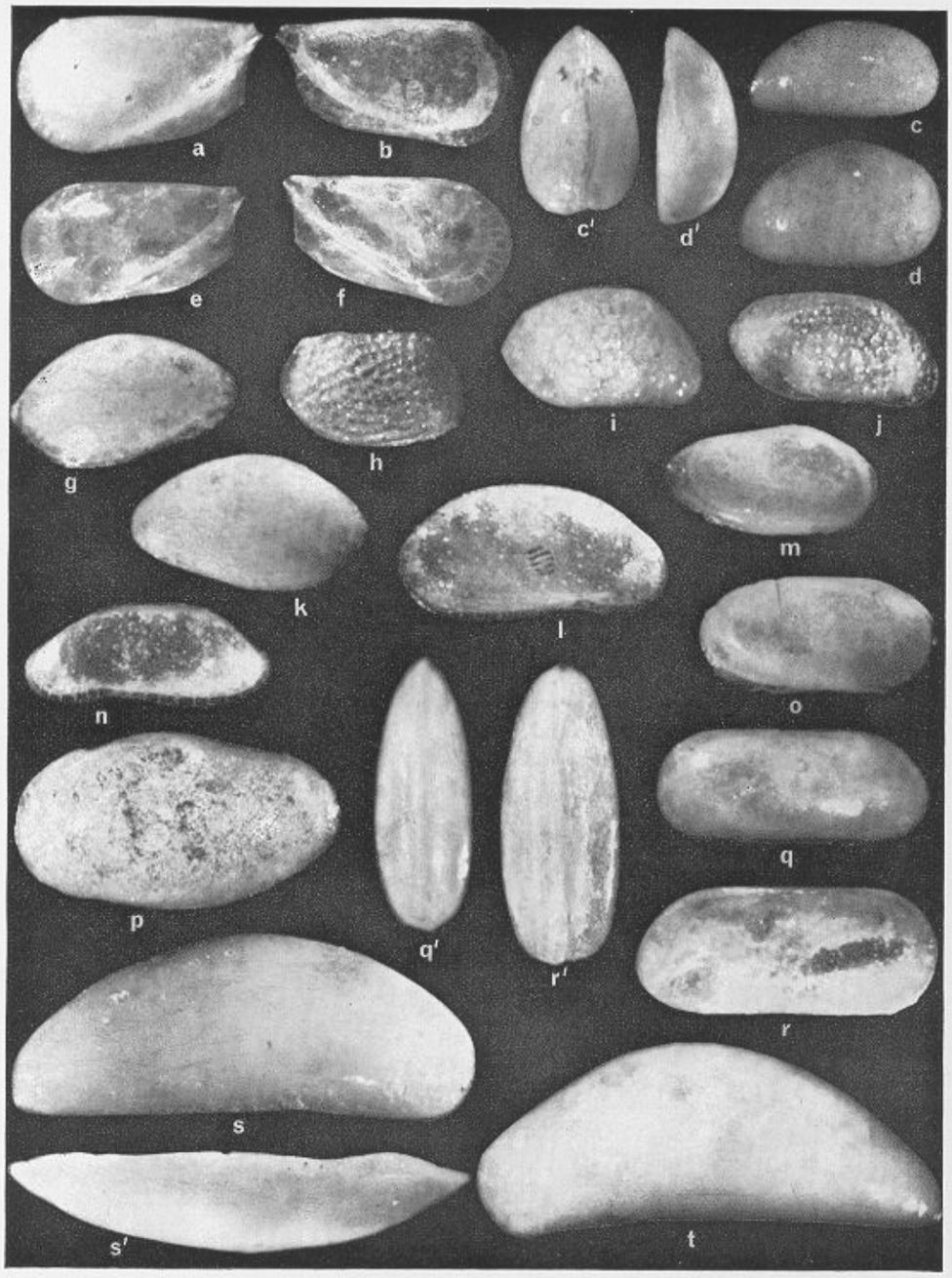
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PLATE II

All specimens from Halley Bay. Magnification ×70.

a. *Loxocythere frigida* sp. nov. Holotype. Adult right valve (HU.13.R.13.63). External lateral view.

