G. Distribution of the marine Asellota

As part of the evaluation of the bathymetrical and regional distribution of bathyal and abyssal Asellota, it was found important to compare the requirements of the deep-sea forms, regarding distribution and temperature, to those of the littoral asellotes. However, a monographic compilation of the entire tribe of Asellota is an undertaking not previously attempted. GURJANOVA (1933b) gave a survey of the occurrence and depth records of the Arctic and Subarctic marine isopods and a similar survey was compiled by NIERSTRASZ (1941) for the Indo-Pacific isopods. There are many misprints in distribution data in the former paper, and the latter paper is by no means complete. In the depth records of both papers the conversions from fathoms to metres are almost all incorrect. Recently, MENZIES (1962b) diagnosed most of the abyssal Atlantic isopods and will discuss their distribution at a later date.

A compilation of the distribution, etc. of all the subspecies, species, and genera of marine asellotes (Stenetrioidea, Parastenetrioidea, and Paraselloidea) is presented in Tables 18 and 20, and the following considerations on bathymetrical and regional distribution and temperature requirements are based on these data.

Explanation to Table 18

Names. The scientific names are based on all the descriptions and later revisions that I am familiar with (including those in the Systematic Part of the present paper). In some cases, suggestions to alter names have *not* been followed. It was found unnecessary to include the first description of all the species mentioned in Table 18, and all the genera in Table 20 in the list of references.

Geographic distribution. This is indicated by reference to geographical names of islands, states, continents, etc. rather than to specified areas of the oceans or by indications of the longitude and latitude (except in a few species occurring far from land). The more northern and western occurrences are mentioned first. In several widely distributed species (especially from the Arctic Ocean and North Atlantic) only localities furthest to points N.W., N.E., S.W., and S.E. have been given.

Depth. For the sake of conformity and comparison with a similar survey of the genera (Table 20) it was found necessary to use, for all species, the exact depths of 4 m, 200 m, 2000 m, and 6000 m as limits between the generally recognized depth zones: eulittoral, sublittoral, bathyal, abyssal, and hadal (cf. p. 16 and p. 271).

Temperature. The temperature records have been derived from many sources. In only very few cases has the temperature been given by the author who described or mentioned the species in question. However, by scanning the station lists of the various expeditions it was sometimes possible to find a record of the temperature;[1] even if records older than some 50 years are not always reliable they should be exact enough for biological purposes. In the majority of cases it was necessary to acquire information on temperatures from hydrographical data of other expeditions, etc., working in the same or an adjacent area.

Where more temperature records over a succession of years were available, the maximum and minimum temperatures or the maximum and minimum mean temperatures have been chosen. For species recorded from one locality only and occurring on the shelf (littorally), the range between the average summer and winter temperatures is given. For species known from more than one locality, the minimum and maximum temperatures are listed. For all species occurring at moderate depths and recorded from more than one locality, the highest possible temperature for the coldest month is also given (in parenthesis).[2] *(Text continued p. 270).*

1. It goes without saying that, if at all possible, information on temperature (and other data of ecological significance) should always be given by the author.
2. Temperature records were taken from the following sources: Navy Hydrographic Office (1958); USSING (1934); RIIS-CARSTENSEN (1936); KNUDSEN (1899); Meteorological Office (1949); NYBELIN (1951); BÖHNECKE & DIETRICH (1951); Koninklijk Nederlands Meteorologisch Institut (1957); NIELSEN (1912); ZENKEVICH (1957); WÜST & DEFANT (1936); SCHOTT (1926); SEWELL (1935); POSTMA (1958); VAN RIEL (1956); WOOSTER & VOLKMANN (1960); Japan Meteorological Agency (1959); Department of Oceanography, University of Washington (1956); Scripps Institution (1949, 1956, 1960); GUNTHER (1936); BRATTSTRÖM & DAHL (1951); SCHOTT (1935); Discovery Reports, Lists of Stations; DEACON (1937); DRYGALSKI (1927); MACKINTOSH (1946); SCHOTT (1902); U. S. Navy Hydrographic Office (1944, 1957); SCHMIDT (1929); THOMSEN (1937); SVERDRUP *et al.* (1942); BRUNS (1958). (The latter contains useful examples of hydrographic data from sea areas around the Russian coasts, these data being originally published in Russian Journals which were not available). – Moreover, Mr. JENS SMED of the Hydrographic Office who also helped with references, placed the large index of data from the North Atlantic area at my disposal.

Table 18. Regional and bathymetrical distribution, range of temperature, length of body, and number of finds of all species and subspecies of Asellota (excl. of Aselloidea), arranged strictly according to depth limits. * Indicates species which it would be more natural to range in other depth zones (cf. the lists p. 271). For further explanation, see p. 248.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities

I. STENETRIOIDEA

A. 0-4 METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
1	*Stenetrium armatum* Haswell, 1881	S. E. Australia	Eulitt.	*16-24*	5.2	2
2	*Stenetrium bartholomei* Barnard, 1940	S. Africa	Eulitt.	*15-23*	6.5; 5.5	2
3	*Stenetrium crassimanus* Barnard, 1914	S. Africa	Eulitt.	*15-21*	7	3
4	*Stenetrium diazi* Barnard, 1920	S. Africa	Eulitt.	*15-21*	5; 6	2
5	*Stenetrium entale* Nordenstam, 1946	Gilbert Is.	Eulitt.	*28*	4.5	1
6	*Stenetrium fractum* Chilton, 1883	S. New Zealand	Eulitt.	*10-16*	4.2	1
7	*Stenetrium gilbertense* Nordenstam, 1946	Gilbert Is.	Eulitt.	*28*	4.9	2
8	*Stenetrium glauerti* Nicholls, 1929	W. Australia	Eulitt.	*18-22*	5	1
9	*Stenetrium hanseni* Nobili, 1906	Tuamotu Is.	Eulitt.	*26-26.5*	5	1
10	*Stenetrium macrochirum* Nicholls, 1929	W. Australia	Eulitt.	*19-23*	5.9	1
11	*Stenetrium medipacificum* Miller, 1941	Hawaii	Eulitt.	*23.5-25.5*	3.6	4
12	*Stenetrium monodi* Nordenstam, 1946	Gulf of Suez	Eulitt.	*23.5-26.5*	–	1
13	*Stenetrium occidentale* Hansen, 1905	W. Indies	Eulitt.	*26-28*	3.3	1
14	*Stenetrium proximum* Nobili, 1907	Tuamotu Is.	Eulitt.	*26-26.5*	3	1
15	*Stenetrium serratum* Hansen, 1905	W. Indies	Eulitt.	*26-28*	6	1
16	*Stenetrium spinirostrum* Nicholls, 1929	W. Australia	Eulitt.	*18-22*	7	1
17	*Stenetrium stebbingi* Richardson, 1902	Bermudas	Eulitt.	*18.5-27*	–	3
18	*Stenetrium syzygus* Barnard, 1940	S. Africa	Eulitt.	*14.5-21*	6	1
19	*Stenetrium truncatum* Nicholls, 1929	W. Australia	Eulitt.	*18-22*	5.5	1
20	*Stenetrium chiltoni* Stebbing, 1905	Ceylon; Amirante Is.; Gilbert Is.	0-62	*21-28*	4.5	4

B. ?0-200 METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
21	*Stenetrium antillense* Hansen, 1905	W. Indies	? < 200	*?20-25*	4.5	1

C. 4-200 (20-110) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
22	*Stenetrium euchirum* Nobili, 1906	Tuamotu Is.	20	*26*	–	2
23	*Stenetrium longicorne* (Lucas, 1849)	W. Mediterranean; Atlantic Morocco	23-110	*13-18*	6; 5.5	*c.* 20
24	*Stenetrium siamense* Hansen, 1905	Gulf of Siam	28-72	*26-30*	4	2

D. 4-6000 (150-3400) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
25*	*Stenetrium acutum* Vanhöffen, 1914	Antarctic Indian Ocean	150-3397	*—1.8-0.7*	11; 8	3

E. 200-2000 (230-1100) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
26	*Stenetrium dagama* Barnard, 1920	S. Africa	348-421	*3.5-8*	7.5	2
27	*Stenetrium dalmeida* Barnard, 1920	S. Africa	247-421	*3.5-9*	7.5	2
28	*Stenetrium haswelli* Beddard, 1886	Off N. Argentine	1097	2.8	16	1
29	*Stenetrium rotundatum* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	9.5; 8.5	1
30	*Stenetrium saldanha* Barnard, 1920	S. Africa	229-247	*4.5-9*	5; 6	2

F. 2000-6000 (4500) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
31	*Stenetrium abyssale* n. sp	Tasman Sea; Kermadec Trench	4510-4540	1.1	8.6; 9.9	2

II. PARASTENETRIOIDEA

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
32	*Gnathostenetroides laodicense* Amar, 1957	E. Mediterranean	2-4	*17-27*	2.2	2

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities

III. PARASELLOIDEA

1. Freshwater (or preferably so)

(Fr. = only freshwater; Br. = also brackish water; (Ma.) = (rarely) also marine)

	JANIRIDAE					
33	*Heterias exul* (Müller, 1892)	Brazil	Fr.	–	3; 2.5	?1
34	*Heterias pusilla* (Sayce, 1900)	Victoria, Australia	Fr.	–	–	1
35	*Jaera italica* Kesselyak, 1938	Sicily; Jugoslavia; Greece	Fr.; Br.; (Ma.)	–	2.3; 3.6	6
36a	*Jaera nordmanni nordmanni* (Rathke, 1837)	Black Sea; Mediterranean; Azores	Fr.; Ma.	–	3.25	*c.* 20
36b	*Jaera nordmanni nordica* Lemercier, 1958[1]	N.W. France; British Isles	Fr.; Br.	–	–	14
37a	*Jaera sarsi sarsi* Valkanov, 1936	Rivers to the Black Sea	Fr.	–	8	many
37b	*Jaera sarsi caspica* Kesselyak, 1938	Caspian Sea; Volga; Ural	Fr.; Br.	–	–	(>) 5
38	*Jaera schellenbergi* Kesselyak, 1938	Jugoslavia	Fr.; (Ma.)	–	2.7; 2.3	2
39	*Mackinia japonica* Matsumoto, 1956	Japan	Fr.	–	4	several
40	*Microcharon acherontis* Chappuis, 1943	Roumania; Hungaria	Fr.	–	2	2
41a	*Microcharon latus latus* (Karaman, 1933)	Jugoslavia	Fr.	–	1.55	4
41b	*Microcharon latus prespensis* Krm., 1954[2]	? Jugoslavia	? Fr.	–	–	? 1
42	*Microcharon major* Karaman, 1954	Jugoslavia	Fr.	–	–	3
43a	*Microcharon profundalis profundalis* Krm., 1940	Jugoslavia	Fr.	–	1.4	–
43b	*Microcharon profundalis beranensis* Krm., 1940	Jugoslavia	Fr.	–	–	1
43c	*Microcharon profundalis kosovensis* Krm., 1940	Jugoslavia	Fr.	–	–	1
43d	*Microcharon profundalis kumanovensis* Krm., 1940	Jugoslavia	Fr.	–	–	4
44	*Microcharon sisyphus* Chapp. & Del., 1954	Corsica	Fr.	–	1.5	1
45a	*Microcharon stygius stygius* (Karaman, 1933)	Jugoslavia	Fr.	–	2	(>) 10
45b	*Microcharon stygius hellenae* Chapp. & Del., 1954	Greece	Fr.	–	–	1
46	*Microparasellus libanicus* Chapp. & Del., 1954	Libya	Fr.	–	2.4	1
47	*Microparasellus puteanus* Karaman, 1933	Jugoslavia	Fr.	–	1	*c.* 5
48	*Protocharon arenicola* Del. & Chapp., 1956	Reunion I.	Fr.	–	1.05	1
49	*Protocharon antarctica* Chappuis, 1958	New Amsterdam I., S. Indian Ocean	Fr.	–	–	1
50	*Protojanira perbrincki* Barnard, 1955	S. Africa	Fr.	–	4	4
51	*Protojanira prenticei* Barnard, 1927	S. Africa	Fr.	–	2.5	1
52	*Pseudasellus nichollsi* Chappuis, 1951	Tasmania	Fr.	–	1.7; 1.5	1

2. Marine; benthic

A. 0-4 METRES

	JANIRIDAE					
53a	*Angeliera phreaticola phreaticola* Chapp. & Del., 1952	S. France; India; Madagascar	Eulitt.	*12-(25)27*	1.5	(>)6
53b	*Angeliera phreaticola ischiensis* Schulz, 1954	Ischia I., Italy	Eulitt.	*13-25*	1.5	1
54	*Angeliera xarifae* Siewing, 1959	Gulf of Aden	Eulitt.	*25*	0.8	1
55	*Bagatus algicola* (Miller, 1941)	Hawaii	Eulitt.	*23.5-25.5*	1.8	15
56	*Bagatus longidactylus* Nordenstam, 1946	Gilbert Is.	Eulitt.	*28*	1.5; 1.8	1

1. Cf. p. 40.
2. The paper in which this subspecies was dealt with was not available.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
57	*Bagatus longimanus* Pillai, 1954	S.W. India	Eulitt.	*26-27*	–	1
58	*Bagatus minutus* (Richardson, 1902)	Bermudas	Eulitt.	*18-27*	2	1
59	*Bagatus nanus* (Stebbing, 1905)	Ceylon	Eulitt.	*26.5-27.5*	1.5	1
60	*Bagatus parva* (Omer-Cooper, 1921)[1]	Fanning I., Cent. Pacific	Eulitt.	*26.5-28.5*	2; 2.5	1
61	*Bagatus platydactylus* Nobili, 1906[2]	Tuamotu Is.	Eulitt.	*26-26.5*	2	1
62a	*Bagatus stebbingi stebbingi* Monod, 1933	Seychelles; E. Mediterranean; ?Azores	Eulitt.	*16-(25.5)28.5*	1.6; 1.9	2-3
62b	*Bagatus stebbingi galloprovincialis* Amar, 1950	W. Mediterranean	Eulitt.	*12-21*	2	4
63	*Bagatus stylodactylus* Nobili, 1906	Tuamotu Is.; Red Sea; ? Cape Verde Is.	Eulitt.	*21.5-(26)29.5*	2	5-6
64	*Caecianiropsis ectiformis* (Vanhöffen, 1914)	Kerguelen	Eulitt.	*3-5*	2.5	1
65	*Caecianiropsis psammophila* Menzies & Pettit, 1956	California	Eulitt.	*10.5-(10.5)17.5*	1.8	2
66	*Caecijaera horvathi* Menzies, 1951	California	Eulitt.	*12-20*	1.7; 1.6	1
67	*Carpias bermudensis* Richardson, 1902	Bermudas	Eulitt.	*18-27*	–	1
68	*Iais californica* (Richardson, 1904)	California; E. Indies; E. Austr.; New Zealand	Eulitt.	*10.5-(26.5)28.5*	2.8	*c.* 10
69	*Iais pubescens* (Dana, 1852)	Subantarctic circumpolar	Eulitt.	*1.6-(14)18.5*	1.5	many
70	*Ianiropsis analoga* Menzies, 1952	Washington – California	Eulitt.	*6-(10.5)14.5*	2.5; 3.7	6
71	*Ianiropsis epilittoralis* Menzies, 1952	California	Eulitt.	*10.5-(11)17.5*	2.5; 3.8	3
72a	*Ianiropsis kincaidi derjugini* Gurjanova, 1933	Bering Sea – California	Eulitt.	*—1-(10.5)17.5*	4.5	*c.* 10
73	*Ianiropsis longiantennata* Thielemann, 1910	Japan	?Eulitt.	*12-24*	2.7; 3.3	1
74	*Ianiropsis minuta* Menzies, 1952	California	Eulitt.	*10.5-14.5*	1.3	2
75	*Ianiropsis montereyensis* Menzies, 1952	California	Eulitt.	*10.5-17.5*	3.6; 3.3	5
76	*Ianiropsis palpalis* Barnard, 1914	S. Africa	Eulitt.	*14.5-(16)23*	4	*c.* 7
77	*Ianiropsis perplexus* Menzies, 1962a	S. Chile	Eulitt.	*7-12*	2.6	2
78	*Ianiropsis serricaudis* Gurjanova, 1936	W. Sea of Japan	Eulitt.	*10-19*	3	*c.* 5
79	*Ianiropsis setifera* Gurjanova, 1950	Sea of Okhotsk; N.W. Pacific; Sea of Japan	Eulitt.	*—1-10*	5	*c.* 6
80	*Ianiropsis tridens* Menzies, 1952	California; N. Chile	Eulitt.	*10.5-(16)19*	2.5	7
81	*Ianthopsis neglecta* (Chilton, 1909)	Cent. New Zealand – Auckland I.	Eulitt.	*11-(13)18.5*	3	6
81a	*Ianthopsis* sp., Vanhöffen 1914	New Amsterdam I., S. Indian Ocean	Eulitt.	*11.5-16.5*	2.5	1
82	*Iathrippa inerme* (Haswell, 1881)	E. Australia	Eulitt.	*18.5-24*	9	1
83	*Iathrippa multidens* Menzies, 1962a	S. Chile	Eulitt.	*4-7*	10	1
84	*Iolella extans* (Barnard, 1914)	S. Africa	Eulitt.	*14.5-(16)23*	1.75; 2.5	5
85a	*Jaera albifrons forsmani* Bocquet, 1950	Britain – N.W. France	?Eulitt.	*8-18*	–	–
85b	*Jaera albifrons ischiosetosa* Forsmann, 1949	Britain; Baltic Sea – White Sea	Eulitt.	*—1.8-(8)18*	5	many
85c	*Jaera albifrons syei* Bocquet, 1950	W. Baltic Sea	Eulitt.	*1-17*	–	–
86	*Jaera hopeana* Costa, 1853	W. & Cent. Mediterranean	Eulitt.	*11-(14)25*	2; 1.3	*c.* 20
36c	*Jaera nordmanni cornuta* Karaman, 1953	Jugoslavia	Eulitt.	*9-23*	–	1
36d	*Jaera nordmanni massiliensis* Lemercier, 1958	W. Mediterranean	Eulitt.	*12-(13)23*	–	7
87	*Jaera petiti* Schulz, 1953	W. Mediterranean	Eulitt.	*12-21*	–	1
88	*Jaera sorrentina* Verhoeff, 1943	Italy	Eulitt.	*13-25*	2.5	1
89	*Janira capensis* Barnard, 1914	S. Africa	Eulitt.	*14.5-(15.5)21*	4	6
90	"*Janira*" *angusta* Barnard, 1920[3]	S. Africa	Eulitt.	*15.5-21*	3	1
91	*Janiralata davisi* Menzies, 1951	California	Eulitt.	*10.5-17.5*	4.7; 3.5	1
92	*Janiralata erostrata* (Richardson, 1899)	W. Aleutian Is.; W. Sea of Japan	Eulitt.	*0-(10)19*	–	2

1. *Ianiropsis parva* must be transferred to *Bagatus*. It was not mentioned by Monod (1961).
2. *Bagatus curvidactylus* Nobili, 1906 was listed by Nierstrasz (1941, p. 284) as a species of which he could give no details because he had not access to Nobili's paper. However, in 1906 Nobili mentioned only *B. stylodactylus* and *platydactylus* (p. 13), these being the only species of *Bagatus* he ever described. Monod (1933, p. 169) used the name *curvidactylus* Nobili, 1906, but this was a misprint for *platydactylus*. Thus, *B. curvidactylus* is a *nomen nudum*.
3. The genus is unknown – it is not *Janira* (see p. 41).