b. *Loxocythere frigida* sp. nov. Paratype. Right valve, instar 8 (HU.13.R.13.43). External lateral view.

c. *Hemicytherura anomala* (Müller) 1908. Male right valve (HU.13.R.13.32). External lateral view.

d. *Hemicytherura irregularis* (Müller) 1908. Female left valve, instar 8 (HU.13.R.13.44). External lateral view.

e. *Hemicytherura irregularis* (Müller) 1908. Right valve, instar 7 (HU.13.R.13.45). External lateral view.

f. *Hemicytherura anomala* (Müller) 1908. Male left valve (HU.13.R.13.33). External lateral view.

g. *Hemicytherura irregularis* (Müller) 1908. Male left valve, instar 8 (HU.13.R.13.36). External lateral view.

h and h′. *Robertsonites antarcticus* sp. nov. Holotype. Adult right valve (HU.13.R.12.61).
h. External lateral view.
h′. Dorsal view.

i. *Hemicytherura anomala* (Müller) 1908. Female right valve (HU.13.R.13.31). External lateral view.

j. *Hemicytherura irregularis* (Müller) 1908. Adult female right valve (HU.13.R.13.47). External lateral view.

k and k′. *Robertsonites antarcticus* sp. nov. Paratype. Left valve, instar 8 (HU.13.R.12.63).
k. External lateral view.
k′. Dorsal view.

l and l′. *Robertsonites antarcticus* sp. nov. Paratype. Adult right valve (HU.13.R.12.62).
l. External lateral view.
l′. Dorsal view.

m and m′. *Bythoceratina dubia* (Müller) 1908. Left valve (HU.13.R.12.46).
m. External lateral view.
m′. Dorsal view.

n and n′. *Cytheropteron antarcticum* Chapman. Right valve (HU.13.R.12.68).
n. External lateral view.
n′. Dorsal view.

o and o′. *Cytheropteron antarcticum* Chapman. Left valve (HU.13.R.12.67).
o. External lateral view.
o′. Dorsal view.

p and p′. *Cytheropteron gaussi* Müller 1908. Right valve (HU.13.R.12.70).
p. External lateral view.
p′. Dorsal view.

q and q′. *Cytheropteron gaussi* Müller 1908. Left valve (HU.13.R.12.71).
q. External lateral view.
q′. Dorsal view.

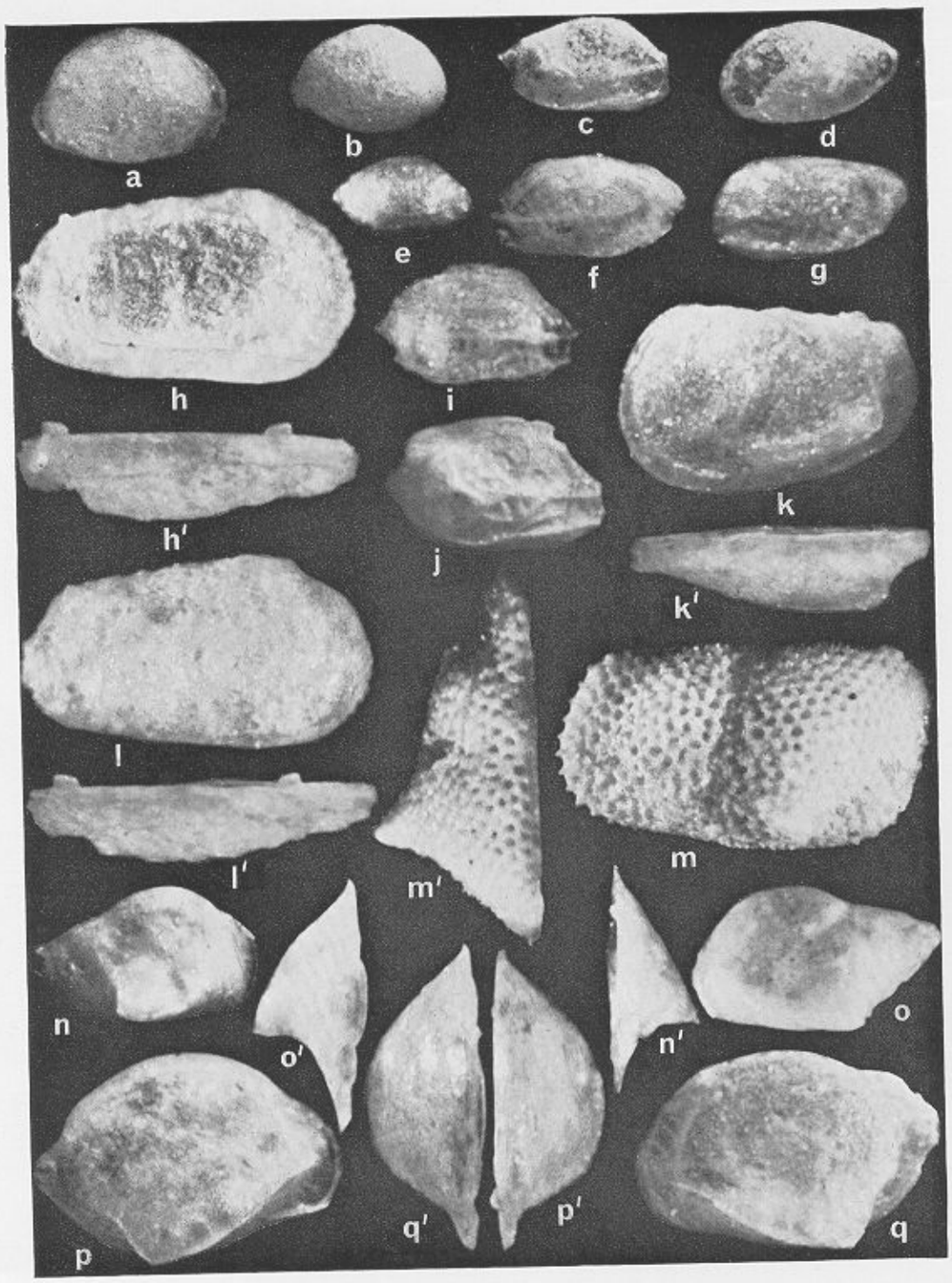
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PLATE III

All specimens from Halley Bay. Magnification ×68.

a. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 6 (HU.13.R.12.4). External lateral view.

b. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 7 (HU.13.R.12.3). External lateral view.

c and c′. *Patagonacythere devexa* (Müller) 1908. Male carapace. Adult (HU.13.R.12.31).
c. From right.
c′. Dorsal view.

d. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 8 (HU.13.R.12.2). External lateral view.

e. *Patagonacythere devexa* (Müller) 1908. Female right valve. Adult (HU.13.R.12.32). External lateral view.

f, f′ and f″. *Cativella bensoni* sp. nov. Holotype. Female carapace. Adult (HU.13.R.12.1).
f. From left.
f′. From right.
f″. Ventral view.