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
93	*Janiralata rajata* Menzies, 1951	California	Eulitt.	*14.5-17.5*	4.0	1
94	*Janiralata triangulata* (Richardson, 1899)	California	Eulitt.	*14.5-17.5*	–	1
95	*Microcharon marinus* Chapp. & Del., 1954	W. & Cent. Mediterranean	Eulitt.	*12-(14.5)25*	1	4
96	*Microcharon tessieri* (Lévi, 1950)	N.W. France	?Eulitt.	*8-18*	2.5	1
97	*Neojaera elongata* Menzies, 1962a	N. – Cent. Chile	Eulitt.	*13-19*	2.5	4
98	*Neojaera serrata* (Barnard, 1914)	S. Africa	Eulitt.	*14.4-20*	2	1
99	*Pseudojanira stenetrioides* Barnard, 1925	S. Africa	Eulitt.	*20-24*	3	1
	JAEROPSIDAE					
100a	*Jaeropsis brevicornis littoralis* Amar, 1949	W. Mediterranean	Eulitt.	*12-(13)23*	–	5
101	*Jaeropsis curvicornis* (Nicolet, 1849)	S. Africa; Ceylon; New Zealand; Chile	Eulitt.	*10-(26.5)27.5*	2.5	4
102	*Jaeropsis hawaiiensis* Miller, 1941	Hawaii	Eulitt.	*23.5-25.5*	1.6	6
103	*Jaeropsis lobata* Richardson, 1899	Oregon – California	Eulitt.	*9-(10.5)17.5*	3.2	2
104	*Jaeropsis paulensis* Vanhöffen, 1914	St. Paul I., Indian Ocean	Eulitt.	*11.5-16.5*	4	1
105	*Jaeropsis rathbunae* Richardson, 1902	Bermudas	Eulitt.	*18-27*	–	1
	MUNNIDAE					
106	*Austrosignum globifrons* Menzies, 1962a	S. Chile	Eulitt.	*4-7*	1	1
107	*Austrosignum incisa* (Richardson, 1908)	Wiencke I., Graham Ld.	Eulitt.	*—1-1*	2.4	1
108	*Munna acarina* Miller, 1941	Hawaii	Eulitt.	*23.5-25.5*	0.85	4
109	*Munna arnholdi* Gurjanova, 1933	Bering Sea	Eulitt.	*—1-6*	3	1
110	*Munna brevicornis* Thomson, 1946	W. Australia	Eulitt.	*18-23*	–	1
111	*Munna chilensis* Menzies, 1962a	S. Chile	Eulitt.	*4-7*	1.0; 1.2	1
112	*Munna chromatocephala* Menzies, 1952	California	Eulitt.	*10.5-14.5*	1.5; 2.2	3
113	*Munna dentata* Vanhöffen, 1914	Kerguelen	Eulitt.	*3-5*	1.2	1
114	*Munna halei* Menzies, 1952	California	Eulitt.	*10.5-14.5*	1.5	1
115	*Munna lundae* Menzies, 1962a	S. Chile	Eulitt.	*4-7*	1.2	1
116	*Munna macquariensis* Hale, 1937	Macquarie I.	Eulitt.	*4.5-7*	6	1
117a	*Munna nana*, f. "*a*" Menzies, 1962a	N.-S. Chile	Eulitt.	*4-(13)19*	–	3
118	*Munna neozelanica* Chilton, 1892	S. New Zealand – Macquarie I.	Eulitt.	*4.5-(9)14*	3	13
119	*Munna petiti* Amar, 1948	W. Mediterranean	Eulitt.	*12-21*	0.9	1
120	*Munna schauinslandi* G.O. Sars, 1905	Chatham I.; Kerguelen; S. Chile	Eulitt.	*4.5-(11.5)16*	1.5	3
	Munna sp., Monod 1931	S. Georgia	Eulitt.	*—0.5-2.2*	–	2
	Munna sp. (α), Monod 1933	Gulf of Suez	Eulitt.	*23-26.5*	0.75	1
	Munna sp. (ß), Monod 1933	Red Sea	?Eulitt.	*24.5-29.5*	–	1
121	*Munna stephenseni* Gurjanova, 1933	Bering Sea – California	Eulitt.	*—1-17.5*	3	*c.* 8
122	*Munna subneglecta* Gurjanova, 1936	W. Sea of Japan	Eulitt.	*10-19*	–	several
123	*Paramunna capensis* Vanhöffen, 1914	S. Africa	Eulitt.	*15.5-21*	0.5	1
124	*Paramunna concavifrons* Barnard, 1920	S. Africa	Eulitt.	*14.5-(18)24*	1.5; 1	3
125	*Paramunna kerguelensis* Vanhöffen, 1914	Kerguelen; S. Chile	Eulitt.	*3-(4)7*	1.6	2
126	*Paramunna subtriangulata* (Richardson, 1908)	Wiencke I., Graham Ld.; S. Georgia; S. Chile	Eulitt.	*—1-(4)7*	1.8	6
	ANTIASIDAE					
127	*Antias dimorphis* Menzies, 1962a	S. Chile	Eulitt.	*9-14*	2.5; 2.0	1
128	*Antias hirsutus*, Menzies, 1951	California	Eulitt.	*10.5-14.5*	1.5; 1.2	1
129	*Antias hofsteni* Nordenstam, 1933	S. Georgia	Eulitt.	*—1-3.5*	2; 1.5	1
130	*Antias laevifrons* Menzies, 1962a	Cent. Chile	Eulitt.	*7-18*	1.3	2
131	*Antias marmoratus* Vanhöffen, 1914	Kerguelen; St. Paul I.; S. Georgia	Eulitt.	*—1-(11.5)16.5*	2.5; 1.5	6
132	*Antias unirameus* Menzies & Miller, 1955	New Zealand	Eulitt.	*12.5-18.5*	–	1
133	*Kuphomunna rostrata* Barnard, 1914	S. Africa	Eulitt.	*15.5-21*	1.75; 2	3

B. 0-200 (150) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
134	*Ectias turqueti* Richardson, 1906	Antarctica; S. Georgia	0-91	*—1.8-(—0.5)2.2*	7	5
135	*Ianiropsis chilensis* Menzies, 1962a	S. Chile	0-40	*4-(12)14*	2.0	6

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
72b	*Ianiropsis kincaidi kincaidi* Richardson, 1904	Bering Sea – California; ?Japan Sea	0-?69	*—1-(14.5) 17.5*	–	*c.* 10
85d	*Jaera albifrons albifrons* Leach, 1814	Greenland – Maine; White Sea – France	0-55	*—1-(8) 20*	5	many
85e	*Jaera albifrons posthirsuta* Forsman, 1949	Britain; New England	0-10	*3-21*	5.5	many
85f	*Jaera albifrons praehirsuta* Forsman, 1949	Greenland – New England; Britain – N.W. France; W. Norway – Baltic Sea	0-*c.* 20	*1-(8) 20*	–	many
136	*Janiralata occidentalis* (Walker, 1898)	Washington – California	0-70	*5.5-(12) 21*	6.5	8
	JAEROPSIDAE					
137	*Jaeropsis dollfusi* Norman, 1899	W. Mediterranean	0-65	*14.5-25*	3.5	3
138a	*Jaeropsis dubia dubia* Menzies, 1951	California	0-*c.* 90	*8.5-(12.5) 24*	2.3; 2.8	19
138b	*Jaeropsis dubia paucispinis* Menzies, 1951	California	0-*c.* 50	*9-14.5*	2-3	7
139	*Jaeropsis patagoniensis* Richardson, 1909	Southern S. America; Falkland Is.; Macquarie I.	1-150	*4.5-7.5*	10	10
	MUNNIDAE					
140	*Munna mediterranea* Pierantoni, 1916	W.-Cent. Mediterranean	2-30	*12-25*	1	2
117b	*Munna nana* f. *typica* Nordenstam, 1933	S. Chile; Falkland Is.	1-100	*2.8-11*	1; 1.2	2
141	*Munna neglecta* Monod, 1931	Antarctica; Falkland Is.	0-50	*—1.5-(4.5) 7.7*	4	14
142	*Munna pallida* Beddard, 1886	Kerguelen; Falkland Is.	0-55	*3-(5) 7*	3	3
143	*Munna ubiquita* Menzies, 1952	California	0-37	*5.5-(13) 24*	1.2; 0.8	11
144	*Paramunna gaini* (Richardson, 1913)	Peterman I., Graham Ld.	1-6	*—1.5-1*	2	2
145	*Paramunna glacialis* (Hodgson, 1910)	Wiencke I., Graham Ld.; Victoria Ld., Antarctica	0-*c.* 30	*—1.5-0*	–	2
146	*Paramunna serrata* (Richardson, 1908)	Antarctica; Falkland Is.; Auckland I.	0.5-22	*—1.5-(5) 7*	1	6
147	*Pleurogonium californiense* Menzies, 1951	California	0-99	*8.5-(10.5) 14.5*	1.1; 1.25	3
148	*Pleorosignum chilense* Menzies, 1962a	S. Chile	0-50	*4-(11) 11.5*	0.87	2
	DENDROTIONIDAE					
149	*Pleurocope dasyura* Walker, 1901	W. Mediterranean; Ceylon	0-18	*12-(26.5) 27*	1.2	2
	ANTIASIDAE					
150	*Antias charcoti* Richardson, 1906	Antarctica	0-20	*—1.8-1*	3	5
151	*Antias hispidus* Vanhöffen, 1914	Falkland Is.; St. Paul I.; Auckland I.	0-95	*—1-(11.5) 16.5*	1.8	4
152	*Antias mawsoni* Hale, 1937	Adelie Ld.; Cent. – S. Chile	0-40	*—1.1-(13) 18*	1.6	5

C. 0-2000 (1510) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
153	*Iathrippa chilensis* Menzies, 1962a	S. Chile	0-300	*4-13*	6	8
154	*Iathrippa longicauda* (Chilton, 1884)	Southern S. America; Falkland Is.; S. Georgia; E. Australia; New Zealand	0-310	1.5-*(19) 24*	8; 9.5	16
155	*Iathrippa sarsi* (Pfeffer, 1887)	Antarctica; Subantarctic islands	0-700	*—1-(4.5) 7*	9	28
156	*Janira alta* (Stimpson, 1853)	N. E. America; W. of Iceland	0-1384[1]	1.2-*(4)* 21	6.7; 7	*c.* 25

1. HANSEN (1916) cited RICHARDSON's depth record "35-487 fathoms" (1905, p. 475). However, HARGER (1879, p. 158) wrote "occasionally collected in tide-pools" and in 1880 (p. 323) he recorded it from "Low water – 30 fathoms" (Clark's Ledge,

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
157	*Janira maculosa* Leach, 1814	Greenland – Morocco; Corsica; Vancouver I.; W. Canada	0-1505	—0.4*(13) 20*	11[1]	(>)100
158	*Neojaera antarctica* (Pfeffer, 1887)	Southern S. America; Falkland Is.; S. Georgia; Kerguelen	0-700	*—0.5-(5) 7*	3.8; 3.5	9
	JAEROPSIDAE					
159	**Jaeropsis bidens* Menzies, 1962a	N.-S. Chile	0-300	*9-(16) 19*	2.2	6
160	*Jaeropsis marionis* Beddard, 1886	Marion I.; Kerguelen, S. Indian Ocean	0-256	*3-5*	4	3
	MUNNIDAE					
161 a	**Munna antarctica antarctica* (Pfeffer, 1887)	Antarctica; Falkland Is.; S. Georgia; Kerguelen	2-310	*—1.1-4*	5	13
162	**Munna kroeyeri* Goodsir, 1842	S. Iceland – W. Baltic	0-? 210	*1-(8) 17*	3	*c.* 10
163	**Munna studeri* Hilgendorf, 1893	S. Georgia; Kerguelen	0-210	*—1-3.5*	3	3
164	*Paramunna rostrata* (Hodgson, 1910)	Antarctica; S. Georgia; Kerguelen	0-569	*1-(3) 5*	2; 1.5	7

D. (4-200) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
165	*Bagatus ichthyoxenos* Monod, 1961	Senegal	40-55[2]	*18*	2.5	(>) 1
166	*Ianiropsis bisbidens* Barnard, 1955[3]	S. Africa	4-6.5	*16-21*	9; 8	1
167	*Ianiropsis breviremis* (G.O.Sars, 1882)	British Isles – W. Norway and Denmark	23-125	*4-(9) 11*	4; 6	*c.* 10
168	*Ianiropsis magnocula* Menzies, 1952	California	57	*9-11.5*	2.2	1
169	*Ianthopsis caudata* (Richardson, 1910)	Philippines	37	*26*	1.5	1
170	*Ianthopsis laevis* Menzies, 1962a	S. Chile	*c.* 50-100	*11.5-12*	5.0	2
171	*Iolella chuni* Thielemann, 1910	Cent. Japan	150	*13-21*	9; 8	1
172	*Iolella spinosissima* (Stephensen, 1936)	Ellesmere Ld.	80	*—1.3*	15	1
173	*Jaera wakishiana* Spence Bate, 1865	Vancouver I., W. Canada	15	*9.4-16.3*	–	1
174	*Janira tricornis* (Krøyer, 1846)	Greenland – Franz Josef Ld.	6-132	*—1.4-(0) 5*	8.6	*c.* 30
175	*Janiralata alascensis* (Benedict, 1905)[3]	Bering Sea	35	*—1-2*	–	1
176	*Janiralata sarsi* (Richardson, 1905)	Amchitka I., Alaska; Sea of Okhotsk	15-?	*0-8*	10.5	2
177	*Janiralata soldatovi* (Gurjanova, 1933)	Sea of Okhotsk; W. Sea of Japan	31-96	*—1.6-3*	5.5	(>) 3
178	*Microjaera anisopoda* Bocquet & Lévi, 1955	W. Mediterranean	20	*12-18*	–	1
179	*Neojaera furcata* (Hodgson, 1910)	Antarctica; S. Chile; Falkland Is.; S. Georgia; S. Africa; Kerguelen	10-125	*—1.5-(5) 7*	3	7
180	*Neojaera pusilla* (Barnard, 1925)	S. Africa; Kerguelen	?-174	*3-8*	1.75	2
	JAEROPSIDAE					
100 b	**Jaeropsis brevicornis brevicornis* Koehler 1885[3]	Channel Is.; N.W. France	*c.* 5	*7-16*	2.9; 2.4	4
181	*Jaeropsis intermedia* Nordenstam, 1933	S. Chile; Falkland Is.; N. Argentine	22-150	*5-12*	3.5; 3.2	6

Bay of Fundy; U.S. Fish Com.); RATHBUN (1905, p. 44) recorded it from "low water to 190 fathoms" and KINDLE & WHITTAKER (1918, p. 251) from "intertidal zone – 487 fathoms".

1. A male (from Lindenov Fjord, S.E. Greenland, 400-600 m), kept in the Copenhagen Museum, is 11 mm, thus, 1-2 mm larger than any hitherto recorded specimen.
2. CADENAT (1959) records the depths of the fish on which this species was taken as 40-55 m.
3. While this paper was in press I received three papers (KUSSAKIN 1961, 1962a, 1962b), describing six new species of *Janiralata*, one of *Ianiropsis*, three of *Caecijaera*, and two of *Jaeropsis* – all from the N.W. Pacific, 4-200 m.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No of localities
182	*Jaeropsis palliseri* Hurley, 1957	Cook Strait, New Zealand	128-146	*8-13*	5.3	1
	MUNNIDAE					
183	*Antennulosignum elegans* Nordenstam, 1933	Falkland Is.	22	*5-7*	1	1
184	*Austrosignum dubia* (Hale, 1937)	Adelie Ld., Antarctica	46	*—1.5-1*	1.8	1
185	*Austrosignum falklandicum* Nordenstam, 1933	Falkland Is.	22-150	*4.5-6*	1.9; 1.6	2
186	*Austrosignum grande* Hodgson, 1910	Antarctica; S. Chile	*c.* 10-35	*—1.8-(8) 11.5*	1.3	2
187	*Austrosignum latifrons* Menzies, 1962a	S. Chile	100	*12*	1.3	1
188	*Austrosignum tillerae* Menzies & Barnard, 1959	California	20-180	*8.3-17.5*	1	5
189	*Munna affinis* Nordenstam, 1933[1]	S. Georgia	5-15	*—1-3.5*	3.0; 3.6	2
161 b	*Munna antarctica australis* (Hodgson, 1902)	Antarctica	20-70	*—1.8-1*	–	14
190	*Munna avatshensis* Gurjanova, 1936	E. Kamtchatka	13-15	*—1-5*	2.2	(>) 2
191	*Munna brasiliensis* Hansen, 1895	N. Brazil	50-100	*25-26*	0.9	1
192	*Munna coeca* Gurjanova, 1930	E. of Spitsbergen	80	*—1.5*	–	1
193	*Munna cryophila* Vanhöffen, 1914	Antarctic Indian Ocean	46	*—1.5*	2	1
194	*Munna fabricii* Krøyer, 1846	W. Greenland – Franz Josef Ld.; N.W. France – Denmark	13-95	*—1.5-(8) 17*	2.2	*c.* 52
195	*Munna groenlandica* Hansen, 1916	W. & E. Greenland	5-100	*—1-(0) 5*	3.4; 3.2	7
196	*Munna maculata* Beddard, 1886	Falkland Is.; Kerguelen	22-51	*3-(5) 7*	4	2
197	*Munna palmata* Liljeborg, 1851	S. Norway	*c.* 35	*5-15*	2	2
198	*Munna pellucida* Gurjanova, 1930	Murman Coast	86	*4*	–	1
199	*Munna spinifrons* Menzies & Barnard, 1959	California	12	*11.5-16.5*	1.5	1
200	*Munna spitzbergensis* Gurjanova, 1930	Spitsbergen	35-85	*—1.5-(—1) 4.5*	–	2
201	*Notoxenus spinifer* Hodgson, 1910	Victoria Ld., Antarctica	*c.* 10-30	*—1.5-0*	–	*c.* 5
202	*Paramunna antarctica* (Richardson, 1906)	Antarctica; S. Georgia	12-60	*—1.5-3*	3	4-5
203	*Paramunna bilobata* G.O. Sars, 1866	W. Ireland – S.W. Norway	20-200	*6-(7) 15*	1.1	15
204	*Paramunna dentata* Nordenstam, 1933	Falkland Is.	22	*5-7*	1	1
205	*Paramunna integra* Nordenstam, 1933	Falkland Is.	122-150	*5-7*	1	2
206	*Paramunna laevifrons* Stebbing, 1910	S. Africa	75	*19-23*	1	1
207	*Paramunna simplex* Menzies, 1962a	S. Chile	100	*12*	1.4	1
208	*Pleurogonium latimanum* Hansen, 1916[1]	Davis Strait, S.W. Greenland	188	*3.9*	1.0	1
209	*Pleurosignum lunata* (Hale, 1937)	Adelie Ld., Antarctica	4-7	*—1.5-1*	2.7	1
	ANTIASIDAE					
210	*Antias uncinatus* Vanhöffen, 1914	S. Africa	4-5	*15-21*	1.5	2
	NANNONISCIDAE					
211	*Nannoniscella groenlandica* Hansen, 1916[2]	W. Greenland	10-132	*1-4*	2.2	1
212	*Nannoniscus caspius* G.O. Sars, 1897	Caspian Sea	4-6	*7-23*	1.3	1
	DESMOSOMATIDAE					
213	*Desmosoma australis* Nordenstam, 1933	S. Georgia	64-148	—0.4-1.7	5.1; 4.1	4
214	*Desmosoma brevipes* Nordenstam, 1933	S. Georgia	64-148	—0.4-1.7	2.4; 2	4
215	*Desmosoma falklandicum* Nordenstam, 1933	Falkland Is.	16	2.8-7	2.5	1
216	*Desmosoma lobiceps* Blake, 1929[3]	Maine	13	*3-13*	2.0; 1.5	1
217	*Desmosoma striata* Menzies, 1962b	S.W. Africa	126	*10*	1.4	1
218	*Desmosoma zenkewitschi* Gurjanova, 1946	E. Arctic Ocean	65	*—1.5*	1.5	1
	ILYARACHNIDAE					
219	*Ilyarachna spicata* (Hodgson, 1910)	Antarctica	*c.* 10-46	*—1.8-1*	2	2

1. While this paper was in press KUSSAKIN (1962b) published descriptions of eight new species and one new subspecies of *Munna* and three new species and one new subspecies of *Pleurogonium*, all from the N. W. Pacific (primilary the Sea of Okhotsk), 4-200 m.
2. Referred to *Austroniscus* by BIRSTEIN (1962).
3. BLAKE (l. c.) gives only the description. Information on locality, depth and bottom was found in PROCTER 1933, p. 247.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	EURYCOPIDAE					
220	*Eurycope pavlenkoi* Gurjanova, 1933	W. Sea of Japan	60	*2.6*	–	1
221	*Eurycope picardi* Amar, 1957	W. Mediterranean	15-30	*12-18*	0.9; 0.7	1

E. 4-2000 (1760) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
222	*Ianthopsis bovallii* (Studer, 1884)	Antarctica; Patagonia; Falkland Is.; S. Georgia; Kerguelen	12-457	—1.8-*(3) 5*	10	8
223	*Ianthopsis nasicornis* Vanhöffen, 1914	Antarctic Indian Ocean; S. Georgia	75-385	—1.8-1.5	10; 7.5	9
224	**Iolella laciniata* (G.O.Sars, 1872)	Greenland – W. Norway	185-1384	1.2-3.9	8.6; 7.2	*c.* 15
225	*Iolella spinosa* (Harger, 1879)	Newfoundland; W. Greenland; S.E. of Iceland .	128-621	—0.1-*5*	17	8
226	**Janira tristani* Beddard, 1886	Tristan da Cunha, S. Atlantic	183-275	*9-10*	5	1
227	*Janiralata holmesi* (Richardson, 1905)	S. E. Alaska	75-344	*4.3-8.5*	–	2
228	*Janiralata solasteri* (Hatch, 1947)	Alaska – California ...	50-295	*6.2-8.1*	4.9	7
229	*Katianira biloba* Gurjanova, 1930..........	Spitsbergen; E. Arctic Ocean	85-698	—1.5-—0.9	2.4	2
230	*Katianira sadko* Gurjanova, 1946..........	E. Arctic Ocean	74-698	—*1.6*-—0.9	3.5	3
	MUNNIDAE					
231	*Austrosignum glaciale* Hodgson, 1910	Antarctica; S. Georgia .	12-385	—1.8-*(—1) 3*	1.7	5
232	**Coulmannia australis* Hodgson, 1910	Antarctica; S. Georgia .	183-400	—*1.4*-1.5	9; 7.6	4
233	*Coulmannia frigida* Hodgson, 1910	Antarctica; Kerguelen .	91-385	—1.8-*3*	3.5	4
234	*Munna bituberculata* Nordenstam, 1933	S. Georgia	75-310	1.5	3.5; 5	2
235	*Munna boecki* Krøyer, 1839	Iceland – W. Norway; North Sea; Morocco	35-350	*5-(9) 16*	4	*c.* 10
236	*Munna hanseni* Stappers, 1911	Iceland – the Faroes; Novaya Zemlya; E. Arctic Ocean	90-1505	—1.0-6.1	3; 2.9	7
237	*Munna limicola* G.O.Sars, 1866	N. Norway – English Channel; Skagerrak .	40-550	*6-(9) 16*	3	18
238	**Munna minuta* Hansen, 1910	Archipelago of Arctic America – Novaya Zemlya; New England – Denmark	4-281	—*0.5-(8) 12*	2.5; 2.2	(>)60
239	**Munna truncata* Richardson, 1908	N. E. America	146-716	3.2-5	–	2
240	*Pleurogonium inerme* G.O.Sars, 1883	Spitsbergen – Franz Josef Ld.; Nova Scotia – Denmark	4-360	—0.3-*(7) 10*	2; 1.5	*c.* 35
241	**Pleurogonium minutum* Beddard, 1886......	Off Tristan da Cunha, S. Atlantic	183-275	9-10	1	1
242	**Pleurogonium rubicundum* (G.O.Sars, 1864) .	The Faroes – N. Norway; Nova Scotia – Denmark	23-271	*5-(8) 11*	1.5	*c.* 40
243	*Pleurogonium spinosissimum* (G.O.Sars, 1866)	Spitsbergen – Franz Josef Ld.; Nova Scotia – Denmark ..	*c.* 10-552	—0.5-*(5) 10*	3	*c.* 30
244	*Pleurosignum elongatum* Vanhöffen, 1914 ...	Antarctic Indian Ocean; Falkland Is.	25-385	—1.8-*(5) 7*	–	2
245	*Pleurosignum magnum* Vanhöffen, 1914.....	Antarctic Indian Ocean; Falkland Is.; S. Chile	20-385	—1.8-*(11) 12*	1.5	5
	DENDROTIONIDAE					
246	*Munella danteci* Bonnier, 1896	Bay of Biscay; Cent. Mediterranean	100-900	*9.5-14*	1.5	3

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	ISCHNOMESIDAE					
247	_Ischnomesus bispinosus_ (G.O. Sars, 1864)	W. of Ireland; N. Norway – Skagerrak; Cent. Mediterranean.	94-1100	_4-13_	3; 2.5	_c._ 37
	MACROSTYLIDAE					
248	*_Macrostylis longiremis_ (Meinert, 1890)	S.W. Iceland; Skagerrak	149-218	5.8-7.5	2.5	6
249	_Macrostylis spinifera_ G.O. Sars, 1864	Davis Strait; S.W. of Iceland; Scotland; N. Norway – Skagerrak	4-1761	3.9-_(8) 18_	2.5; 2.0	_c._ 45
	NANNONISCIDAE					
250	_Austroniscus ovalis_ Vanhöffen, 1914	Antarctic Indian Ocean	70-385	—1.8-—1.7	2.5	2
251	_Austroniscus rotundatus_ Vanhöffen, 1914	Antarctic Indian Ocean	70-385	—1.8-—1.7	2	2
252	_Nannoniscus arcticus_ Hansen, 1916	E. Greenland; S. of Jan Mayen	75-699	—1.4-—0.4	2.8	2
	DESMOSOMATIDAE					
253	_Desmosoma angustum_ G.O. Sars, 1899	W. Norway – Skagerrak	50-680	_5-(6) 11_	2; 1.5	31
254	_Desmosoma armatum_ G.O. Sars, 1864	E. Greenland; W. Norway – Skagerrak	50-478	—_1_-6.7	1.9	28
255	_Desmosoma filipes_ Hult, 1936	W. Greenland; W. Ireland – Denmark; Cent. Mediterranean.	34-1000	_1.3-13_	4; 3	_c._ 30
256	_Desmosoma laterale_ (G.O. Sars, 1899)	Davis Strait; W. Norway – Skagerrak	50-1096	_2-(7) 15_	2	34
257	_Desmosoma lineare_ G.O. Sars, 1864	W. of Ireland; N. Norway – Skagerrak	50-697	2.6-6.8	3.5; 2	_c._ 50
258	_Desmosoma modestum_ Nordenstam, 1933	S. Georgia	125-250	—0.3-1.2	2.2	2
259	_Desmosoma polaris_ Gurjanova, 1946	E. Arctic Ocean	40-510	—1.5-—1.0	2	2
260	_Desmosoma tenuimanum_ G.O. Sars, 1868	E. Greenland – E. Arctic Ocean; Nova Scotia – Denmark	11-698	_—1-(6) 12_	2.6	_c._ 71
261	_Echinopleura aculeata_ (G.O. Sars, 1864)	N. Norway – Skagerrak; Scotland; Cent. Mediterranean	27-681	_1-(13) 16_	2.5; 1.5	_c._ 65
	ILYARACHNIDAE					
262	_Ilyarachna acarina_ Menzies & Barnard, 1959	California	73-1120	_3.5-(9) 12.8_	4	10
263	_Ilyarachna arctica_ (Hansen, 1916)	Jan Mayen – E. Arctic Ocean	104-698	—0.9-_1.5_	2.2	2
264	_Ilyarachna bergendali_ Ohlin, 1901	E. Greenland – E. Arctic Ocean	20-698	_—1-(0.2) 4.5_	5.8	3
265	*_Ilyarachna coronata_ G.O. Sars, 1870	Davis Strait; S. of Iceland; S.W. Norway	188-1505	3.3-4.5	5	_c._ 16
266	_Ilyarachna quadrispinosa_ Beddard, 1886	Antarctica; S. Georgia; Kerguelen	22-569	_—1.5-2.2_	17	10
267	*_Ilyarachna starokadomskii_ Gurjanova, 1936	Sea of Okhotsk; W. Sea of Japan	100-780	_—1.5-0.1_	6.5	5
268	*_Ilyarachna zachsi_ Gurjanova, 1936	W. Sea of Japan	105-1002	_0.2-1.2_	9	5
269	_Pseudarachna hirsuta_ (G.O. Sars, 1864)	W. Ireland – Denmark.	30-478	_3-(10) 13_	2.5	35
	EURYCOPIDAE					
270	*_Eurycope latirostris_ G.O. Sars, 1882	W. Norway – W. of Ireland	188-536	_6-9_	2	5
271	*_Eurycope mutica_ G.O. Sars, 1864	Ellesmere Ld. – Novaya Zemlya; Nova Scotia – Denmark	_c._ 9-_c._ 225	_0-(5) 10_	1.5	_c._ 52
272	_Eurycope phalangium_ G.O. Sars, 1864	Davis Strait; British Isles; N. Norway – Skagerrak	54-1096	3.3-_(7) 11_	2	_c._ 45

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
273	*Eurycope pygmaea* G.O. Sars, 1870	W. Norway – Skagerrak	150-280	5-8	1	4
	Eurycope spp., Lo Bianco 1903	Cent. Mediterranean...	100-1100	*13.3-14*	–	6
274a	*Munnopsurus giganteus giganteus* (G.O. Sars, 1879)	Spitsbergen – Novaya Zemlya; Iceland – W. Norway; Bering Sea; Sea of Okhotsk	40-1469	—1.1-*3*	33; 25	*c.* 53
274b	*Munnopsurus giganteus ochotensis* (Gurjanova, 1933)	Sea of Okhotsk	80-645	*—1.6-2.0*	15	4
275	**Munnopsurus minutus* Gurjanova, 1933	W. Sea of Japan	190-440	*0.5-3.6*	7	3
	MUNNOPSIDAE					
276	*Munnopsis typica* M. Sars, 1861	Arctic circumpolar; N. Atlantic to Cape Cod and the Skagerrak...	4-*c.* 1200	—1.8*(8) 9*	17.7; 18	*c.* 185

F. 4-6000 (8-2800) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	DESMOSOMATIDAE					
277	*Desmosoma coarctatum* (G.O. Sars, 1899)...	Davis Strait; W. Norway – Denmark.....	24-2702	1.5-*(7) 8.5*	2; 1.9	16
278	*Desmosoma intermedium* Hult, 1936	Davis Strait; W. Norway – ?Denmark (?30)	90-2258	2.4-*(5) 8*	–	13
	ILYARACHNIDAE					
279	*Ilyarachna longicornis* (G.O. Sars, 1864)	W. Greenland – New England; Spitsbergen – E. Arctic Ocean; W. Ireland – Skagerrak	8-2788	—1.4-7	10.5	*c.* 107
	EURYCOPIDAE					
280	*Eurycope cornuta* G.O. Sars, 1864	W. Greenland – E. Arctic Ocean; New England – Skagerrak	55-2207	*—1.0-(7) 8*	5; 4	*c.* 105
281	**Eurycope furcata* G.O. Sars, 1870..........	Davis Strait; S.W. of Iceland; N. Norway – Skagerrak..........	150-2258	2.4-*6.8*	2	11
282	**Eurycope producta* G.O. Sars, 1868	W. Greenland – E. Arctic Ocean; W. of Ireland – Skagerrak ...	72-2087	—1.0-6.8	4	*c.* 28

G. 200-2000 (210-1960) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
283	*Acanthaspidia drygalskii* Vanhöffen, 1914...	Antarctic Indian Ocean	350-385	—1.8	6.5	2
284	*Acanthaspidia typhlops* (G.O. Sars, 1879) ...	Davis Strait; Iceland; S.W. of the Faroes; N. Norway.........	860-1416	—0.7-7	12; 8.2	5
285	*Ianthopsis monodi* Nordenstam, 1933[1]	Antarctic Indian Ocean	*c.* 500	*0.5*	10	1
286	*Ianthopsis multispinosa* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	7	1
287	*Ianthopsis pulchra* (Hansen, 1916)	Davis Strait; S.W. of Iceland	1096-1505	1.2-4.5	9	4
288	*Ianthopsis ruseri* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	8.5	1
289	*Iolella glabra* Richardson, 1908	Off Cape Hatteras, Cent. N. E. America .	1624	3.8	–	1
290	*Iolella vilhelminae* (Stephensen, 1913)	W. Greenland	400-410	—0.7	14	1
291	*Jaerella armata* Richardson, 1911	S. Bering Sea	549	*3.3*	8	1
292	*Janira japonica* Richardson, 1909..........	Off S. California	781	*5-6*	6.5	1
293	*Janirella abyssicola* Richardson, 1911	Off S.W. Spain	1205	*10*	–	1
294	*Janirella bonnieri* Stephensen, 1915	W. Mediterranean.....	1227	*12.9*	5	1

1. Monod (1926, p. 14) gives the occurrence of *Ianthopsis nasicornis* Vanhöffen (= *I. monodi* Nordenstam) as "10°00′S, 80°48′W" which is a misprint for 70°00′S, 80°48′W (cf. l. c., pp. 28, 32, 33, 38, and 43).

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
295	*Janirella carribica* Menzies, 1956a	W. Caribbean Sea	1169	*4.9*	5.5	1
296	*Janirella glabra* Richardson, 1911	Canary Is.	946	*8*	–	1
297	*Janirella nanseni* Bonnier, 1896[1]	Bay of Biscay	950	*9.6*	7	2
298	*Janirella spongicola* Hansen, 1916	S.W. of Iceland	913	6.1	5; 5.5	1
299	*Katianira chelifera* Hansen, 1916	S.W. of Iceland	1505	4.5	1.8; 2	1
300	*Katianira cornigera* Gurjanova, 1930	Spitsbergen	1000	*—0.5*	2.4	1
301	*Microprotus caecus* Richardson, 1909	S. Bering Sea	549	*3.3*	15	1
302	*Neojaera octodentatus* (Vanhöffen, 1914)	Antarctic Indian Ocean	385	—1.8	1.2	1
303	*Neojaera vanhöffeni* n. nom.[2]	Antarctic Indian Ocean	385	—1.8	3	1
304	*Trichopleon ramosum* Beddard, 1886	S. of the Philippines	914	*5*	> 5	1
	HAPLONISCIDAE					
305	*Haploniscus armadilloides* Hansen, 1916	S. of Iceland	1301	3.9	1.5	1
306a	*Haploniscus bicuspis tepidus* n. subsp.	S.W. of Iceland	1505	4.5	1.7	1
307	*Haploniscus capensis* Menzies, 1962b	S. Africa	706	*4.1*	2.7; 2.9	1
308	*Haploniscus helgei* n. sp.	S. Australia	1320-1340	3.5	8.1; 8.9	1
309	*Haploniscus retrospinis* Richardson, 1908	N. E. America	713	4.2	–	1
310	*Haploniscus tropicalis* Menzies, 1962b	S. Caribbean Sea	1534-1714	*4.1-4.2*	imm. 1.5	2
	MUNNIDAE					
311	*Astrurus crucicauda* Beddard, 1886	Kerguelen	220	*3.2*	4	1
312	*Astrurus ornatus* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	1.5	1
313	*Echinomunna horrida* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	3.5	1
314	*Munna globicauda* Vanhöffen, 1914	Antarctic Indian Ocean	350-385	—1.8	1	(>) 2
315	*Munna psychrophila* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	2	1
316	*Munna spinifera* Robinson & Menzies, 1961.	Gulf of Aden	1261	*7.2*	3	1
317	*Neasellus kerguelenensis* Beddard, 1885	Off N. Argentine; Kerguelen	220-1097	*3.2-3.5*	2	2
318	**Notoxenoides abyssi* Menzies, 1962b	S. Africa	1816	*2.8*	2.0; 1.9	1
319	*Paramunna gaussi* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	1.3	1
320	*Paramunna typica* (Tattersall, 1905)	W. of Ireland	220-300	*10*	2	2
321	*Pleurogonium albidum* Beddard, 1886	Kerguelen	220	*3.2*	3	1
322	*Pleurogonium intermedium* Hansen, 1916	N. of Iceland; N.W. of the Faroes	365-887	—0.6-0.6	1.3; 1	3
323	*Pleurogonium pulchrum* Hansen, 1916	W. of Iceland	256	6.0	1.1	1
324	*Pleurogonium serratum* Beddard, 1886	Kerguelen	220	*3.2*	2	1
	DENDROTIONIDAE					
325	*Acanthomunna hystrix* (Hansen, 1916)	S.W. of Iceland	1505	4.5	3.4; 3.1	1
326	*Acanthomunna spinipes* (Vanhöffen, 1914)	Antarctic Indian Ocean	385	—1.8	6	1
327	**Dendromunna spinipes* Menzies, 1962b	S. Africa	1816	2.8	2.0	1
328	*Dendrotion hanseni* Menzies, 1956a	W. Caribbean Sea	1244	*4.9*	3.5	1
329	*Dendrotion paradoxum* Hansen, 1916	S.W. of Iceland	1505	4.5	2.5; 2.6	1
330	*Dendrotion spinosum* G.O.Sars, 1872	Iceland – S.W. Norway	281-1505	4.5-*7.5*	3.8; 2.8	4
	SCHISTOSOMATIDAE					
331	**Schistosoma ramosum* Hansen, 1916	S. of Iceland	1960	3.1	1.4	1
	ISCHNOMESIDAE					
332	*Helomesus gorbunovi* (Gurjanova, 1946)	E. Arctic Ocean	698	—0.9	4.5	1
333	*Heteromesus dentatus* Hansen, 1916	S.W. of Iceland	1505	4.5	3.9; 3.6	1

1. In order to avoid further confusion it should be noted that all the localities given by BONNIER (1896, pp. 673-674) as longitude East, should be long. West. Thus the type locality for this species is Gulf of Gascony, 44°17′N, 4°38′W – not "North of the Azores at 40°38′E. Longitude and 44°17′N. Latitude" (MENZIES 1956a, p. 10).
2. This species was described by VANHÖFFEN (1914) as *Austrofilius serratus*. According to MENZIES (1962a, pp. 70, 75) *Neojaera* and *Austrofilius* are synonyms. Earlier in 1914, BARNARD described a species as *Jaera serrata* (No. 98 in this table) which was transferred by NORDENSTAM (1933, p. 188) to *Neojaera*. Thus, the name of the latest described species (*Austrofilius serratus*) should be altered and I would propose *Neojaera vanhöffeni* in its place.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
334	*Heteromesus frigidus* Hansen, 1916	N. Iceland, N. of the Faroes; E. Arctic Ocean	698-1435	—0.9-0.6	3.7	7
335	*Heteromesus greeni* (Tattersall, 1905)	Off N. Ireland	364-700	*9-9.5*	4	2
336	*Heteromesus schmidti* Hansen, 1916........	S. of Iceland	956	*2*	4.2	1
337	*Heteromesus spinosus* (Beddard, 1886)......	Off the Azores........	1829	*4.9*	6	1
338	*Heteromesus* n. sp., CATTLEY (in press)	Off Kenya	1789	3.0	4.3	1
339	*Ischnomesus bacillopsis* (Barnard, 1920)	S. Africa	1280	*2.9*	7	1
340	*Ischnomesus caribbicus* Menzies, 1962b	S. Caribbean Sea......	1714	*4.1*	7.8	1
341	*Ischnomesus multispinis* Menzies, 1962b	S. Caribbean Sea......	975	*5.4*	7.4	1
342	*Ischnomesus* n. sp., CATTLEY (in press)	Off Tanganyika	732	8.3	8	1
343	*Mixomesus pellucidus* n. sp...............	Tasman Sea	610	*7.6*	5.5	1
	PSEUDOMESIDAE					
344	*Pseudomesus brevicornis* Hansen, 1916	N. of Iceland	1412	—0.9	3.2	1
	MACROSTYLIDAE					
345	*Macrostylis elongata* Hansen, 1916	S. of Iceland	1591	3.3	2.5	1
346	*Macrostylis longipes* Hansen, 1916	E. of Iceland	1412	—0.9	2.9	1
347	*Macrostylis spiniceps* Barnard, 1920	S. Africa	1280	*2.9*	3	1
	NANNONISCIDAE					
348	*Nannoniscoides angulatus* Hansen, 1916	N. of the Faroes; E. Arctic Ocean.....	698-1322	—0.9-—0.6	2.2	2
349	*Nannoniscus aequiremis* Hansen, 1916	S. of Jan Mayen	885	*—0.6*	1.9	1
350	*Nannoniscus affinis* Hansen, 1916..........	S.W. of Iceland	1505	4.5	1.3	1
351	*Nannoniscus australis* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	2	1
352	*Nannoniscus bidens* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	4; 3	1
353	*Nannoniscus camayae* Menzies, 1962b	S. Carribbean Sea.....	1714	*4.1*	4.1	1
354	*Nannoniscus crassipes* Hansen, 1916	N. Norway	225-470	*4.5-8*	1.5	*c.* 4
355	*Nannoniscus laticeps* Hansen, 1916.........	N. of Iceland	552	—0.5	> 1.4	1
356	*Nannoniscus minutus* Hansen, 1916	Davis Strait	1096	3.3	1.5	1
357	*Nannoniscus plebejus* Hansen, 1916	S.W. of Iceland	1505	4.5	1.6; 1.2	1
358	*Nannoniscus reticulatus* Hansen, 1916	N. of Iceland; E. Arctic Ocean	510-698	—0.9-—0.5	2; 1.8	3
359	*Nannoniscus simplex* Hansen, 1916	W. & S.W. of Iceland..	1070-1505	4.4-4.5	2.6; 1.9	2
	Nannoniscus sp., MENZIES 1962b	S. Caribbean Sea......	975	*5.4*	–	1
	DESMOSOMATIDAE					
360	*Dactylostylis acutispinis* Richardson, 1911 ..	Off Rio de Oro, N.W. Africa	698	*8*	–	1
361	*Desmosoma elongatum* Bonnier, 1896	Bay of Biscay.........	950	*9.6*	4.1	1
362	*Desmosoma latipes* Hansen, 1916..........	Davis Strait	1096	3.3	2.2	1
363	*Desmosoma magnispinum* Menzies, 1962b ..	S. Caribbean Sea......	1800-1906	*4.1*	2.1	1
364	*Desmosoma plebejum* Hansen, 1916........	E. & N. E. of Iceland ..	1412-1666	—1.0-—0.9	1.7	2
365	*Desmosoma politum* Hansen, 1916	W. & S.W. of Iceland..	1070-1505	4.4-4.5	2.2	2
366	*Desmosoma reticulata* Gurjanova, 1946	E. Arctic Ocean.......	698	—0.9	6.5	1
	Desmosoma sp., BARNARD 1920	S. Africa	1280	*2.9*	3.25	1
	Desmosoma sp., LO BIANCO 1903	Cent. Mediterranean...	950	13.4	–	1
	Desmosoma sp., MONOD 1926	Antarctic Indian Ocean	569	*—1.8*	–	1
	ILYARACHNIDAE					
367	*Ilyarachna affinis* Barnard, 1920...........	S. Africa	1280	*2.9*	5	1
368	*Ilyarachna aries* (Vanhöffen, 1914)	Antarctic Indian Ocean	385	—1.8	2	1
369	**Ilyarachna aspidophora* n. sp..............	E. of New Zealand	213	*14.7*	3.2	1
370	*Ilyarachna clypeata* G.O. Sars, 1870........	N. Norway	225-471	*4.5-8*	4	2
371	*Ilyarachna crassiceps* Barnard, 1920........	S. Africa	1280	*2.9*	2.75	1
372	*Ilyarachna dubia* Hansen, 1916	N. E. of Iceland.......	1666-1902	—1.0	3.8; 3	2
373	*Ilyarachna fusiformis* (Barnard, 1920)	S. Africa	1280	*2.9*	3.5	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
374	*Ilyarachna magnifica* (Vanhöffen, 1914)	Antarctic Indian Ocean	350-385	—1.8	5	1
375	*Ilyarachna nordenstami* n. sp.	S. Georgia	252-310	1.5	5.3; 3.9	1
376	*Ilyarachna polita* Bonnier, 1896	Bay of Biscay	950	*9.6*	6	1
	Ilyarachna sp., Lo Bianco 1903	Cent. Mediterranean	200-950	*13.4-13.9*	–	2
	Ilyarachna sp., Menzies 1962b	S. Caribbean Sea	975	*5.4*	–	1
	Ilyarachna sp., Menzies 1962b	S. Africa	1816	*2.8*	–	1
	Ilyarachna sp., Hartmann & Barnard, 1958	California	760	5.1	–	1
377	*Ilyarachna spinoafricana* Menzies, 1962b	S. Africa	706	*4.1*	3.5; 2.7	1
378	*Ilyarachna thori* n. sp.	S. of Iceland; S.W. of the Faroes	216-820	7.5-7.7	4.2	2
	EURYCOPIDAE					
379	*Acanthocope spinosissima* Menzies, 1956a	W. Caribbean Sea	1169	*4.9*	8	1
380	*Syneurycope capensis* (Barnard, 1920)	S. Africa	1280	*2.9*	5	1
381	*Eurycope beddardi* Bonnier, 1896	Bay of Biscay	960	*9.6*	6.1	1
382	*Eurycope crassa* Vanhöffen, 1914	Antarctic Indian Ocean	350-400	—1.9-—1.8	8	2
383	*Eurycope curta* Vanhöffen, 1914	Antarctic Indian Ocean	385	—1.8	1.2	1
384	*Eurycope frigida* Vanhöffen, 1914	Antarctic Indian Ocean; S. Georgia	252-385	—1.8-1.5	4	2
385	*Eurycope gaussi* Wolff, 1956	Antarctic Indian Ocean	385	—1.8	3.3	1
386	**Eurycope gibberifrons* n. sp.	E. of New Zealand	213	*14.7*	2.3	1
387	*Eurycope inermis* Hansen, 1916	S. of Jan Mayen – E. Arctic Ocean; Davis Strait – S.W. of the Faroes	460-1902	—1.4-4.1	11.5; 9.3	*c.* 25
388	*Eurycope laktionovi* Gurjanova, 1946	E. Arctic Ocean	698	*—0.9*	3	1
389	*Eurycope megalura* G.O. Sars, 1872	S.W. of Iceland; S.W. Norway; W. of Ireland	283-1505	4.5-9	2.5	5
390	*Eurycope neupokoevi* Gurjanova, 1946	E. Arctic Ocean	698	*—0.9*	4	1
391	*Eurycope nobili* Richardson, 1911	Bay of Biscay	1107	*8.8*	–	1
392	*Eurycope quadrata* Barnard, 1920	S. Africa	1280	*2.9*	4	1
393	*Eurycope ratmanovi* Gurjanova, 1946	E. Arctic Ocean	1445	*0.6*	6	1
	Eurycope sp., Menzies 1962b	S. Caribbean Sea	1534-1616	*4.2*	–	1
394	*Eurycope sulcifrons* Barnard, 1920	S. Africa	1280	*2.9*	4	1
395	*Lipomera lamellata* Tattersall, 1905	W. of Ireland	364	*10*	1.3	1
396	*Munnopsurus atlanticus* (Bonnier, 1896)	Bay of Biscay	950	*9.6*	6	1
397	*Munnopsurus laevis* (Richardson, 1909)	Bering Sea; W. & E. of Japan	638-1019	*2.8-6*	10	3
398	*Munnopsurus mimus* Barnard, 1914	S. Africa	421-1280	*2.9-6.7*	14; 11	3
399	*Storthyngura atlantica* (Beddard, 1885)	Off the Azores	1646	4.4	10	1
400a	*Storthyngura pulchra caribbea* (Benedict, 1901)	West Indies	1260	4.9	15.8; 15	1
401	*Storthyngura robustissima* Monod, 1925	Antarctic Indian Ocean; S. Shetland Is.	400-750	*—1.9-1.1*	28; 18	2
402	**Paropsurus pellucidus* (Beddard, 1885)	N. of New Guinea	1957	2.4	45	1
	MUNNOPSIDAE					
403	*Munnopsis bathyalis* n. sp.	Bali Sea	545-570	*6.5*	19.9; 19.7	1
404	*Munnopsis latifrons* Beddard, 1885	East China Sea; S. of Japan	612-1211	*2.8-6*	15; 16.8	3
405	*Munnopsis mandibularis* n. sp.	Off Kenya	1510	*3.2*	12.5	1
	INCERTAE SEDIS					
406	*Urias spinosus* Richardson, 1911	Off Rio de Oro, N.W. Africa	698	*8*	–	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities