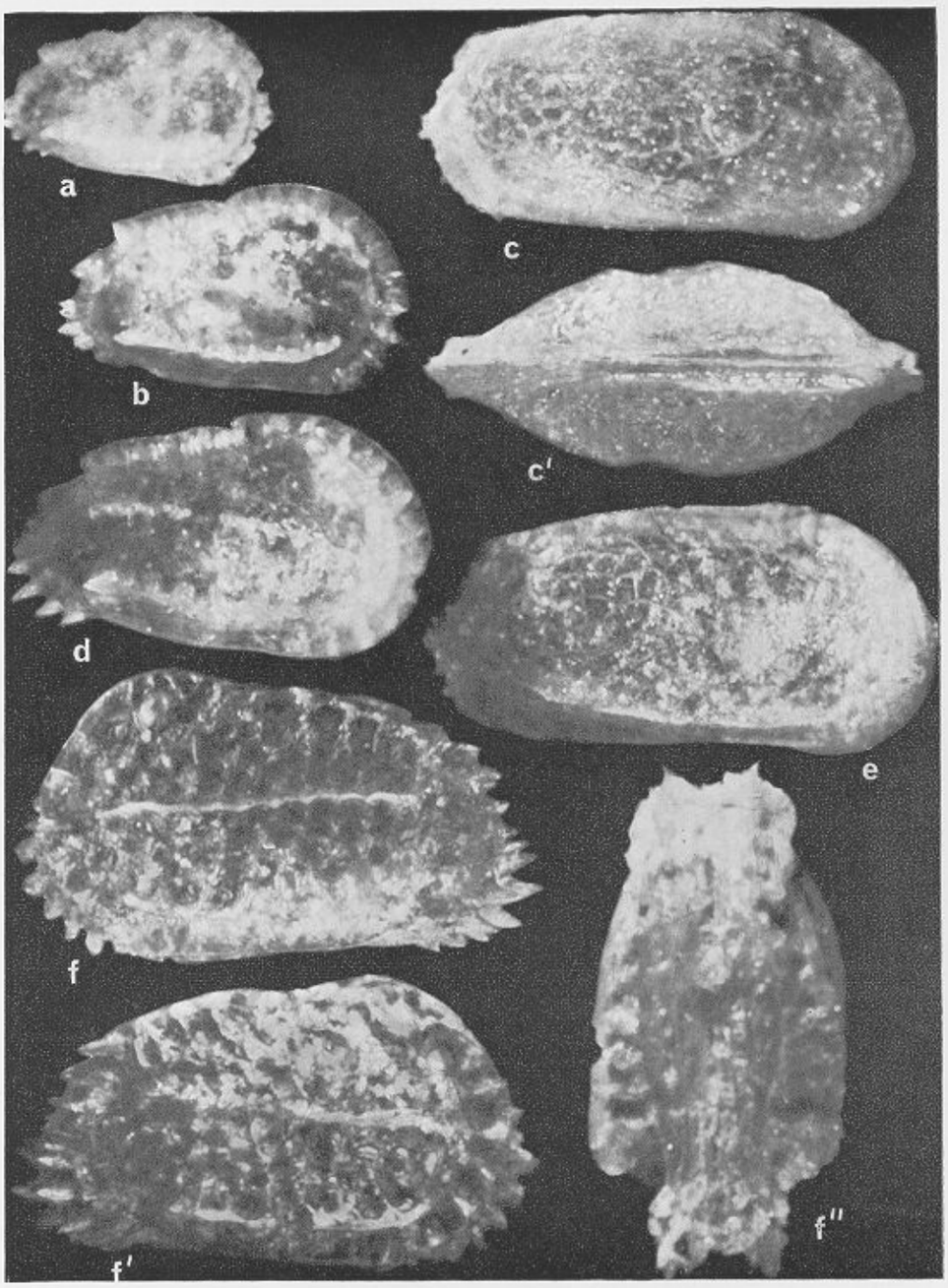
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PLATE IV

All specimens from Halley Bay. Magnification $\times 55 \pm 5$.

a and a′. *Cytheropteron gaussi* Müller 1908. Right valve (HU.13.R.12.72).
a. External.
a′. Dorsal view.

b and b′. *Loxoreticulatum fallax* (Müller) 1908. Female left valve (HU.13.R.12.60).
b. Lateral.
b′. Dorsal view.

c. *Loxoreticulatum fallax* (Müller) 1908. Juvenile right valve (HU.13.R.12.58). External lateral view.

d. *Sclerochilus meridionalis* Müller 1908. Left valve, penultimate instar (HU.13.R.12.43). External view.

e. *Australicythere polylyca* (Müller) 1908. Right valve, instar 6 (HU.13.R.12.21). External lateral view.

f. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 8 (HU.13.R.12.6). Ventral view.

g. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 8 (HU.13.R.12.2). External lateral view.

h and h′. *Cativella bensoni* sp. nov. Paratype. Right valve, instar 7 (HU.13.R.12.5).
h. External lateral view.
h′. Dorsal view.

i. *Patagonacythere devexa* (Müller) 1908. Right valve, instar 6 (HU.13.R.12.33). External lateral view.