H. 200-6000 (230-5840) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	JANIRIDAE					
407	**Spinianirella walfishensis* Menzies, 1962b	S.W. – S. Africa	1817-2970	*2.6-2.8*	5.2	2
	HAPLONISCIDAE					
408	*Haploniscus antarcticus* Vanhöffen, 1914	Antarctic Indian Ocean	385-3397	—1.8-—0.3	3; 2.8	2
306b	*Haploniscus bicuspis bicuspis* (G.O. Sars, 1879)	S. of Jan Mayen – E. Arctic Ocean; Iceland – W. Norway; E. of Argentine; S.W. of S. Africa	(?360) 698-5024	—1.1-1.1(?3.5)	2.9; 2.6	21
409	**Haploniscus dimeroceras* Barnard, 1920	N. of W. Indies; E. of Argentine; Bay of Guinea; S.W.-S. Africa	1280-5843	*—0.3-2.9*	2.5	7
410	*Haploniscus spinifer* Hansen, 1916	Davis Strait; S.W. of Iceland; off S.W. Africa	1505-4047	1.4-4.5	2.8	5
	MUNNIDAE					
411	*Munna acanthifera* Hansen, 1916	Davis Strait; off Iceland; E. Arctic Sea	293-2258	—1.0-8.4	3.1; 2.8	17
	DENDROTIONIDAE					
412	**Acanthomunna proteus* Beddard, 1886	W. of New Zealand	1280-2012	2.8-4.4	7	2
	ISCHNOMESIDAE					
413	*Haplomesus angustus* Hansen, 1916	S. E. Greenland; N. of Iceland; E. Arctic Ocean	698-2137	—0.9-3.0	4.8	3
414a	*Haplomesus insignis insignis* Hansen, 1916	Davis Strait; N. of West Indies; E. Arctic Ocean	698-5494	—0.9-*2.1*	4.5	3
415	*Haplomesus quadrispinosus* (G.O. Sars, 1879)[1]	S. of Jan Mayen – E. Arctic Ocean; Davis Strait – W. of Norway; S. of Japan.	510-4150	—1.4-2.4	5	13
416	*Haplomesus tenuispinis* Hansen, 1916	Davis Strait; ?N. of West Indies; E. Pacific Ocean	698-3474 (?5440)	—0.9-*2.4*	4.3	4
417	*Heteromesus granulatus* Richardson, 1908	Off New England – off Delaware	713-3235	*3.2-4.4*	–	5
418	*Heteromesus longiremis* Hansen, 1916	Davis Strait; E. Arctic Ocean	698-2702	—0.9-1.5	5	2
	MACROSTYLIDAE					
419	*Macrostylis abyssicola* Hansen, 1916	Davis Strait; E. Arctic Ocean; off Congo River	698-3921	—0.9-*2.5*	3.1; 2.4	5
420	*Macrostylis subinermis* Hansen, 1916	Off Iceland; N. of the Faroes	1090-3474	—1.0-1.4	3.2	7
	NANNONISCIDAE					
421	*Nannoniscus oblongus* G.O. Sars, 1870	W. of Spitsbergen – E. Arctic Ocean; Iceland; N.-S. Norway; E. of Argentine.	225-5843	—0.3-*8*	2.6; 2.2	*c.* 9

1. A misprint is to be found in HANSEN's list of records (1916, p. 61). The position of St. 139 should read 63°36′N, 7°30′W (not 53°36′N).

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	EURYCOPIDAE					
422	*Eurycope antarctica* Vanhöffen, 1914	S. of Cape Horn; Antarctic Indian Ocean	385-3839	—1.8-*0.3*	3; 2.5	2
423	*Eurycope brevirostris* Hansen, 1916	Off Iceland; N.W. of the Faroes; Antarctic Indian Ocean	887-3423	—0.6-4.5	2.7; 2.1	4
424	*Eurycope complanata* Bonnier, 1896	Davis Strait; E.S.E. of Bermudas; Bay of Biscay	950-5779	1.5-*9.6*	6; 5	5
425	*Eurycope hanseni* Ohlin, 1901	W. of Spitsbergen – E. Arctic Ocean; E. of Iceland	460-2750	—1.4-*0.1*	10; 6.7	(>) 21
426	*Eurycope parva* Bonnier, 1896	Davis Strait; S.W. of the Faroes; Bay of Biscay	872-2702	1.5-*9.6*	2.7; 3	3
427	*Eurycope spinifrons* Gurjanova, 1933	W. Sea of Japan	308-3000	*0.2-0.7*	5	several
428	*Munnopsurus australis* (Vanhöffen, 1914) ...	Antarctic Indian Ocean	*c.* 400-3423	*—1.8-—0.6*	8.8	2
429	*Munnopsurus longipes* (Tattersall, 1905)	Davis Strait; S.W. of the Faroes; W. of Ireland	640-2702	1.5-*10*	10; 18.6	4
	MUNNOPSIDAE					
430	*Munnopsis australis* Beddard, 1885	Antarctic & Subantarctic Indian Ocean	*c.* 400-2926	—1.8-1.2	8	3
431	*Munnopsis beddardi* (Tattersall, 1905)	Davis Strait; S.W. of the Faroes; W. of Ireland; S. Africa ...	364-2702	1.5-*10*	7; 6.3	5
432	*Munnopsis eximius* (Hansen, 1916).........	Davis Strait; S. of Iceland; S.W. of the Faroes	870-2702	1.5-*7.5*	8.5; 5.7	4
433	*Munnopsis longiremis* Richardson, 1912	W. of Costa Rica; off Galapagos Is........	1485-3570	*1.9*-3.6	15	2

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	JANIRIDAE					
434	*Abyssijaera acarina* Menzies, 1962b........	E.S.E. of Bermuda ...	5779	*2.3*	1.6	1
435	*Acanthaspidia bifurcata* Menzies, 1962b	Off S.W. Africa.......	2970	*2.6*	4.2	1
436	*Acanthaspidia decorata* (Hansen, 1895)	Cent. Atlantic (7.5°N, 21.3°W)	4000	*2.4*	9.7	1
437	*Ianthopsis acanthonotus* (Beddard, 1886)....	Antarctic Indian Ocean	3063-3398	—0.3	24	2
438	*Ianthopsis nodosa* Vanhöffen, 1914	Antarctic Indian Ocean	3423	—0.3	6	1
439	*Janira abyssicola* Beddard, 1886	Off Fiji Is.	2468	*2.0*	–	1
440	*Janira operculata* n. sp.	Gulf of Panama	3270-3670	*2.0*	3.1	1
441	*Janirella bifida* Menzies, 1962b	S. Africa	4885	*1.1*	3.8	1
442	*Janirella lobata* Richardson, 1908..........	Off New England	2480-3235	*2.9-3.2*	–	3
443	*Janirella laevis* Hansen, 1916..............	Davis Strait	2258-2702	1.5-2.4	4	2
444	*Janirella magnifrons* Menzies, 1962b	S.W. of S. Africa	4588	*0.8*	3.2	1
445	*Janirella vemae* Menzies, 1956b	N. of W. Indies	5104-5122	*2.3*	3.3	1
446	*Janthura abyssicola* n. sp..................	Bay of Guinea........	2550	*3.0*	2.5	1
447	*Microprotus antarcticus* Vanhöffen, 1914 ...	Antarctic Indian Ocean	3398	—0.3	–	1
448	*Rhacura pulchra* Richardson, 1908	Off New England	3235	*3.2*	–	1
449	*Xostylus parallelus* Menzies, 1962b	E. of N. Argentine.....	5024	*0.3*	8.1	1
	ECHINOTHAMBEMATIDAE					
450	*Echinothambema ophiuroides* Menzies, 1956b	N. of West Indies	5104-5124	*2.3*	5.0	1
451	*Vemathambema elongata* Menzies, 1962b ..	Off S.W. Africa.......	4935	*1.0*	5.2	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	THAMBEMATIDAE					
452	*Microthambema tenuis* Birstein, 1961	S. E. of Japan	5680-5690	*1.5*	2.7	1
453	*Thambema amicorum* Stebbing, 1913	W. of Ireland	2487	*3*	8	1
	HAPLONISCIDAE					
454	*Haploniscus acutus* Menzies, 1962b	S.W. of Africa	4588	*0.8*	3.3	1
455	*Haploniscus armatus* (Menzies, 1962b)	S.W. of S. Africa	4588-4960	*0.8*	2.6	2
456	*Haploniscus curvirostris* Vanhöffen, 1914	Antarctic Indian Ocean	3423	—0.3	3	1
457	*Haploniscus elevatus* Menzies, 1962b	S.W. of S. Africa	4960	*0.8*	1.9	1
458	*Haploniscus excisus* Richardson, 1908	Off New England	3235	3.2	–	1
459	*Haploniscus ingolfi* n. sp.	S. of Jan Mayen	2465	—1.0	1.8	1
460	*Haploniscus kermadecensis* n. sp.	Kermadec Trench	4540	*1.1*	5.9	1
461	*Haploniscus minutus* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	2.5	1
462	*Haploniscus nondescriptus* Menzies, 1962b	S. Africa	4885	*1.1*	3.6	1
463	*Haploniscus ornatus* (Menzies, 1962b)	S. of Cape Horn; S. of S. Georgia	3756-3839	*0.3*	1.9	1
464	*Haploniscus ovalis* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	2.1; 2.0	1
465	*Haploniscus parallelus* Menzies, 1962b	E. of Argentine; S.W. of S. Africa	4960-5024	*0.3-0.8*	2.1; 1.8	2
466	*Haploniscus percavix* Menzies, 1962b	W. of the Azores; off S.W. & S. Africa	*c.* 2000-4885	*1.1-3.5*	3.4; 2.1	3
467	*Haploniscus polaris* Menzies, 1962b	S.W. of S. Africa	4960	*0.8*	2.1	1
468	*Haploniscus princeps* Menzies, 1962b	Off S.W. & S. Africa	3049-4885	*1.1-2.4*	2.1; 2.2	2
469	*Haploniscus quadrifrons* Menzies, 1962b	Off Gabon; off Congo River	2997-3921	*1.2-2.5*	2.1	2
470	*Haploniscus robinsoni* Menzies & Tinker, 1960	Off Ecuador	2860	*1.7*	2.5; 2.4	1
471	*Haploniscus rostratus* (Menzies, 1962b)	S.W. of S. Africa	4960	*0.8*	3.3	1
472	*Haploniscus rugosus* Menzies, 1962b	Off S.W. & S. Africa	3049-4885	*1.1-2.4*	3.1	2
	Haploniscus sp., MENZIES 1962b	N. of W. Indies	5163-5172	*2.2*	–	1
	Haploniscus sp., MENZIES 1962b	N. of W. Indies	5410-5440	*2.1*	–	1
	Haploniscus sp., MENZIES 1962b	N. of W. Indies	5684	*2.1*	–	1
	Haploniscus sp., MENZIES 1962b	Off Gabon	2997	*1.2*	–	1
	Haploniscus sp., MENZIES 1962b	Off S.W. Africa	4047	*1.4*	–	1
	Haploniscus sp., MENZIES 1962b	E. of S. Brazil	4144-4166	*0.5*	–	1
	Haploniscus sp., MENZIES 1962b	E. of N. Argentine	5024	*0.3*	–	1
	Haploniscus sp., MENZIES 1962b	S.W. of S. Africa	4960	*0.8*	–	1
	Haploniscus sp., MENZIES 1962b	S.W. of S. Africa	4588	*0.8*	–	1
	Haploniscus sp., MENZIES 1962b	E. N. E. of Falkland Is.	2738	*1.8*	–	1
	Haploniscus sp., MENZIES 1962b	W. of S. Sandwich Is.	2741	*0.3*	–	1
473	*Haploniscus spatulifrons* Menzies, 1962b	S.W. of S. Africa	4588	*0.8*	2.6; 5.3	1
474	*Haploniscus telus* Menzies, 1962b	S.W. of S. Africa	4960	*0.8*	2.5	1
475	*Haploniscus tricornis* Menzies, 1962b	S.W. of S. Africa; S. of S. Georgia	3756-4588	*0.3-0.8*	4.2	2
476	*Haploniscus tricornoides* Menzies, 1962b	S.W. of S. Africa	4960	*0.8*	2.5	1
477	*Haploniscus tridens* Menzies, 1962b	E. of Argentine	5024-5843	*0-0.3*	4.2; 3.2	2
478	*Haploniscus trituberculatus* Menzies, 1962b	Off S.W. Africa; S.W. of S. Africa	3049-4588	*0.8-2.4*	2.6; 2.25	2
479	*Haploniscus tuberculatus* Menzies, 1962b	S.W. of S. Africa	4588	*0.8*	1.7	1
480	*Haploniscus unicornis* Menzies, 1956b	N. of W. Indies	5104-5122	*2.3*	1.45	1
481	*Hydroniscus abyssi* Hansen, 1916	S. of Davis Strait	3521	1.3	2.8	1
482	*Hydroniscus ornatus* Menzies, 1962b	E. of S. Brazil; S.W. of S. Africa	3954-4588	*0.8-1.4*	4.0; 3.5	2
483	*Hydroniscus quadrifrons* Menzies, 1962b	N. of W. Indies; E. of Argentine	5163-5684	*0.1-2.2*	3.2; 2.7	5
	MUNNIDAE					
484	*Munna argentinae* Menzies, 1962b	S. of Cape Horn	3839	*0.3*	2.0	1
485	*Notoxenoides vemae* Menzies, 1962b	Off S.W. Africa	4047	*1.4*	1.8	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	DENDROTIONIDAE					
486	*Acanthomunna beddardi* Menzies, 1962b	S. Africa	4885	*1.1*	5.4	1
487	*Dendromunna mirabile* n. sp.	Kermadec Trench	5230-5340	1.1	5.7	1
	ANTIASIDAE					
488	*Abyssianira argentinensis* Menzies, 1962b	E. N. E. of Falkland Is.	2681	*1.8*	–	1
489	*Abyssianira dentifrons* Menzies, 1956b	N. of W. Indies; E. of N. Argentine; S. W. of S. Africa	4588-5293	*0.3-2.3*	2.8	4
	ISCHNOMESIDAE					
490	*Bactromesus elegans* (Menzies, 1962b)	E. N. E. of Falkland Is.; S. Africa	2738-4588	*0.8-1.8*	7.2	2
491	*Bactromesus gracilis* (Birstein, 1960)	S. of Japan	5680-5690	*1.5*	2.9	1
492	*Gomphomesus wolffi* (Birstein, 1960)	S. of Japan; N. W. Pacific (31°N, 174°E)	4000-5530	*1.4-1.5*	4.1	2
493	*Haplomesus bifurcatus* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	5.0	1
494	*Haplomesus brevispinis* Birstein, 1960	S. E. of Japan	5510-5690	*1.5*	9	2
414b	*Haplomesus insignis orientalis* Birstein, 1960	S. of Japan	4000-4150	*1.4*	5.1	1
495	*Haplomesus modestus* Hansen, 1916	Davis Strait	2258	2.4	3.8; 3.6	1
496	*Haplomesus ornatus* Menzies, 1962b	E. of Argentine; off S. W. Africa; S.W. of S. Africa	4060-5293	*0.1-1.4*	6.8	3
497	*Haplomesus robustus* Birstein, 1960	E. of Japan	5450-5817	*1.5*	7.5; 7.8	2
498	*Haplomesus scabriusculus* Birstein, 1960	E. of Japan	5450	*1.5*	8	1
499	*Haplomesus thomsoni* (Beddard, 1886)	N.W. Pacific (36°N, 178°E)	3750	1.7	6	1
500	*Haplomesus tropicalis* Menzies, 1962b[1]	Cent. Caribbean Sea; (E. Mediterranean)	(2526-)4071	*4.2(-13.7)*	4.1; 3.1	1 (+1)
501	*Helomesus menziesi* (Birstein, 1960)	E. of Japan	5680-5690	*1.5*	7.5	1
502	*Heteromesus bifurcatus* Menzies, 1962b	Cent. Caribbean Sea	4071	*4.2*	*c.* 8	1
503	*Heteromesus similis* Richardson, 1911	N. E. of the Azores	2995	*2.7*	–	1
504	*Heteromesus spinescens* Richardson, 1908	Off New England – off Virginia	2154-3337	*3.2-4.5*	–	5
505	*Ischnomesus anacanthus* n. sp.	Tasman Sea	3710	*1.1*	18.8	1
506	*Ischnomesus armatus* Hansen, 1916	Davis Strait; N. of W. Indies	2702-5497	1.5-*2.1*	4.8	2
507	*Ischnomesus bacilloides* (Beddard, 1886)	W. of Cent. Chile	2652	1.9	15	1
508	*Ischnomesus bacillus* (Beddard, 1886)	S. of Australia	3292	*0.8*	14	1
509	*Ischnomesus bidens* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	*c.* 13	1
510	*Ischnomesus birsteini* n. sp.	Kermadec Trench	4410	1.2	15	1
511	*Ischnomesus decemspinosus* Menzies, 1962b	Off S.W. Africa	3049	*2.4*	8.4	1
512	*Ischnomesus elegans* Menzies, 1962b	E. of Argentine	5293	*0.1*	*c.* 11	1
513	*Ischnomesus magnificus* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	*c.* 23	1
514	*Ischnomesus paucispinis* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	*c.* 5	1
515	*Ischnomesus planus* n. sp.	W. of Costa Rica	3570	*1.9*	35-40	1
516	*Ischnomesus profundus* Hansen, 1916	S. of Davis Strait	3521	1.3	4	1
517	*Ischnomesus roseus* n. sp.	W. of Costa Rica; Gulf of Panama	3270-3670	*1.9*	*c.* 20	2

1. According to MENZIES (1962b, p. 121), the *Vema* collected *Haplomesus tropicalis* both in the Central Caribbean Sea (L.G.O. Biotrawl No. 95, depth 4071 m) and in the Mediterranean S. of Crete (L.G.O. Biotrawl No. 76, depth 2526 m). There are very few other records of asellotes from the Mediterranean, and none from depths greather than 1200 m. Moreover, the highest temperature record for any species of *Haplomesus* is 4°C, while the bottom temperature at the Mediterranean locality is *c.* 13.7°. For these reasons I wrote to Dr. MENZIES expressing my serious doubts as to the correctness of this record. Due to his confirmative answer ("I have made repeated check including lengthy correspondance with the Lamont Geological Observatory; as far as I can determine the record stands") and due to the fact that also a species of *Ischnomesus (bispinosus)* was on one occasion recorded from the Mediterranean (although only at a depth of 1100 m) I have also decided to accept this record, albeit with some hesitation.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
518	*Ischnomesus simplissimus* Menzies, 1962b	S.W. of S. Africa	4885-5960	*0.8-1.1*	9.1	2
	Ischnomesus sp., MENZIES, 1962b	N.W. of W. Indies	5271-5291	*2.1*	–	1
	Ischnomesus sp., MENZIES 1962b	Cent. Caribbean Sea	2875-2941	*4.1*	–	1
	Ischnomesus sp., MENZIES 1962b	Off Cent. Brazil	3222-3336	*2.7*	–	1
	Ischnomesus sp., MENZIES 1962b	E. of N. Argentine	5024	*0.3*	–	1
	Ischnomesus sp., MENZIES 1962b	E. of N. Argentine	3954-3963	*1.4*	–	1
	Ischnomesus sp., MENZIES 1962b	Off S.W. Africa	4047	*1.4*	–	1
	Ischnomesus sp., MENZIES 1962b	S.W. of S. Africa	4885	*1.1*	–	1
	Ischnomesus sp., MENZIES 1962b	S.W. of S. Africa	4960	*0.8*	–	1
	Ischnomesus sp., this paper	Tasman Sea	3710	*1.1*	24	1
519	*Ischnomesus wolffi* Menzies, 1962b	Off S.W. Africa; S.W. of S. Africa	4047-4960	*0.8-1.4*	–	2
520	*Stylomesus granulosus* Menzies, 1962b	S.W. of S. Africa	4588	*0.8*	7.2; 8.9	1
521	*Stylomesus pacificus* Birstein, 1960	E. of Japan	5450	*1.5*	4	1
522	*Stylomesus productus* Menzies, 1962b	E. of Argentine	5293	*0.1*	*c.* 4.8	1
523	*Stylomesus regularis* Menzies, 1962b	E. of S. Brazil	4144-4166	*0.5*	6.0; 5.75	1
524	*Stylomesus simplex* Menzies, 1962b	E. of Argentine; S.W. of S. Africa	4885-5843	*0-1.1*	*c.* 3.6	3
525	*Stylomesus simulans* Menzies, 1962b	E. of Argentine	5293	*0.1*	*c.* 4.6	1
	Stylomesus sp., MENZIES 1962b	E. of N. Argentine	5024	*0.3*	–	1
	Stylomesus sp., MENZIES 1962b	S. of S. Georgia	3756	*0.3*	–	1
526	*Stylomesus spinulosus* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	*c.* 3.7	1
	MACROSTYLIDAE					
527	*Macrostylis bifurcatus* Menzies, 1962b	S.W. of S. Africa	4588-4960	*0.8*	2.7	2
528	*Macrostylis bipunctatus* Menzies, 1962b	E. of N. Argentine; S.W. of S. Africa	3954-5024	*0.3-1.4*	2.1; 2.5	5
529	*Macrostylis caribbicus* Menzies, 1962b	Cent. Caribbean Sea	2875-2941	*4.1*	4.8	1
530	*Macrostylis hirsuticaudis* Menzies, 1962b	Off Congo River	2997	*1.2*	3.2; 2.7	1
531	*Macrostylis latifrons* Beddard, 1886	N.W. Pac. (36°N, 178°E)	3749	1.7	5	1
532	*Macrostylis magnifica* n. sp.	S. of Davis Strait	3521	1.3	3.3	1
533	*Macrostylis minutus* Menzies, 1962b	N. of W. Indies	5163-5494	*2.1-2.2*	2.5	3
534	*Macrostylis setifer* Menzies, 1962b	N. of W. Indies	5477-5494	*2.1*	6.1	1
	Macrostylis sp., MENZIES 1962b	S. Africa	4885	*1.1*	–	1
535	*Macrostylis truncatex* Menzies, 1962b	N. of Bahama Is.	3950-3963	*2.5*	3.5	1
536	*Macrostylis vemae* Menzies, 1962b	N. of W. Indies	5410-5684	*2.1*	3.8; 3.9	2
	NANNONISCIDAE					
537	*Austroniscus karamani* Birstein, 1962	E. of Japan	5450	*1.5*	3.75	1
538	*Nannoniscoides hirsutus* Menzies, 1962b	E. of N. Argentine	5024	*0.3*	1.2	1
539	*Nannoniscus analis* Hansen, 1916	Davis Strait	2258	2.4	2.7; 2.1	1
540	*Nannoniscus armatus* Hansen, 1916	S. of Davis Strait	3521	1.3	> 1.6	1
541	*Nannoniscus inermis* Hansen, 1916	Davis Strait	2258	2.4	3.3	1
542	*Nannoniscus laevis* Menzies, 1962b	S. Africa	4885	*1.1*	3.2	1
543	*Nannoniscus primitivus* Menzies, 1962b	Cent. Caribbean Sea	2868-2875	*4.1*	1.8	1
	Nannoniscus sp., MENZIES 1962b	Off S.W. Africa	2970	*2.6*	–	1
544	*Nannoniscus spinicornis* Hansen, 1916	S. of Jan Mayen	2465	—1.0	1.5	1
	DESMOSOMATIDAE					
545	*Desmosoma birsteini* Menzies, 1962b	S.W. of Bermudas	5166	*2.3*	2.3	1
546	*Desmosoma gracilipes* Hansen, 1916	Davis Strait	2258-2702	1.5-2.4	3.2; 2.7	2
547	*Desmosoma insigne* Hansen, 1916	Davis Strait	2702	1.5	3.1; 1.9	1
548	*Desmosoma longimana* (Vanhöffen, 1914)	Antarctic Indian Ocean	2735	0.3	5.4	1
549	*Desmosoma longispinum* Hansen, 1916	S. of Davis Strait	3521	1.3	2.1; 1.8	1
550	*Desmosoma simile* Hansen, 1916	Davis Strait	2258	2.4	2.2	1
	Desmosoma sp., MENZIES 1962b	N. of W. Indies	5410-5440	*2.1*	–	1
	Desmosoma sp., MENZIES 1962b	Off S.W. Africa	4047	*1.4*	–	1
	Desmosoma sp., MENZIES 1962b	Off S.W. Africa	2970	*2.6*	–	1
	Desmosoma sp., MENZIES 1962b	W. of S. Sandwich Is.	2741	*0.3*	–	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	ILYARACHNIDAE					
551	*Ilyarachna abyssorum* Richardson, 1911	E. of the Azores	4060-4165	*2.5*	13	2
552	*Ilyarachna africana* Menzies, 1962b	Off S.W. Africa	3049	*2.4*	3.6	1
553	*Ilyarachna antarctica* Vanhöffen, 1914......	Antarctic Indian Ocean	3397-3423	—0.3	6.3	2
554	*Ilyarachna bicornis* Hansen, 1916	Davis Strait	2702	1.5	8.7	1
555	*Ilyarachna derjugini* Gurjanova, 1946	E. Arctic Ocean	2500	*—0.5*	4	1
556	*Ilyarachna gurjanovae* Menzies, 1962b	S. Africa	4885	*1.1*	3.2	1
557	*Ilyarachna indentifrons* Menzies, 1962b	S. Africa	4885	*1.1*	4.4	1
558	*Ilyarachna multispinosa* Menzies, 1962b	S. E. of Montevideo; S.W. of S. Africa ...	4960-5024	*0.3-0.8*	2.4	2
559	*Ilyarachna nodifronoides* Menzies, 1962b ...	S.W. of S. Africa	4960	*0.8*	7.0; 4.5	1
560	*Ilyarachna scotia* Menzies, 1962b	S. of Cape Horn	3813	*0.3*	3.2	1
561	*Ilyarachna simplex* Menzies, 1962b	S. Africa	4885	*1.1*	2.9	1
	Ilyarachna sp., MENZIES 1962b	N. of W. Indies	5410-5440	*2.1*	–	1
	Ilyarachna sp., MENZIES 1962b	Cent. Caribbean Sea ...	2875-2941	*4.1*	–	1
	Ilyarachna sp., MENZIES 1962b	Off S.W. Africa	3049	*2.4*	–	1
	Ilyarachna sp., MENZIES 1962b	E. of S. Brazil.........	4144-4166	*0.5*	–	1
	Ilyarachna sp., MENZIES 1962b	E. of Argentine	5843	*0*	–	1
	Ilyarachna sp., MENZIES 1962b	S. of Cape Horn	3839	*0.3*	–	1
562	*Ilyarachna spinosissima* Hansen, 1916	Davis Strait	2702-3521	1.3-1.5	6; 3.8	2
563	*Ilyarachna triangulata* Menzies, 1962b	Off S.W. Africa	3049	*2.4*	4.4	1
	EURYCOPIDAE					
564	*Acanthocope acutispina* Beddard, 1885	Off Cent. Chile	2650	1.9	4.2	1
565	*Acanthocope annulatus* Menzies, 1962b.....	S. Africa	4885	*1.1*	3.2	1
566	*Acanthocope argentinae* Menzies, 1962b	E. of N. Argentine.....	5024	*0.3*	*3.6*	1
567	*Acanthocope galatheae* n. sp.	Gulf of Panama	3270-3670	*2.0*	6.0	1
	Acanthocope sp., MENZIES 1962b	Cent. Caribbean Sea ...	4071	*4.2*	–	1
	Acanthocope sp., MENZIES 1962b	Cent. Caribbean Sea ...	4076	*4.2*	–	1
	Acanthocope sp., MENZIES 1962b	Off S.W. Africa	4047	*1.4*	–	1
568	*Acanthocope spinicauda* Beddard, 1885	S. of Australia	3290	*0.8*	7.7	1
569	*Acanthocope unicornis* Menzies, 1962b	Off S.W. Africa	4047	*1.4*	5.4	1
570	*Syneurycope hanseni* Menzies, 1956b	N. of W. Indies	5104-5122	*2.3*	3.75	1
571	*Syneurycope heezeni* Menzies, 1962b	Off Cent. Brazil; S. of Cape Horn	3222-3839	*0.3-2.7*	4.5	3
572	*Syneurycope multispina* Menzies, 1962b	S. W. of S. Africa	4960	*0.8*	4.2; 4.3	1
573	*Syneurycope parallela* Hansen, 1916	S. of Davis Strait......	3474	1.4	3.7	1
574	*Eurycope acutitelson* Menzies, 1962b.......	S. W. of S. Africa	4960	*0.8*	3.2; 3.4	1
575	*Eurycope nodosa* Menzies, 1962b	S. Africa	4885	*1.1*	4.6	1
576	*Eurycope ovalis* Vanhöffen, 1914	Antarctic Indian Ocean	3423	—0.3	3.4	1
577	*Eurycope ovaloides* Menzies, 1962b	Off S.W. Africa	3049	*2.4*	4.3	1
578	*Eurycope sarsi* Beddard, 1886	Off Marion I., S.W. Indian Ocean .	2514-2926	1.2	24	2
579	*Eurycope scabra* Hansen, 1897	Gulf of Panama	2486	*2.1*	25.6	1
	Eurycope sp., MENZIES 1962b	S.W. of Bermudas.....	5166	*2.3*	–	1
	Eurycope sp., MENZIES 1962b	Bahama Is	2357-2370	*2.7*	–	1
	Eurycope sp., MENZIES 1962b	N. of W. Indies	5104-5122	*2.3*	–	1
	Eurycope sp., MENZIES 1962b	N. of W. Indies	5271-5291	*2.1*	–	1
	Eurycope sp., MENZIES 1962b	N. of W. Indies	5410-5440	*2.1*	–	1
	Eurycope sp., MENZIES 1962b	N. of W. Indies	5477-5494	*2.1*	–	1
	Eurycope sp., MENZIES 1962b	Cent. Caribbean Sea ...	4071	*4.2*	–	1
	Eurycope sp., MENZIES 1962b	E. of S. Brazil.........	4144-4166	*0.5*	–	1
	Eurycope sp., MENZIES 1962b	E. of N. Argentine.....	5024	*0.3*	–	1
	Eurycope sp., MENZIES 1962b	Off S.W. Africa	2970	*2.6*	–	1
	Eurycope sp., MENZIES 1962b	S. Africa	4885	*1.1*	–	1
	Eurycope sp., MENZIES 1962b	S.W. of S. Africa	4960	*0.8*	–	1
	Eurycope sp., MENZIES 1962b	S.W. of S. Africa	4588	*0.8*	–	1
	Eurycope sp., MENZIES 1962b	S. of Cape Horn	3839	*0.3*	–	1
	Eurycope sp., MENZIES 1962b	W. of S. Sandwich Is. .	2741	*0.3*	–	1

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No of localities
580	*Eurycope vicarius* Vanhöffen, 1914	S. of Cape Horn; Antarctic Indian Ocean	3423-3839	—0.3-*0.3*	9	2
581	*Munneurycope elongata* n. sp.	S. of Davis Strait	3521	1.3	3.9	1
582	*Munneurycope harrietae* n. sp.	Tasman Sea	4400	*1.1*	18	1
583	*Munneurycope incisa* (Gurjanova, 1946)	N.W. of Spitsbergen	2380	—1.0	10	1
584	*Munneurycope nodifrons* (Hansen, 1916)	Davis Strait	2702	1.5	5	1
585	*Storthyngura abyssalis* n. sp.	Tasman Sea	4400	*1.1*	29	1
586	*Storthyngura birsteini* Menzies, 1962b	E. of Cape Horn	3776	*1*	21.5	1
587	*Storthyngura brachycephala* Birstein, 1957	Kurile-Kamtchatka Trench	5670-5680	*1.1*	13	1
588	*Storthyngura challengeri* n. sp.	Antarctic Indian Ocean	2300	*0.4*	31	1
589	*Storthyngura digitata* Menzies, 1962b	E. of Argentine	5843	*0*	5.8	1
590	*Storthyngura elegans* Vanhöffen, 1914	Antarctic Indian Ocean	3423	*—0.3*	2.3	1
591	*Storthyngura fragilis* (Beddard, 1885)	E. of Japan	3429	1.8	12	1
592	*Storthyngura gordonae* n. sp.	Off Marion I., S.W. Indian Ocean	2925	1.2	18.4	1
593	*Storthyngura intermedia* (Beddard, 1885)	E. of Japan	5011	1.8	9	1
594	*Storthyngura magnispinis* (Richardson, 1908)	Davis Strait; off New England	2258-2702	1.5-3.2	4.2; 3.7	3
595	*Storthyngura novae-zelandiae* (Beddard, 1885)	E. of New Zealand	2012	2.8	12	1
400b	*Storthyngura pulchra pulchra* (Hansen, 1897)	W. of Costa Rica; Gulf of Panama; N. of Galapagos Is.	2490-3570	*1.9-2.0*	25.4; 26.0	4
596	*Storthyngura serrata* n. sp.	Gulf of Panama	2950-3190	*2.0*	10.7	1
597	*Storthyngura snanoi* Menzies, 1962b	Cent. Caribbean Sea	4071	*4.2*	–	1
	Storthyngura sp., MENZIES 1962b	E. of Argentine	5293	*0.1*	–	1
	Storthyngura sp., MENZIES 1962b	S. of S. Georgia	3756	*0.3*	–	1
	Storthyngura sp., BEDDARD 1885	Off Marion Is., S.W. Indian Ocean	2926	1.2	25-28	1
	Storthyngura sp., this paper	S. of Australia	3290	*0.8*	17	1
	Storthyngura sp. juv., BEDDARD 1886	E. of New Zealand	2012	2.8	(>) 3	1
598	*Storthyngura spinosa* (Beddard, 1885)	S. E. Indian Ocean (54°S, 109°E)	3567	0.1	20	1
599	*Storthyngura symmetrica* Menzies, 1962b	S. Africa	4885	*1.1*	18.5; 6.5	1
600	*Storthyngura triplispinosa* Menzies, 1962b	E. of Argentine; W. & S.W. of S. Africa	3049-5843	*0-2.4*	14.5	4
601	*Storthyngura truncata* (Richardson, 1908)	Off New England	2788-3235	2.7-3.2	4	2
602	*Storthyngura vemae* Menzies, 1962b	S.W. of Bermudas	5166	*2.3*	3.5	1
603	*Bathyopsurus abyssicolus* (Beddard, 1885)	W. of the Azores	3886	2.3	40	1
604	*Paropsurus giganteus* n. sp.	W. of Costa Rica; Tasman Sea	3570-4400	*1.1-1.9*	59; 60	2
	MUNNOPSIDAE					
605	*Munnopsis gracilis* Beddard, 1885	E. of New Zealand	2012	2.8	12	1
	INCERTAE SEDIS					
606	*Haplomunna caeca* (Richardson, 1905)	Off California	3993	*1.4*	–	1
607	*Mesosignum kohleri* Menzies, 1962b	Cent. Caribbean Sea	2868-4076	*4.1-4.2*	2.3; 2.5	4
608	*Mesosignum usheri* Menzies, 1962b	Cent. Caribbean Sea	2875-2941	*4.1*	2.1; 2.0	1

K. 2000-11.000 (2450-7900) METRES

	ISCHNOMESIDAE					
609	*Ischnomesus andriashevi* Birstein, 1960	Japan Trench; S. of Japan	4000-6207	*1.4-1.5*	16	2
610	**Stylomesus inermis* (Vanhöffen, 1914)	E. of Argentine; Antarctic Indian Ocean	2450-6079	—0.3-*0.3*	5.1	4

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	ILYARACHNIDAE					
611	*Ilyarachna kermadecensis* n. sp.	Kermadec Trench	4540-7000	1.1-1.3	15.2; 8.7	3
	EURYCOPIDAE					
612	*Storthyngura benti* Wolff, 1956	Kermadec Trench	5230-7000	1.1-1.3	19; 18	5
613	*Storthyngura chelata* Birstein, 1957	Kurile-Kamtchatka Trench; Japan Trench	5345-6860	*1.6-1.8*	35	3
614	*Storthyngura furcata* Wolff, 1956	Kermadec Trench	5850-6730	1.2-1.3	30.5; 25	3
615	*Bathyopsurus nybelini* Nordenstam, 1955	N. of W. Indies; Puerto Rico Trench; Kermadec Trench; Tasman Sea	4400-7900	*1.1-2.7*	45; 25	4

L. 6000-11.000 (6160-10.000) METRES

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No. of localities
	HAPLONISCIDAE					
	Haploniscus n. sp., BELJAEV & VINOGRADOVA 1961	Sunda Trench	6935-7060	1.4	–	1
	Hydroniscus n. sp., WOLFF 1960	Japan Trench	6471-6571	*1.5*	–	1
	ISCHNOMESIDAE					
616	*Haplomesus cornutus* Birstein, 1960	Japan Trench	6471-6571	*1.7*	9.8	1
617	*Haplomesus gigas* Birstein, 1960	Kurile-Kamtchatka Trench; Japan Trench	6156-8430[1]	1.7-*1.9*	15	3
618	*Ischnomesus bruuni* Wolff, 1956	Kermadec Trench	6960-7000	1.3	13.5	1
619	*Ischnomesus spärcki* Wolff, 1956	Kermadec Trench	6660-7000	1.3	16	2
	MACROSTYLIDAE					
620	*Macrostylis galatheae* Wolff, 1956	Philippine Trench	9820-10.000	2.6	5.5	1
621	*Macrostylis hadalis* Wolff, 1956	Banda Trench	7270	3.6	4.4	1
	ILYARACHNIDAE					
	Ilyarachna sp., WOLFF 1960	Kurile-Kamtchatka Trench	8330-8430	*1.9*	–	1
	EURYCOPIDAE					
622	*Eurycope galatheae* Wolff, 1956	Kermadec Trench	6960-7000	1.3	5.8	1
623	*Eurycope madseni* Wolff, 1956	Kermadec Trench	6960-7000	1.3	6.9	1
	Eurycope sp., BELJAEV & VINOGRADOVA 1961	Sunda Trench	6820-6850	1.4	–	1
624	*Munneurycope menziesi* n. sp.	Kermadec Trench	6960-7000	1.3	13.5	1
625	*Storthyngura bicornis* Birstein, 1957	Japan Trench	6156-6207	1.7	30	1
626	*Storthyngura herculea* Birstein, 1957	Aleutian Trench; Kurile-Kamtchatka Trench; Japan Trench	6475-8100	1.6-1.8	45	5
400c	*Storthyngura pulchra kermadecensis* n. subsp.	Kermadec Trench	6620-6730	1.3	27; 22	1
627a	*Storthyngura tenuispinis tenuispinis* Birstein, 1957	Aleutian Trench	7246	1.6	19	1
627b	*Storthyngura tenuispinis kurilica* Birstein, 1957	Kurile-Kamtchatka Trench	7210-7230	1.8	19	1
628	*Storthyngura vitjazi* Birstein, 1957	Kurile-Kamtchatka Trench; Japan Trench	7305-8430	*1.9*	32	2
	Storthyngura n. sp., BELJAEV & VINOGRADOVA 1961	Sunda Trench	6820-6850	1.4	–	1

1. BIRSTEIN (1960, p. 6) recorded the depth of *Vitjaz* St. 3214 as 6560 m. According to BIRSTEIN (1957, p. 965) and several other Russian authors (e. g. RASS 1958, p. 108 and FILATOVA 1958, p. 216) the depth at this station is 6156-6207 m.

Serial No.	Name	Locality	Depth (in m)	Temperature (in °C.)	Body length (in mm)	No of localities
	3. Marine; pelagic					
	DESMOSOMATIDAE					
629	*Desmosoma chelatum* Stephensen, 1915.....	W. Mediterranean.....	*c.* 10	*13-24*	4.5	1
	EURYCOPIDAE					
630	*Munneurycope murrayi* (Walker, 1903)	Atlantic Ocean; N. and S.W. Indian Ocean; Bering Sea; N.W. Pacific	*c.* 400-3100	*2-10*	10.3; 8	45
	MUNNOPSIDAE					
631	*Paramunnopsis longicornis* (Hansen, 1895) ..	E. of Cent. Brazil......	*c.* 600-800	*4.3-5.4*	4	1
632	*Paramunnopsis oceanica* (Tattersall, 1905)...	Atlantic Ocean; Antarctic Indian Ocean	(0)*c.* 60-3000	–	6; 7	7
633	*Paramunnopsis spinifer* (Vanhöffen, 1914)...	Cent. Atlantic Ocean ..	*c.* 400-3000	*2.8-11*	3	2

Temperatures measured at the actual locality where the species was collected are printed in ordinary type, all others in italics.

Body length gives always the greatest length on record; if lengths of both females and males of a species are available, the former is recorded first.

Number of localities. The symbol (>) means: "at least".

Quality of the material

In the section on systematics it has been repeatedly stressed that yet more revisionary work remains to be accomplished within the Paraselloidea. Future investigations will probably show that several of the species listed in Table 18 are synonyms while others may have to be divided into two or more separate species. The composition of several of the genera is certainly not final, and this also applies to some of the families.

In addition, a very large number of new species and genera (and probably even some families) still remain to be established. This is very evident when considering the overwhelming number of new species in the latest larger papers on marine asellotes.

In view of the rather limited character of the material at my disposal, I have in the following survey of the bathymetrical and regional distribution of the marine asellotes preferred to deal, first and foremost, with the group as a whole. In my opinion, it is yet too early to treat in detail the distribution of many of the genera and most of the species, primarily those of the deep-sea.

For the same reasons it has also proved impossible to compare the distribution of deep-sea asellotes to that of other animal groups – except in very general terms.

1. BATHYMETRICAL DISTRIBUTION

Definition of terms. As mentioned above (p. 16), the bathymetrical zones of the sea are defined according to both depth and temperature; the latter being of the order of more than 10° C. in the littoral and sublittoral zones, 4-10° in the bathyal, and below 4° in the abyssal zone.

However, great difficulties are encountered in the bathymetrical arrangement of groups such as the asellotes, which have a large number of species and genera occurring at moderate depths at high latitudes. Here the temperatures are subject to seasonal variations and are on the whole considerably lower than those prevailing at the same depths in the southern boreal, northern antiboreal, subtropical and tropical regions.