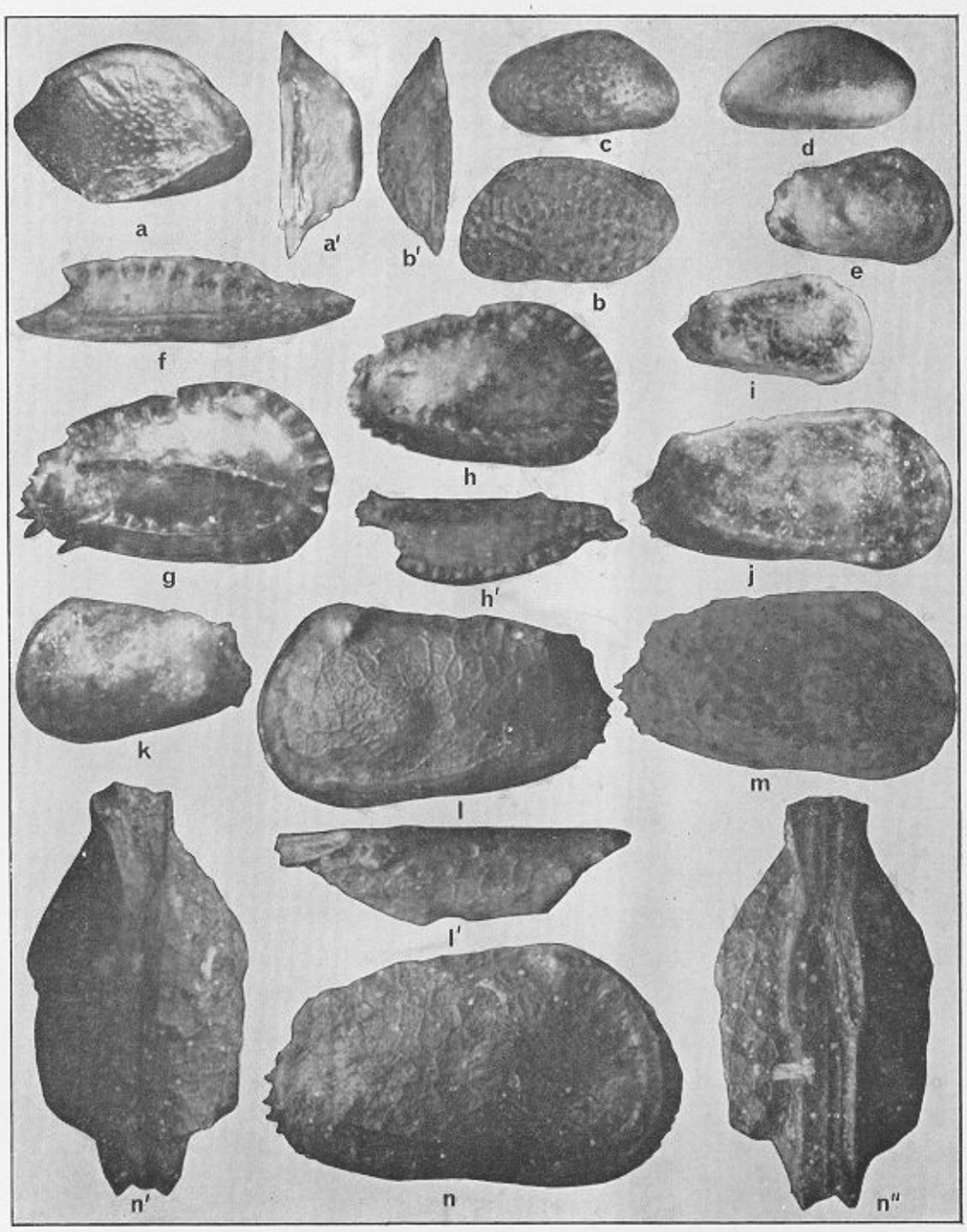
j. *Patagonacythere devexa* (Müller) 1908. Right valve, instar 8 (HU.13.R.12.34). External lateral view.

k. *Australicythere polylyca* (Müller) 1908. Left valve, instar 7 (HU.13.R.12.22). External lateral view.

l and l′. *Australicythere polylyca* (Müller) 1908. Left valve, instar 8 (HU.13.R.12.23).
l. External lateral view.
l′. Dorsal view.

m. *Australicythere polylyca* (Müller) 1908. Right valve, instar 8 (HU.13.R.12.24). External lateral view.

n, n′ and n″. *Australicythere polylyca* (Müller) 1908. Carapace. Adult (HU.13.R.12.25).
n. From right.
n′. Dorsal view.
n″. Ventral view.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