In some transitional cases the bathymetrical arrangement may be a compromise between depth and temperature occurrence. However, in Arctic-antarctic and Subarctic-subantarctic regions, it is, in my opinion, impossible to use the terms littoral, sublittoral, and bathyal in the same sense as at lower latitudes. Nor can the terms bathyal and abyssal be applied to species and genera occurring in enclosed basins, as e. g. the Mediterranean and the Sulu Sea, with temperatures of more than 10° from surface to bottom (cf. p. 16). Thus, in the following surveys only the depth intervals are used (except in the final lists of species and genera in which both the depth and the temperature ranges are in accordance with those of the various bathymetrical zones).

a. Species

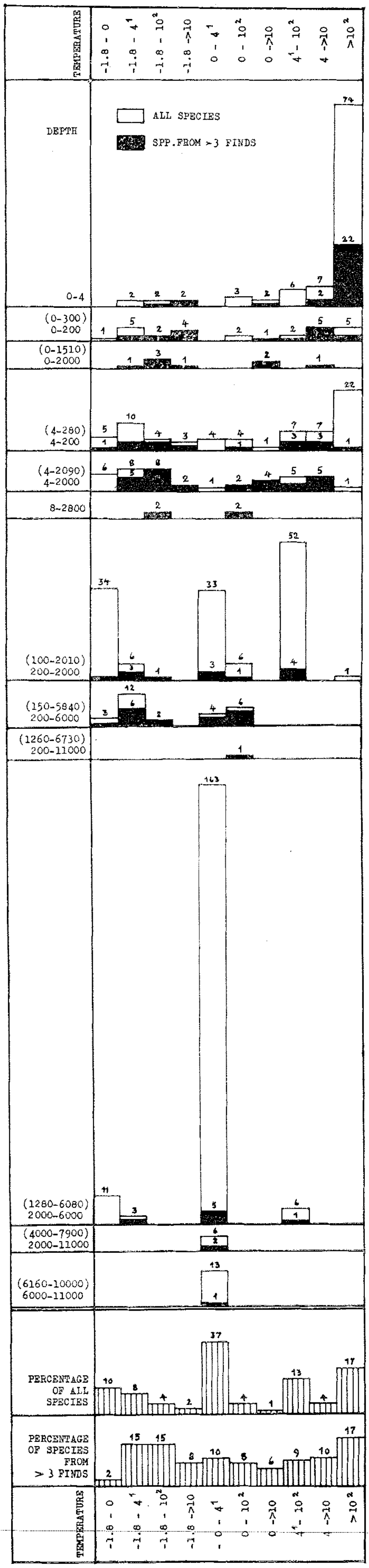
Depth.

Based on the data supplied in Table 18, the first column of Table 19 (p. 273) gives the number of species of Asellota (excl. of Aselloidea), strictly arranged according to the acknowledged depth limits (0-4, 4-200, 200-2000, 2000-6000, and 6000-10.000 m).

The actual depth records of a species should not, however, be applied too precisely. If a species with e. g. several records between 200 and 2000 m has been taken once or a few times at about 150 or 2200 m, it should be regarded as belonging within the first-mentioned depth limits; this being especially so when the range of temperature is in agreement with the temperature characteristic of the said depth zone.

In Table 18 it was found necessary to separate by means of the exact depth limits. In accordance with the above considerations, a truer picture of the bathymetrical arrangement is reached if the following species are transferred to the zones indicated. This transfer can of course be made with the greatest confidence with regard to species known from several localities, many depth and temperature records thus being available.

		Depth range	Temp. range
A. Species known from more than 10 localities:			
0- 200 m:	*Munna antarctica*	2- 310	-1- 4°
4- 200 m:	*Munna minuta*	4- 281	-0.5-12°
	Pleurogonium rubicundum	23- 271	5-11°
	Eurycope mutica	9- 225	0-10°
4-2000 m:	*Eurycope producta*	72-2087	-1- 7°
200-2000 m:	*Iolella laciniata*	185-1384	1.2- 4°
	Ilyarachna coronata	188-1505	3.3- 4.5°
200-6000 m:	*Eurycope furcata*	150-2258	2.4- 7°
B. Species known from 6-10 localities:			
0- 4 m:	*Jaeropsis brevicornis*	0- 5	7-23°
0- 200 m:	*Jaeropsis bidens*	0- 300	9-19°
	Munna kroeyeri	0-?210	1-17°
4- 200 m:	*Macrostylis longiremis* ...	149- 218	6- 7.5°
2000-6000 m:	*Haploniscus dimeroceras* ..	1280-5843	-0.3- 2.9°
C. Species known from 2-5 localities:			
0- 200 m:	*Munna studeri*	0- 210	-1- 3.5°
200-2000 m:	*Munna truncata*	146- 716	3.2- 5°
	Coulmannia australis	183- 400	-1.4- 1.5°
	Acanthomunna proteus ...	1280-2012	2.8- 4.4°
	Ilyarachna starokadomskii	100- 780	-1.5- 0.1°
	Ilyarachna zachsi	105-1002	0.2- 1.2°
	Eurycope latirostris	188- 536	6- 9°
	Munnopsurus minutus	190- 440	0.5- 3.5°
200-6000 m:	*Stenetrium acutum*	150-3397	-1.8- 0.7°
2000-6000 m:	*Spinianirella walfishensis* .	1817-2970	2.6- 2.8°
	Stylomesus inermis	2450-6079	-0.3- 0.3°
D. Species known from 1 locality:			
4- 200 m:	*Ilyarachna aspidophora* ...	213	14.7°
	Eurycope gibberifrons	213	14.7°
200-2000 m:	*Janira tristani*	183-275	9-10°
	Pleurogonium minutum ...	183-275	9-10°
2000-6000 m:	*Notoxenoides abyssi*	1816	2.8°
	Dendromunna spinipes ...	1816	2.8°
	Schistosoma ramosum	1960	3.1°
	Paropsurus pellucidus	1957	2.4°



In Table 19, column 2, the number of species at the various depth intervals is recorded, after the above mentioned 32 species have been transferred. Column 3 gives their percentage of the total number of species (excl. of the pelagic species).

The preponderance of species between 2000 and 6000 m (the abyssal zone) is evident (29 %). This is also expressed by an earlier estimate (Wolff 1956a, p. 140) of the Asellota constituting 86 % of the number of isopod species from depths exceeding 3000 m. Next in quantity are species between 200 and 2000 m. The majority of eurybathic species (6.7 %) are distributed between 4 and 2000 m. *Storthyngura pulchra,* the only species ranging from bathyal to hadal depths, is divided into three subspecies, one occurring bathyally, one abyssally and one hadally; as discussed above (p. 137), I found it impossible to rank these three subspecies as separate species.

No less than 330 of the total of 628 species of asellotes under consideration are known from one find only, and another 117 and 29 species are known from only two and three finds respectively. Thus, a more reliable picture of the bathymetric distribution – at least at more moderate depths – is obtained when excluding all species recorded only once, twice or three times. Table 19, column 4, gives the distribution of the remaining 152 species and column 5 their percentage.

As could be expected, the percentage of species from moderate depths has increased greatly, but this is probably due, primarily, to specimens being more easily available at these depths. Likewise, it is hardly surprising that eurybathic species should now be amongst the dominating groups. This is still more pronounced when the distribution of the 52 species known from at least ten finds is considered (Table 19, column 6). There is no doubt that the relative number of species with a wide bathymetrical range will be considerably increased when the actual bathymetrical range of the, so far, rarely recorded species becomes better known.

Temperature.

As mentioned above, and shown in detail in the following chapter on regional distribution, a large number of the asellotes occur at high latitudes in both hemispheres. Many of these species are there-

Fig. 174. Relation between temperature and depth occurrence of all species of marine Asellota and of species from at least 4 finds. The ciphers denote the number of species or the percentage. (1. ±0.5°C.; 2. ±1°C.).

Table 19. Number and percentage of benthic species, genera and families of Asellota (excl. of Aselloidea) occurring at different depth intervals.

Column		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		All species			Spp. from > 3 finds		Spp. from > 9 finds	All genera			Genera with > 1 sp.		Genera with > 2 spp.		Fam-ilies
Depth intervals	Actual depths (spp. or genera)	Spp. not transf.	Spp. transferred					Gen. not transf.	Genera transferred						
		No.	No.	%	No.	%	No.	No.	No.	%	No.	%	No.	%	No.
Freshwater	-	19	19	3.0	8	5.3	2	7[1]	7[1]	7.2	5[1]	8	1[1]	2.5	(1)
0- 4	0- 4	97	98	15.6	28	18.4	4	8	8	8.3	3	5	0	0	1*
0- 200	0- 150	24	27	4.3	16	10.5	6	6[2]	6[2]	6.2	5[2]	8	5[2]	12	1
0- 2000	0- 1620	12	8	1.3	8	5.3	5	9	9	9.3	9	15	9	22	0
0- 6000	0- 4540	0	0	0	0	0	0	4	4	4.1	4	7	4	10	4
4- 200	4- 200	61	67	10.7	17	11.2	6	4	4	4.1	0	0	0	0	0
4- 2000	4- 1760	55	42	6.7	29	19.1	17	6	6	6.2	3	5	1	2.5	0
4- 6000	4- 5170	7	4	0.6	4	2.6	4	4	4	4.1	4	7	4	10	4
4-11.000	4-10.000	0	0	0	0	0	0	4	4	4.1	4	7	4	10	4
200- 2000	210- 1960	128	133	21	13	8.5	3	12	11	11.3	2	3	1	2.5	1*
200- 6000	230- 5840	28	27	4.3	17	11.2	5	14	10	10.3	10	16	7	17	1
200-11.000	400- 8430	1	1	0.2	1	0.7	0	2	2	2.1	2	3	2	5	0
2000- 6000	2010- 5840	176	183	29.2	8	5.3	0	14	20	20.6	8	14	2	5	3*
2000-11.000	2380- 7900	7	6	1.0	2	1.3	0	3	2	2.1	2	3	1	2.5	0
6000-11.000	6160-10.000	13	13	2.1	1	0.7	0	0	0	0	0	0	0		0
Total number		628	628	–	152	–	52	97	97	–	61	–	41	–	19

1. *Microcharon* is counted as a freshwater genus. 2. *Jaera* is counted as a marine genus.

fore found at temperatures which are below those characteristic of the depth zones. In Fig. 174 the species within the various depth intervals (with the above-mentioned 32 species transferred, and exclusive of the freshwater species) have been plotted against the temperature intervals at which they are known to occur.

No less than 60 species (10 % of all marine, benthic asellotes) have until now been taken exclusively at negative temperatures and a further 83 (14 %) have a temperature range which goes below zero. The largest number of species (224) occurs within the temperature limits of 0 and 4°. To these should be added the six species between 2000 and 6000 m which in Fig. 174 had to be ranged under 4-10°, since all of them have been taken at temperatures of 4.1 or 4.2°. The geographical distribution of many asellotes at high latitudes is clearly illustrated by the fact that more than half of the species between 200 and 2000 m (54 %) have only been taken at temperatures below 4°, and are thus entirely outside the ordinary temperature range of 4-10° for bathyal species. Only one of the species between 200 and 2000 m, viz. the Mediterranean *Janirella bonnieri,* occurs at temperatures exceeding 10°.

Fig. 174 also gives the temperature range of the remaining 144 marine species when those known from only 1-3 finds have been excluded. As could be expected from the geographical distribution of the asellotes, the temperature range of most of these more commonly recorded species is very wide. It is certain, however, that the percentage of species occurring from 0-4° will be considerably increased when the many exclusively abyssal species, so far recorded from only one or two localities, become better known.

Depth-temperature.

In accordance with the above statements, I have in the following prepared lists of species that should be regarded as truly eulittoral-bathyal, sublittoral-bathyal, bathyal, bathyal-abyssal, and bathyal-hadal – agreeing with the definitions both in regard to depth and temperature. It was not considered necessary to include lists of the truly abyssal, abyssal-hadal, and hadal species, since those ranged in Table 18 under the equivalent depth intervals all occur at temperatures below 4° (or more exactly 4.2°).[1] The eight species listed below should be added to the truly abyssal species (apart from *Stenetrium abyssale*, they were previously transferred to this zone from the depth intervals where they were ranged in Table 18).

1. With perhaps the exception of No. 500, *Haplomesus tropicalis*.

List of species which are true representatives of the zones ranging beyond c. 200 m.

The ciphers to the left refer to the serial numbers in Table 18 which give the depth, temperature, etc. of each species. Species marked * are from at least four localities.

Eulittoral-bathyal (0-*c.* 2000 m; *c.* 4-> 10°)

*153. *Iathrippa chilensis*
*159. *Jaeropsis bidens*

Sublittoral-bathyal (4-*c.* 2000 m; *c* 4-> 10°)

*235. *Munna boecki*
*237. *Munna limicola*
246. *Munella danteci*
*247. *Ischnomesus bispinosus*
*249. *Macrostylis spinifera*
*253. *Desmosoma angustum*
*262. *Ilyarachna acarina*
*269. *Pseudarachna hirsuta*

Bathyal (*c.* 200-*c.* 2000 m; *c.* 4-*c.* 10°)

26. *Stenetrium dagama*
27. *Stenetrium dalmeida*
30. *Stenetrium saldanha*
289. *Iolella glabra*
292. *Janira japonica*
226. *Janira tristani*
293. *Janirella abyssicola*
295. *Janirella carribbica*
296. *Janirella glabra*
297. *Janirella nanseni*
298. *Janirella spongicola*
299. *Katianira chelifera*
304. *Trichopleon ramosum*
305. *Haploniscus armadilloides*
307. *Haploniscus capensis*
308. *Haploniscus helgei*
309. *Haploniscus retrospinis*
310. *Haploniscus tropicalis*
316. *Munna spinifera*
239. *Munna truncata*
320. *Paramunna typica*
241. *Pleurogonium minutum*
323. *Pleurogonium pulchrum*
325. *Acanthomunna hystrix*
412. *Acanthomunna proteus*
328. *Dendrotion hanseni*
329. *Dendrotion paradoxum*
*330. *Dendrotion spinosum*
333. *Heteromesus dentatus*
335. *Heteromesus greeni*
337. *Heteromesus spinosus*
340. *Ischnomesus caribbicus*
341. *Ischnomesus multispinis*
342. *Ischnomesus* n. sp., CATTLEY
343. *Mixomesus pellucidus*
350. *Nannoniscus affinis*
353. *Nannoniscus camayae*
*354. *Nannoniscus crassipes*
357. *Nannoniscus plebejus*
359. *Nannoniscus simplex*
360. *Dactylostylis acutispinis*
361. *Desmosoma elongatum*
363. *Desmosoma magnispinum*
365. *Desmosoma politum*
370. *Ilyarachna clypeata*
265. *Ilyarachna coronata*
376. *Ilyarachna polita*
377. *Ilyarachna spinoafricana*
378. *Ilyarachna thori*
379. *Acanthocope spinosissima*
381. *Eurycope beddardi*
*270. *Eurycope latirostris*
*389. *Eurycope megalura*
391. *Eurycope nobili*
395. *Lipomera lamellata*
396. *Munnopsurus atlanticus*
399. *Storthyngura atlantica*
403. *Munnopsis bathyalis*
406. *Urias spinosus*

Bathyal-abyssal (*c.* 200-*c.* 6000 m; < *c.* 4-*c.* 10°)

*410. *Haploniscus spinifer*
*411. *Munna acanthifera*
*417. *Heteromesus granulatus*
*420. *Macrostylis subinermis*
*421. *Nannoniscus oblongus*
*424. *Eurycope complanata*
*281. *Eurycope furcata*
426. *Eurycope parva*
*429. *Munnopsurus longipes*
*431. *Munnopsis beddardi*
*432. *Munnopsis eximius*

Bathyal-hadal (*c.* 200-11.000; < *c.* 4-*c.* 10°)

*400. *Storthyngura pulchra* (with subspecies)

Abyssal (*c.* 2000-6000 m; < *c.* 4°)

31. *Stenetrium abyssale*
407. *Spinianirella walfishensis*
*409. *Haploniscus dimeroceras*
318. *Notoxenoides abyssi*
327. *Dendromunna spinipes*
331. *Schistosoma ramosum*
610. *Stylomesus inermis*
402. *Paropsurus pellucidus*

In addition nos. 434-499 and 501-608 in Table 18.

Abyssal-hadal (*c.* 2000-11.000; < *c.* 4°)

Nos. 609 and 611-615 in Table 18.

Hadal (*c.* 6000-11.000; < *c.* 4°)

Nos. 616-628 in Table 18.

Vertical range.

In spite of there being few records of most deep-sea asellote species, a fair number are already known to have a considerable vertical distribution. No less than 38 species have a range of at least 2000 m. They can be listed as follows (with the given serial number):

With a range greater than 2000 m:

407. *Spinianirella walfishensis*
466. *Haploniscus percavix*
410. *Haploniscus spinifer*
617. *Haplomesus gigas*
416. *Haplomesus tenuispinis*
417. *Heteromesus granulatus*
418. *Heteromesus longiremis*
609. *Ischnomesus andriashevi*
506. *Ischnomesus armatus*
420. *Macrostylis subinermis*
277. *Desmosoma coarctatum*
278. *Desmosoma intermedium*
611. *Ilyarachna kermadecensis*
279. *Ilyarachna longicornis*
423. *Eurycope brevirostris*
280. *Eurycope cornuta*
281. *Eurycope furcata*
425. *Eurycope hanseni*
282. *Eurycope producta*
427. *Eurycope spinifrons*
429. *Munnopsurus longipes*
600. *Storthyngura triplispinosa*
430. *Munnopsis australis*
431. *Munnopsis beddardi*
433. *Munnopsis longiremis*

With a range greater than 3000 m:

408. *Haploniscus antarcticus*
415. *Haplomesus quadrispinosus*
610. *Stylomesus inermis*
419. *Macrostylis abyssicola*
615. *Bathyopsurus nybelini*
422. *Eurycope antarctica*
428. *Munnopsurus australis*

With a range greater than 4000 m:

306b. *Haploniscus bicuspis*
409. *Haploniscus dimeroceras*
414a. *Haplomesus insignis*
424. *Eurycope complanata*

With a range greater than 5000 m:

421. *Nannoniscus oblongus*
400a-c. *Storthyngura pulchra* (3 subspp.)

b. Genera

Depth.

A survey of genera strictly arranged according to depth distribution is given in Table 20 and their number is recorded in Table 19, column 7. As was found to be the case with several species however, some genera should be transferred to other depth intervals where they more naturally belong – although their range does go somewhat beyond the limits. This applies to the following:

The number of genera and their percentage – with the six transferred genera – is presented in Table 19, columns 8 and 9.

As with the species, the preponderance of genera between 2000 and 6000 m is evident, although it is not as high as in the species. As could be expected, the percentage of eurybathic genera is higher than that of eurybathic species. This applies especially to genera from 0-2000 and from 200-6000 m.

A great many genera are, at present, known from

(Text continued p. 280).

		Depth range	Temp. range
A. Genus with 8 species:			
2000-6000 m:	*Stylomesus*	2450-6079	–0.3-1.3°
B. Genera with 2 species:			
2000-6000 m:	*Notoxenoides*	1816-4047	1.5-3°
	Dendromunna	1816-5340	1 -3°
	Paropsurus	1957-4400	1 -2.5°
C. Genera with 1 species:			
2000-6000 m:	*Spinianirella*	1816-2970	2.5-3°
	Schistosoma	1960	3°

Table 20. The genera of Asellota (excl. of Aselloidea) arranged strictly according to the depths at which they occur. Within each section (A, B, C, etc.) the genera are listed according to increasing depth occurrence. The number of species at each depth interval is given. The minimum and maximum depth at which any of the species in question occur is indicated for each depth interval. (+) indicates that a species has later been transferred to the depth interval concerned, (—) that a species has been transferred from it (cf. the text, p. 271). Unnamed species are not counted; subspecies are listed together with the nominate species. Furthermore, the minimum and maximum temperatures for all the marine genera are listed. Given also for genera occurring at moderate depths is (in parenthesis) the temperature for the coldest month – if such temperatures were available. In all genera recorded from more than one locality, the temperature (in parenthesis) denotes the highest temperature for the coldest month.

1. FRESHWATER

1. *Heterias* Richardson, 1904
   2 spp.
2. *Mackinia* Matsumoto, 1956
   1 sp.
3. *Microparasellus* Karaman, 1933
   2 spp.
4. *Protocharon* Delamare & Chappuis, 1956 (see CHAPPUIS *et al.* 1956)
   2 spp.
5. *Protojanira* Barnard, 1927
   2 spp.
6. *Pseudasellus* Chappuis, 1951
   1 sp.

2. FRESHWATER AND/OR MARINE

A. 0-4 metres

7. *Microcharon* Karaman, 1934
   Freshwater: 6 spp.
   Marine: 2 spp.

B. 0-200 (55) metres

8. *Jaera* Leach, 1814
   Freshwater (marine) (0-4 m): 3 spp.
   Marine: 0- 4 m: 4 spp.
   0-55 m: 1 sp.
   15 m: 1 sp.
   — 1.8-(8) 20° C.

3. MARINE

A. 0-4 metres

9. *Angeliera* Chappuis & Delamare, 1952
   2 spp.
   12-(25) 27°
10. *Caecianiropsis* Menzies & Pettit, 1956
   2 spp.
   3-(11) 18°
11. *Caecijaera* Menzies, 1951
   1 sp.
   12-20°
12. *Carpias* Richardson, 1902
   1 sp.
   18-27°
13. *Gnathostenetroides* Amar, 1957
   1 sp.
   17-27°
14. *Iais* Bovallius, 1886
   2 spp.
   2-(26) 28°
15. *Kuphomunna* Barnard, 1914
   1 sp.
   15-21°
16. *Pseudojanira* Barnard, 1925
   1 sp.
   20-24°

B. 0-200 (125) metres

(8. *Jaera* – see 2B)

17. *Pleurocope* Walker, 1901
   0-18 m: 1
   12-(26.5) 27°
18. *Bagatus* Nobili, 1906
   0- 4 m: 9
   40-55 m: 1
   12-(27) 29°
19. *Ectias* Richardson, 1906
   0-91 m: 1
   —1.8- —0.5°
20. *Antias* Richardson, 1906
   0- 4 m: 6
   0-95 m: 3
   4- 5 m: 1
   —1.8-(15) 21°
21. *Ianiropsis* G.O. Sars, 1899
   0- 4 m: 10
   0- 69 m: 2
   4-125 m: 3
   —1-(16) 24°

C. 0-2000 (1620) metres

22. *Jaeropsis* Koehler, 1885
0- 4 m: 5
0-150 m: 4 (+)
0-300 m: 2 (—)
22-150 m: 2
3-(26.5) 27°

23. *Janiralata* Menzies, 1951
0- 4 m: 4
0- 70 m: 1
15- 96 m: 3
50-344 m: 2
—1.6-(15) 21°

24. *Austrosignum* Hodgson, 1910
0- 4 m: 2
10-180 m: 5
12-385 m: 1
—1.8-(12) 18°

25. *Iathrippa* Bovallius, 1886
0- 4 m: 2
0-700 m: 3
—1-(19) 24°

26. *Neojaera* Nordenstam, 1933
0- 4 m: 2
0-700 m: 1
10-174 m: 2
385 m: 2
—1.8-(15) 20°

27. *Paramunna* G.O.Sars, 1866
0- 4 m: 4
0- 30 m: 3
0-569 m: 1
12-200 m: 6
220-385 m: 2
—1.8-(19) 24°

28. *Pleurosignum* Vanhöffen, 1914
0- 50 m: 1
4- 7 m: 1
20-385 m: 2
—1.8-(11) 12°

29. *Pleurogonium* G.O.Sars, 1872
0- 99 m: 1
188 m: 1 (+)
5-552 m: 4 (— —)
220-887 m: 4 (+)
—0.6-(10) 14°

30. *Iolella* Richardson, 1905
0- 4 m: 1
80- 150 m: 2
128-1384 m: 2 (—)
400-1624 m: 2 (+)
—1.3-(16) 21°

D. 0-6000 (4540) metres

31. *Stenetrium* Haswell, 1881
0- 4 m: 20
?0- 200 m: 1
20- 110 m: 3
150-3397 m: 1
229-1097 m: 5
4540 m: 1
—1.8-30°

32. *Munna* Krøyer, 1839
0- 4 m: 14
0- 100 m: 5 (+ +)
0- 310 m: 3 (— —)
5- 100 m: 12 (+)
5-1505 m: 6 (— —)
350-1261 m: 3 (+)
293-3839 m: 1
3839 m: 1
—1.8-(24) 29°

33. *Janira* Leach, 1814
0- 4 m: 1
0-1505 m: 2
6- 132 m: 1
185- 275 m: 1 (—)
781 m: 1 (+)
2468-3670 m: 2
—1.4-(16) 21°

34. *Ianthopsis* Beddard, 1886
0- 4 m: 1
37- 100 m: 2
12- 457 m: 2
385-1505 m: 4
3063-3423 m: 2
—1.8-(25) 26°

E. 4-200 (10-130) metres

35. *Microjaera* Bocquet & Lévi, 1955
20 m: 1
12-18°

36. *Antennulosignum* Nordenstam, 1933
22 m: 1
5-7°

37. *Notoxenus* Hodgson, 1910
10-30 m: 1
—1.5-0°

38. *Nannoniscella* Hansen, 1916[1]
10-132 m: 1
1-4°

F. 4-2000 (27-1510) metres

39. *Coulmannia* Hodgson, 1910
91-400 m: 2 (—)
—1.8-3°

40. *Pseudarachna* G.O.Sars, 1899
30-478 m: 1
3-(11) 13°

41. *Echinopleura* G.O.Sars, 1899
27-681 m: 1
1-(13) 16°

42. *Munella* Bonnier, 1896
100-960 m: 1
9.5-14°

43. *Katianira* Hansen, 1916
74- 698 m: 2
1000-1505 m: 2
—1.6-4.5°

1. Birstein cancelled this genus while the present paper was in press – cf. footnote on next page.

G. 4-6000 (5170) metres

44. *Munnopsurus* Richardson, 1912
40-1469 m: 2 (—)
421-1280 m: 3 (+)
400-3423 m: 2
—1.8-(9.5) 10°

45. *Munnopsis* M. Sars, 1861
4-1200 m: 1
545-1510 m: 3
364-3570 m: 4
2012 m: 1
—1.8-(9) 10°

46. *Austroniscus* Vanhöffen, 1914[1]
70- 385 m: 3
5450 m: 1
—1.8-4°

47. *Desmosoma* G. O. Sars, 1864
13- 148 m: 6
11-1096 m: 8
24-2702 m: 2
698-1906 m: 6
2258-5166 m: 6
—1.5-(13) 15°

48. *Nannoniscus* G. O. Sars, 1870
4- 6 m: 1
75- 699 m: 1
225-1714 m: 11
225-5843 m: 1
2258-4885 m: 6
—1.8-(6) 8° (22°)[2]

H. 4-11.000 (10.000) metres

49. *Eurycope* G. O. Sars, 1864
15- 60 m: 2 (++)
9-1096 m: 4 (+——)
55-2258 m: 3 (——)
213-1902 m: 14 (+—)
308-5779 m: 6 (+)
2486-4960 m: 7
7000 m: 2
—1.9-(13) 18°

50. *Ilyarachna* G. O. Sars, 1870
10- 46 m: 1 (+)
20-1505 m: 7 (———)
8-2788 m: 1
213-1902 m: 12 (+++—)
2500-5024 m: 13
4540-7000 m: 1
—1.8-(11) 15°

51. *Ischnomesus* Richardson, 1908
94-1100 m: 1
732-1714 m: 4
2652-5494 m: 15
4000-6207 m: 1
6660-7000 m: 2
0.1-(13) 13°

52. *Macrostylis* G. O. Sars, 1864
4- 1761 m: 2 (—)
1280- 1591 m: 3
698- 3921 m: 2
2875- 5684 m: 10
7270-10.000 m: 2
—1-(12) 18°

J. 200-2000 (220-1960) metres

53. *Astrurus* Beddard, 1886
220-385 m: 2
—1.8-3°

54. *Lipomera* Tattersall, 1905
364 m: 1
10°

55. *Echinomunna* Vanhöffen, 1914
385 m: 1
—1.8°

56. *Neasellus* Beddard, 1885
220-1097 m: 1
3-3.5°

57. *Jaerella* Richardson, 1911
549 m: 1
3.5°

58. *Mixomesus* n. gen.
610 m: 1
7.5°

59. *Dactylostylis* Richardson, 1911
698 m: 1
8°

60. *Urias* Richardson, 1911
698 m: 1
8°

61. *Dendrotion* G. O. Sars, 1872
281-1505 m: 3
4.5-7.5°

62. *Trichopleon* Beddard, 1886
914 m: 1
5°

63. *Pseudomesus* Hansen, 1916
1412 m: 1
—1°

64. *Schistosoma* Hansen, 1916
1960 m: 1 (—)
3°

K. 200-6000 (350-5840) metres

65. *Heteromesus* Richardson, 1908
364-1829 m: 6
698-3235 m: 2
2154-4071 m: 3
—1-9°

66. *Janirella* Bonnier, 1896
913-1227 m: 6
2258-5122 m: 5
1-13°

67. *Acanthomunna* Beddard, 1886
385-1505 m: 2 (+)
1280-2012 m: 1 (—)
4885 m: 1
—1.8-4.5°

1. While the present paper was in press Birstein (1962) published the description of a new species *Austroniscus karamani* from 5450 m in the N. W. Pacific, at the same time cancelling the genus *Nannoniscella* Hansen and referring *N. groenlandica* to *Austroniscus*. As far as possible the text has been altered accordingly.
2. One species, *N. caspius* from the Caspian Sea (4-6 m), occurs at a temperature of *c.* 6-*c.* 22°. It was described by G. O. Sars (1897) and was apparently correctly referred to *Nannoniscus*. It does not appear to have been found again.

68. *Microprotus* Richardson, 1909
549 m: 1
3398 m: 1
—0.3-3.5°

69. *Acanthaspidia* Stebbing, 1893
350-1416 m: 2
2970-4000 m: 2
—1.8-7°

70. *Spinianirella* Menzies, 1962
1816-2970 m: 1 (—)
2.5-3°

71. *Notoxenoides* Menzies, 1962
1816 m: 1 (—)
4047 m: 1 (+)
1.5-3°

72. *Nannoniscoides* Hansen, 1916
698-1322 m: 1
5024 m: 1
—0.6-0.5°

73. *Helomesus* n. gen.
698 m: 1
5690 m: 1
—1-1.5°

74. *Paropsurus* n. gen.
1957 m: 1 (—)
3570-4400 m: 1 (+)
1-2.5°

75. *Dendromunna* Menzies, 1962
1816 m: 1 (—)
5340 m: 1 (+)
1-3°

76. *Haploniscus* Richardson, 1908
706-1714 m: 5
385-5843 m: 4 (—)
2000-5843 m: 27 (+)
—1.8-4.5°

77. *Acanthocope* Beddard, 1885
1169 m: 1
2650-5024 m: 6
0.3-5°

78. *Syneurycope* Hansen, 1916
1280 m: 1
3222-5122 m: 4
0.5-3°

L. 200-11.000 (400-8430) metres

79. *Storthyngura* Vanhöffen, 1914
400-1646 m: 2
1260-6730 m: 1
2012-5843 m: 18
5230-7000 m: 3
6156-8430 m: 4
—1.9-5°

80. *Haplomesus* Richardson, 1908
510-5494 m: 4
2258-5817 m: 8
6156-8430 m: 2
—1.4-3° (13.7°)[1]

M. 2000-6000 (2490-5780) metres

(64. *Schistosoma* – see J)

(70. *Spinianirella* – see K)

81. *Thambema* Stebbing, 1913
2487 m: 1
3°

82. *Janthura* n. gen.
2550 m: 1
3°

(71. *Notoxenoides* – see K)

(74. *Paropsurus* – see K)

83. *Rhacura* Richardson, 1908
3235 m: 1
3°

84. *Mesosignum* Menzies, 1962
2868-4076 m: 2
4°

(75. *Dendromunna* – see K)

85. *Haplomunna* Richardson, 1908
3993 m: 1
1.5°

86. *Bactromesus* n. gen.
2738-5690 m: 2
0.8-1.8°

87. *Abyssianira* Menzies, 1956
2681-5293 m: 2
0.3-2.5°

88. *Hydroniscus* Hansen, 1916
3521-5684 m: 3
0.1-2°

(95. *Stylomesus* – see N)

89. *Gomphomesus* n. gen.
4000-5530 m: 1
1.5°

90. *Vemathambema* Menzies, 1962
4935 m: 1
1°

91. *Xostylus* Menzies, 1962
5024 m: 1
0.3°

92. *Echinothambema* Menzies, 1956
5124 m: 1
2.5°

93. *Microthambema* Birstein, 1961
5690 m: 1
1.5°

94. *Abyssijaera* Menzies, 1962
5779 m: 1
2.3°

N. 2000-11.000 (2380-7900) metres

95. *Stylomesus* Wolff, 1956
4144-5843 m: 7 (+)
2450-6079 m: 1 (—)
—0.3-1.3°

96. *Munneurycope* Stephensen, 1913
2380-4400 m: 4
7000 m: 1
—1-1.5°

97. *Bathyopsurus* Nordenstam, 1955
3886 m: 1
4400-7900 m: 1
2-2.5°

1. See footnote on p. 265.

a single or two species only (36 and 20, respectively). In Table 19 (p. 273), colums 10-13, are given the number and percentage of the remaining genera when those with one or two species are excluded.

It is easily seen that, on the whole, the eurybathic genera are richer in species than the more stenobathic genera, the percentage of the former having increased greatly. Furthermore, it is noteworthy that the reduction in percentage of stenobathic genera is as large in shallow water genera (from 0-4 and 4-200 m) as in deep water genera (from 200-2000 and 2000-6000 m). This is in contradiction to conditions found within the species. In the latter, the percentage of stenobathic species from deep water decreased considerably when rarely recorded species were excluded (columns 3 and 5), while the percentage of species from 0-4 and from 4-200 m increased. The fact that the deep-sea species are primarily known from only one or two finds was thought to be due to less intensive collecting at greater depths. However, this explanation does not hold good for the stenobathic genera from the various depth intervals; they continue to be rare even when genera with only one or two species are excluded. It is also characteristic that the number of the records of single or two species in the latter genera is very low (in most cases only one).[1] Thus, practically all the stenobathic genera with one or two species are actually rare or, at least, seldom collected at all depths. This probably means that when these genera become better known – either through the addition of more species or additional records of already described species, or both – the majority will prove to be considerably eurybathic.

The number of monotypic genera at depths of 0-200, 200-2000, and 2000-6000 m is practically the same (11, 10, and 11, respectively). This is not so with the amphipods, however, where J. L. BARNARD (1962)[2] finds a marked increase in the number of monotypic genera as one proceeds downwards. Monotypism in endemic abyssal genera in the amphipods is as high as 92 % compared to only 69 % in the asellotes (or even 61 % if *Munneurycope* and *Bathyopsurus*, which range into the hadal zone, are included).

Temperature.

As with the species, the geographical distribution of the asellotes is also reflected in the temperature range of the genera. Fig. 175 shows genera within the various depth zones (with the above-mentioned six transferred genera, and exclusive of the freshwater genera), plotted against the temperature intervals at which they are known to occur.

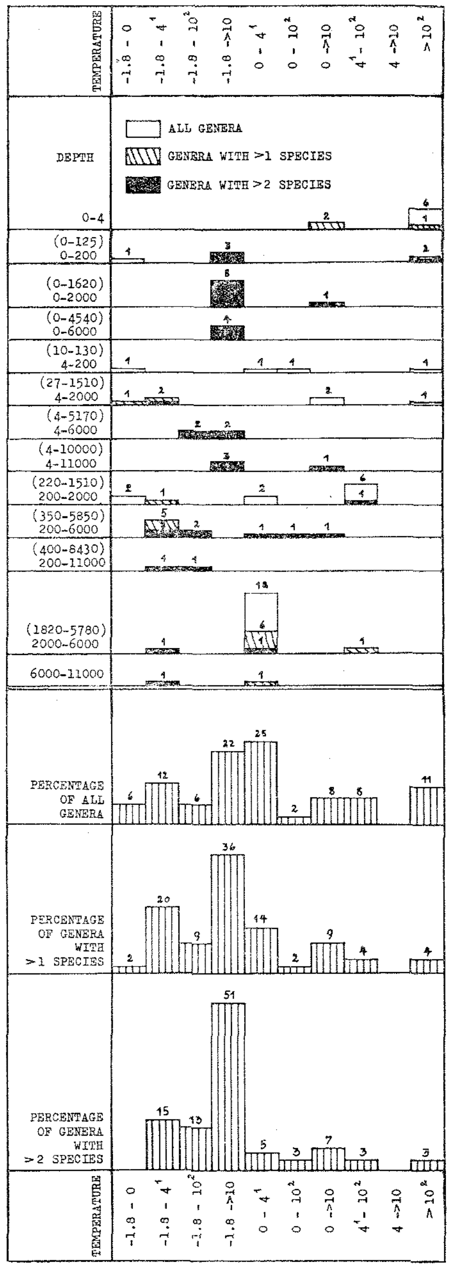


Fig. 175. Relation between temperature and depth occurrence of all genera of marine Asellota and of genera with more than one or two species. The ciphers denote the number of genera or the percentage. (1. ±0.5 °C.; 2. ±1 °C.).

It is remarkable that five of the 90 genera occur only at negative temperatures, and that no less than 41 of them range below zero (three-fourths of the latter even below –1.5°). This is rather different from conditions found in the species (Fig. 174)

1. The only exception is the eulittoral genus *Iais* with two species, both known from at least ten localities.
2. Referred to in BARNARD 1961. I have not yet seen the paper.

where less than one-fourth ranged below zero. On the other hand, the percentage of genera from 0-4° and above 10° is somewhat lower than that of the species. As could be expected, the range of temperature is, on the whole, greater in the genera than in the species.

Also shown in Fig. 175 is the temperature range of the 56 genera with more than one species, and of the 40 genera with more than two species. Most of the genera (primarily those with more than two species) have a very wide temperature range, half of them occurring within the largest temperature span, from –1.8 to more than 10° (half of these even from –1.8-20° and most of the remaining from –1-18°). No less than 80 % of all asellote genera with more than two species range below zero.

Depth-temperature.

As in the case of the species, lists of true representatives of the various zones have been prepared for the genera, in this case also including genera from shallow water.

List of genera which are true representatives of the various depth zones.

The ciphers to the left refer to the serial numbers in Table 20 which gives the depth distribution and the temperature range of all genera. The number of species in each genus is added here (in parenthesis).

Freshwater (rarely marine)

1. *Heterias* (2)
2. *Mackinia* (1)
3. *Microparasellus* (2)
4. *Protocharon* (2)
5. *Protojanira* (2)
6. *Pseudasellus* (1)
7. *Microcharon* (8)

Eulittoral (0-4 m; $>$ 10°)

9. *Angeliera* (2)
11. *Caecijaera* (1)
12. *Carpias* (1)
13. *Gnathostenetroides* (1)
15. *Kuphomunna* (1)
16. *Pseudojanira* (1)

Eulittoral-sublittoral (0-*c.* 200 m; $>$ *c.* 10°)

17. *Pleurocope* (1)
18. *Bagatus* (10)

Eulittoral-bathyal (0-*c.* 2000 m; *c.* 4-$>$ *c.* 10°)

22. *Jaeropsis* (13)

Eulittoral-abyssal (0-*c.* 6000 m; $<$ *c.* 4°-$>$ *c.* 10°)

31. *Stenetrium* (31)
32. *Munna* (45)
33. *Janira* (8)
34. *Ianthopsis* (11)

Sublittoral (4-*c.* 200 m; $>$ *c.* 10°)

35. *Microjaera* (1)

Sublittoral-bathyal (4-*c.* 2000 m; *c.* 4- $>$ *c.* 10°)

40. *Pseudarachna* (1)
42. *Munella* (1)

Sublittoral-abyssal (4-*c.* 6000 m; $<$ *c.* 4- $>$ *c.* 10°)

44. *Munnopsurus* (7)
45. *Munnopsis* (9)
46. *Austroniscus* (4)
47. *Desmosoma* (28)
48. *Nannoniscus* (20)

Sublittoral-hadal (4- $>$ *c.* 6000 m; $<$ *c.* 4- $>$ *c.* 10°)

49. *Eurycope* (38)
50. *Ilyarachna* (35)
51. *Ischnomesus* (23)
52. *Macrostylis* (19)

Bathyal (*c.* 200-*c.* 2000 m; *c.* 4-*c.* 10°)

54. *Lipomera* (1)
57. *Jaerella* (1)
58. *Mixomesus* (1)
59. *Dactylostylis* (1)
60. *Urias* (1)
61. *Dendrotion* (3)
62. *Trichopleon* (1)

Bathyal-abyssal (*c.* 200-*c.* 6000 m; $<$ *c.* 4-*c.* 10°)

65. *Heteromesus* (11)
66. *Janirella* (11)

Bathyal-hadal (*c.* 200- $>$ *c.* 6000 m; $<$ *c.* 4-*c.* 10°)

79. *Storthyngura* (28)
(80. *Haplomesus* (14))

Abyssal (*c.* 2000-*c.* 6000 m; $<$ *c.* 4°)

64. *Schistosoma* (1)
70. *Spinianirella* (1)
71. *Notoxenoides* (2)
74. *Paropsurus* (2)
75. *Dendromunna* (2)
81. *Thambema* (1)
82. *Janthura* (1)
83. *Rhacura* (1)
84. *Mesosignum* (2)
85. *Haplomunna* (1)
86. *Bactromesus* (2)
87. *Abyssianira* (2)
88. *Hydroniscus* (3)
89. *Gomphomesus* (1)
90. *Vemathambema* (1)
91. *Xostylus* (1)
92. *Echinothambema* (1)
93. *Microthambema* (1)
94. *Abyssijaera* (1)
95. *Stylomesus* (8)

Abyssal-hadal (*c.* 2000-*c.* 6000 m; $<$ *c.* 4°)

96. *Munneurycope* (5)
97. *Bathyopsurus* (2)

Vertical distribution.

Some genera have a remarkably wide vertical distribution (cf. Table 20, Fig. 176 and Figs. 147-171 on pp. 230-234). *Macrostylis* ranges from 4-10.000 m, including on one hand a North Atlantic species, *M. spinifera* (which is found at a depth of a few metres in Danish waters)[1] and on the other, the most deeply-occurring (identified) isopod on record, *M. galatheae*, from the Philippine Trench; the temperature range of the genus is from –1-18°. Next comes *Ilyarachna* from 8-7000 m (or probably 8430 m)[2] and with a temperature range from –1.8-15°.

Storthyngura and *Haplomesus* have an almost equally wide distribution, ranging from 400/510-8430 m. The former, at least, is a pronounced cold water genus (–1.9-5°). Only three of the twenty-eight species of *Storthyngura* are, in part or exclusively, found at depths less than 2000 m.

Eurycope and *Ischnomesus* also have an almost equally large vertical range (from 9/94-7000 m). As with the two first-mentioned genera, these two contain species which occur at temperatures well above 10° (to 18 and 13° respectively).

Including a (still undescribed) species from the *Vitjaz* (BELJAEV & VINOGRADOVA 1961), *Haploniscus* ranges from 400-7060 m and is also (as *Storthyngura* and perhaps *Haplomesus*) a pronounced cold water genus (–1.8-4.5°).

Four genera have a vertical distribution of between *c.* 5000 and 6000 m, viz. *Nannoniscus* (4-5840 m), *Austroniscus* (70-5450 m), *Desmosoma* (10-5170 m) and *Helomesus* (700-5690 m). Apart from one species in the Caspian Sea (which probably reproduces during the winter), *Nannoniscus* is a cold water genus (–1.8-8°). This also applies to *Austroniscus* (–1.8-4°) and *Helomesus* (–1-1.5°), although the latter contains only two species. *Desmosoma* has a wide temperature range (–1.5-15°).

Finally, four genera range from the tidal zone into abyssal depths, viz. *Stenetrium* (0-4540 m), *Munna* (0-3840 m), *Janira* (0-3670 m), and *Ianthopsis* (0-3420 m). They all have a very wide temperature range. Other genera with a vertical distribution of 3500-4500 m (but not with eulittoral species) are *Acanthaspidia, Janirella, Acanthomunna, Dendromunna, Heteromesus, Stylomesus, Nannoniscoides, Munnopsurus, Acanthocope, Syneurycope, Munneurycope, Bathyopsurus,* and *Munnopsis.*

Winter temperatures.

It is well known that in many littoral and sublittoral marine animals the temperature during the reproduction period has more significance on the distribution than the temperature at which the species is able to live throughout its life-span. However, an evaluation of this problem can only be achieved after a careful study of the biology of the species in suitable localities – preferably in connexion with experimental work. No studies of this nature have yet been made on the asellotes in question. With a view to future studies along these lines, it was, nevertheless, found useful to include in Tables 18 and 20 the highest possible temperature for the coldest month. This temperature is, of course, of great importance with regard to species which will later be found to reproduce only during the winter.

1. STEPHENSEN 1948, p. 86.
2. The depth of a yet undescribed specimen from the *Vitjaz* (cf. WOLFF 1960, p. 112).

c. Families

According to the revision made in the Systematic Part, there are 19 families of Stenetrioidea, Parastenetrioidea and Paraselloidea. Their number at the different depth intervals is given in Table 19, column 14. It should be noted that the five families marked * are represented by only one or two species each (Gnathostenetroidesidae, Pseudomesidae, Schistosomatidae, Thambematidae, and Echinothambematidae).

In Fig. 176 the families and their genera are arranged according to increasing depth. The range of species in the larger families can be summarized as follows (listed according to increasing depth occurrence):

Munnidae. Of the 93 species, 20 occur from 0-4 m, 13 from 0-200 m, and 28 from 4-200 m; thus, two-thirds of all species are restricted to the shelf. Only four species penetrate beyond 2000 m.

Janiridae. Of the 117 marine species, no less than 46 species occur from 0-4 m, 16 from 4-200 m, 24 from 200-2000 m, and 18 species are abyssal. Three-fifths of the species are restricted to the shelf.

Antiasidae has eleven species on the shelf (seven of them from 0-4 m); two more species are abyssal.

Desmosomatidae. Of the 30 species, half occur from 4-200 m or from 4-2000 m; seven range from 200-2000 m and six are abyssal.

Nannoniscidae. Of the 26 species, 5 occur from 4-200 or 4-2000 m, 12 from 200-2000 m and 8 are abyssal.

Ilyarachnidae has a very similar vertical distribution. Of the 36 species, 7 occur from 4-200 or 4-2000 m, 14 from 200-2000 m, 13 are abyssal, and 2 species[1] penetrate into the hadal zone.

1. Including one (still undescribed) species of *Ilyarachna* from the *Vitjaz* (WOLFF 1960, p. 112).

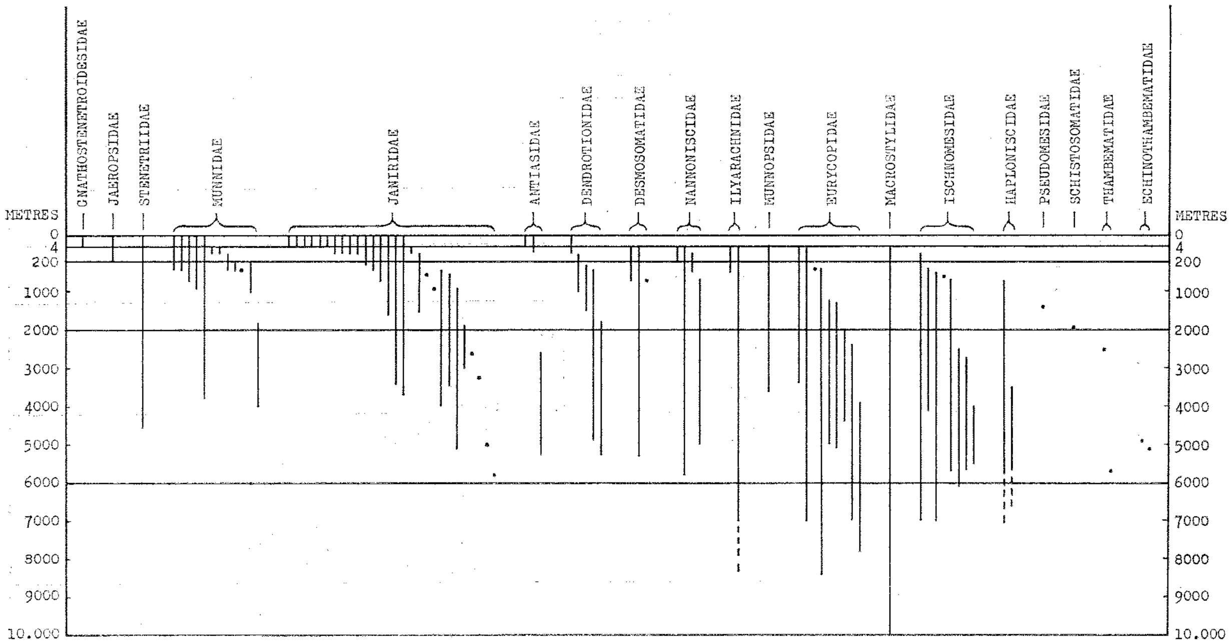


Fig. 176. Vertical distribution of marine genera and families of Asellota arranged according to increasing depth. Broken lines indicate undescribed specimens (cf. the text).

Munnopsidae. Three of the nine benthic species range from 200-2000 m, four from 200-3600 m.

Eurycopidae. Of the 96 species, 8 only occur from 4-200 or 4-2000 m, 23 are found between 200 and 2000 m, while more than half are restricted to depths exceeding 2000 m: 43 are abyssal, 4 abysso-hadal and 7 hadal. All nine genera (except the rather dubious *Lipomera*) have a very wide vertical distribution (min.: 2400 m, max.: 8000 m).

Macrostylidae. Of the 19 species, two only range from 4-200 and 4-2000 m and three from 200-2000 m; ten are abyssal and two hadal.

Dendrotionidae has 11 species, of which 6 occur from 200-2000 m and 3 are abyssal.

Ischnomesidae has only one shelf representative (ranging from 94-1100 m). Of the other 61 species, 18 are found from 200-2000 m, more than half (38) are abyssal, one abysso-hadal and four are hadal.

Haploniscidae is the most pronounced asellote deep-sea family. Of the 39 (+ 2) species, five occur from 700-2000 m, three from 400-6000, no less than 31 are abyssal and, according to BELJAEV & VINOGRADOVA (1961), two species (still undescribed) are hadal.

d. Vertical zonation in the abyssal zone

From literary data, VINOGRADOVA (1958, 1959)[1] examined the vertical distribution of 1144 species of invertebrates from depths exceeding 2000 m. For all species she recorded a rapid decrease from 2000 to 6000 m and a much less abrupt decrease from about 6000 m down to the greatest depths (1958, fig. 15). However, in some of the groups (Spongia, Isopoda, Spinulosa, Forcipulata, and Holothurioidea) she found maxima in the number of species at depths of 2500-3000 m and 4000-4500 m. In two other groups (Coelenterata and Phanerozonia) one maximum only (at 3000-3500 m) was observed, and in the remaining groups (Cirripedia, Decapoda, Crinoidea and Echinoidea) there were no maxima whatever between 2000 and 6000 m.[2] Further, VINOGRADOVA found an abrupt change in the taxonomic composition of the species. In the majority of the groups this change took place at 2500-3000 and 4000-4500 m, but in only a few (Spongia, Isopoda, Forcipulata, and Holothurioidea) was there a correlation between the taxonomic change and the occurrence of maxima of species. The depths at which

1. While the present paper was in press, VINOGRADOVA published a third paper on this subject (1962), a résumé (in English) of the original paper in Russian (VINOGRADOVA 1958).
2. VINOGRADOVA did not include a survey of the vertical distribution of the very important deep-sea group, the polychaetes. In view of the marked preponderance of eurybathic polychaetes (KIRKEGAARD 1954, p. 40), there can be very little doubt that in this group also it will be impossible to demonstrate a maximum between 2000 and 6000 m.

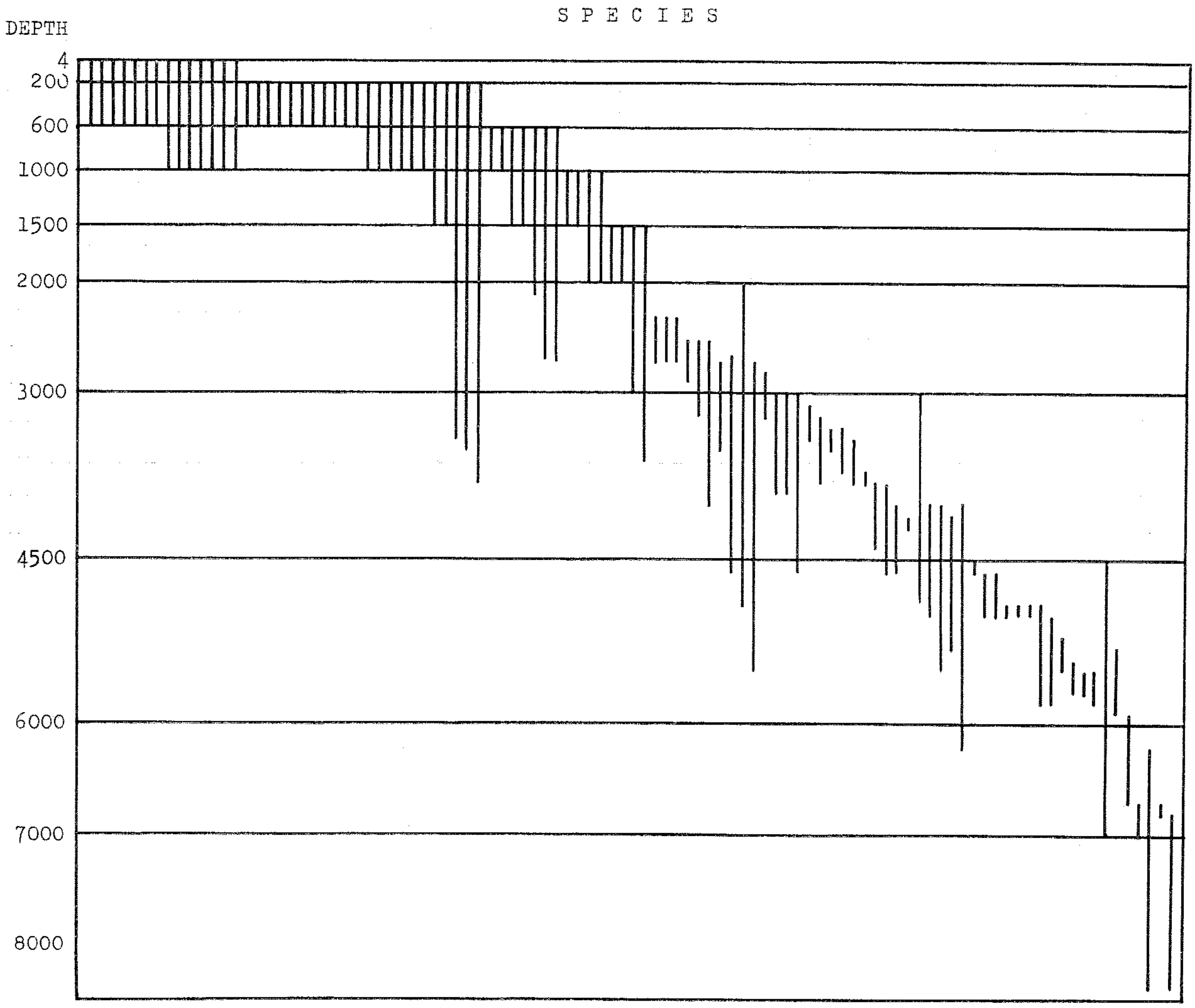


Fig. 177. Vertical distribution of benthic species of Asellota known from 2-3 finds, with the upper limit at 200-4 m and extending downwards beyond 200 m. Based strictly on depth records.

these changes occur are identical in all oceans. The greatest change in the taxonomic composition was found at depths of about 3000 m, and it was claimed that this depth (or perhaps rather a transitional area with depths of 2500-3500 m) represents the upper limit of the abyssal zone. Accordingly, VINOGRADOVA proposed the following division: (1) the upper-abyssal subzone from 3000 to about 4500 m; (2) the lower-abyssal zone from about 4500 to 6000 m; (3) the ultra-abyssal (hadal) zone below 6000 m.

MADSEN (1961 b, p. 198) suggested that increased knowledge of the vertical range of abyssal species may show that several are confined to rather narrow depth intervals. As an example, species of Porcellanasteridae were given, one found between 4040 and 5610 m (15 finds) and one between 5200 and 7200 m (7 finds).

VINOGRADOVA's statement of a change of taxonomic composition at 4500 m and of two maxima in the total number of species of Isopoda between 2000 and 6000 m cannot be supported by the present bathymetrical survey of the abyssal Asellota (which comprises 85-90 % of all Isopoda from this zone). The percentage of species occurring within the various depth intervals is to a large extent dependent on whether all species or only the more commonly recorded ones are considered (Table 19, p. 273, columns 2-6). When evaluating the vertical zonation this factor must, therefore, be taken into account. Moreover, I find it absolutely necessary, in a study of the vertical zonation, to exclude all species known from a single find only. The record of these species gives, primarily, the depths at which the greatest activity in collecting has taken place.

Figs. 177 and 178 show the actual vertical distribution of all asellote species[1] from depths exceeding 200 m (and with the upper limit at 4 m, thus excluding

1. Recorded more than once.

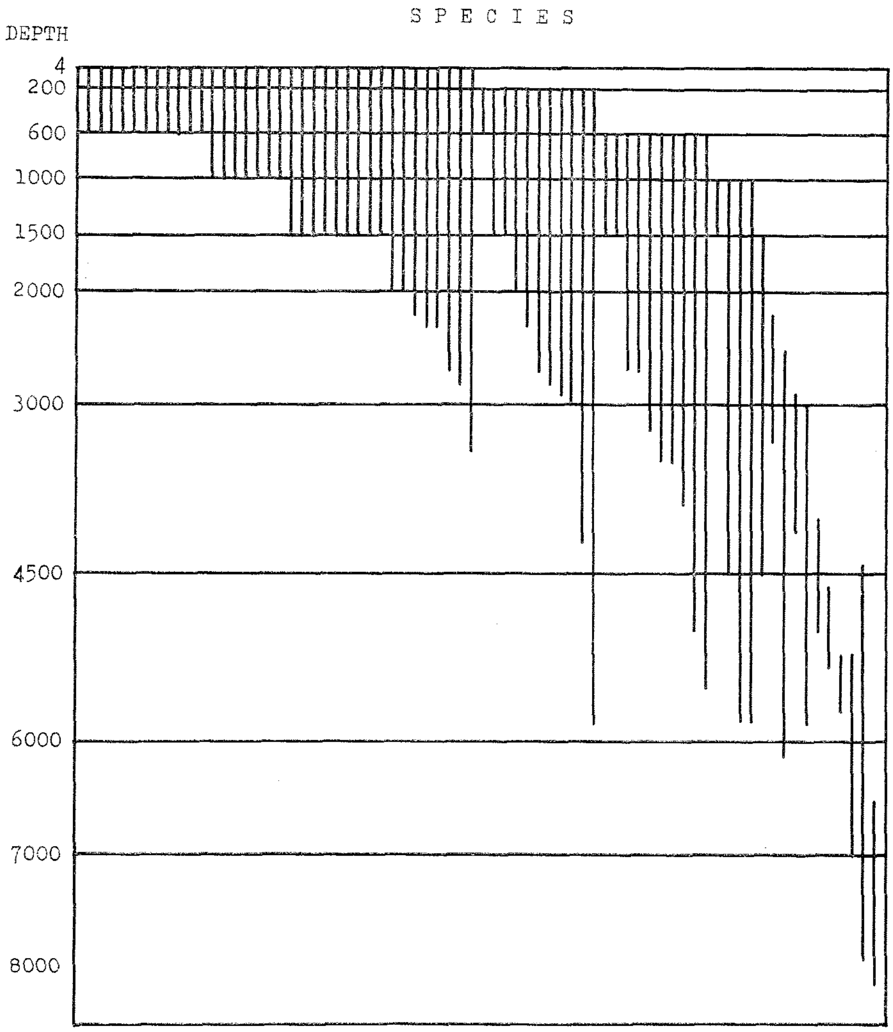


Fig. 178. Vertical distribution of benthic species of Asellota known from at least four finds. Otherwise see Fig. 177.

the few species occurring from 0-2000 (1500) m – cf. Table 18). The difference in range of species known from 2-3 finds only, and those known from at least 4 finds, is striking. While around 4500 m there may be indications of a certain change in composition in the rarely recorded species (Fig. 177), this does not apply to species recorded in greater abundance (Fig. 178).

When using VINOGRADOVA's method of plotting the number of species occurring within each depth interval of 500 m (1958, 1959), there is again a considerable difference in the general picture (Figs. 179 and 180).[1]

1. VINOGRADOVA drew lines between the points indicating the numbers at the various depth intervals, thus showing "curves" of bathymetrical range. Although it would have been more correct to illustrate by way of diagram, her method has been adopted here to facilitate comparison.

In the first place, "curve" A in Fig. 179, showing the depth range of all species (including those known from one, two or three finds only) has a much more pronounced double maximum between 2000 and 6000 m than the similar "curve" shown in VINOGRADOVA's fig. 4 (1958). This seems to speak in favour of there actually being two separate fauna elements in the abyssal zone (VINOGRADOVA l. c.). The difference is due to the fact that the curve in Fig. 179 includes all the recently described new species from the *Vema* Expedition (MENZIES 1962b).

However, "curve" A cannot be expected to give a true picture of the actual depth occurrence of the abyssal asellotes. This is clearly demonstrated if the rarely recorded species are not considered. Already, after excluding the species known from one find only (Fig. 179, "curve" B), the maximum between 4500 and 5000 m has practically disappeared. This is still more obvious when only species from at least four

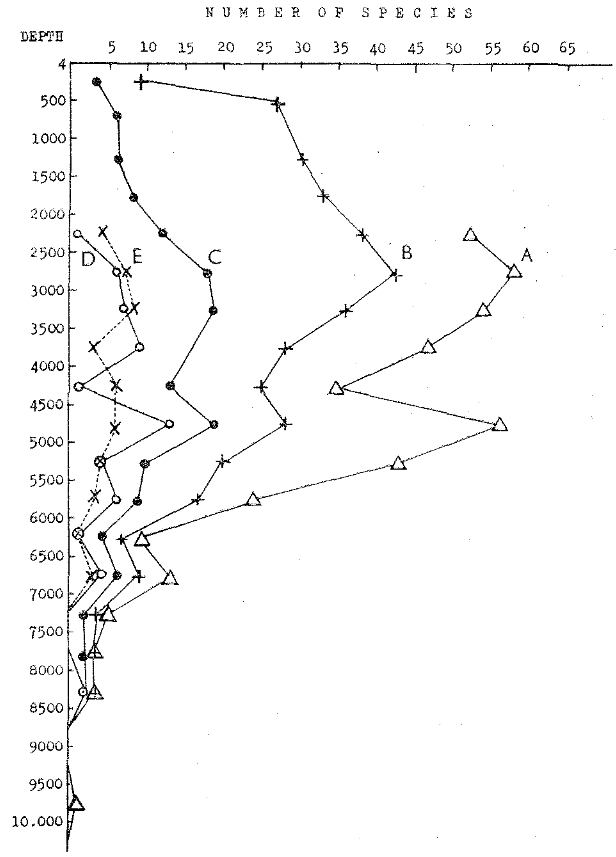


Fig. 179. Number of benthic species of deep-sea Asellota (from > 2000 m), occurring at depth intervals of 500 m. A, *all species; B, species from at least 2 finds; C-E, species from* 2-3 finds; all these species (C), species whose lower limit lies in the said depth interval (D), and species whose upper limit lies in the said depth interval (E).

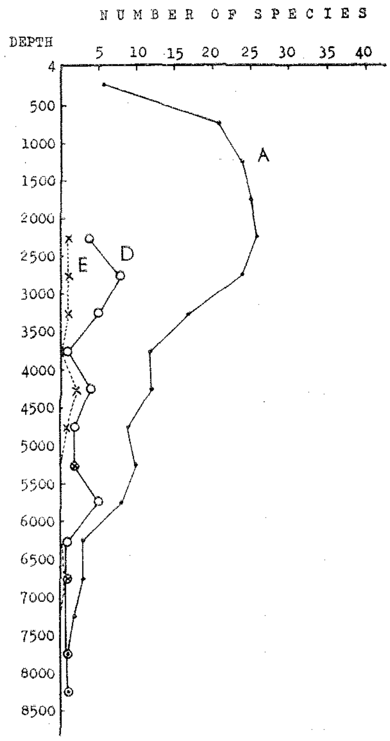


Fig. 180. Number of benthic species of deep-sea Asellota (from > 2000 m and from at least four finds), occurring at depth intervals of 500 m. A, all these species; D and E, as in Fig. 179.

finds are considered (Fig. 180, "curve" A).[1] Thus, as far as the asellotes are concerned, I can find nothing to corroborate the existence of the lower-abyssal subzone suggested by VINOGRADOVA.[2]

It is evident from Fig. 178 and "curve" A (Fig. 180) that with regard to the asellotes there is no sharp upper limit towards the bathyal zone, neither in composition nor in variance in the number of species within the depth intervals – the latter being practically the same between 3000 and 1000 m. There is no doubt that the lack of change in composition is due to the geographical distribution of a great number of asellotes at high latitudes in both hemispheres – where many cold stenothermic, eurybathic species are distributed both on the lower continental slope and in the true abyssal depths.

1. VINOGRADOVA's illustrations also included "curves" of the number of species whose upper or lower limit of occurrence was to be found in the depth interval in question. I have followed this system in my Figs. 179 and 180. The number is probably too low to show anything of interest (although there could perhaps be an indication of several species ranging to depths between 2500 and 3000 m).
2. It is outside the scope of the present work to evaluate the results obtained in other groups examined by VINOGRADOVA. With a similar exclusion of the rarely recorded species, I have little doubt that a correspondingly even decrease in the number of species within the abyssal zone will be encountered in some or all of these groups.

2. REGIONAL DISTRIBUTION

Definition of terms.

The main division has been made between the five oceans: the Arctic, Atlantic, Indian, Pacific and Antarctic Oceans.

The Arctic Ocean. The boundary towards the Pacific is set at the Bering Strait. Towards the Atlantic the limits established by BROCH (1933, map 6) have been adopted. Thus, areas north of the ridge off Holsteinsborg in West Greenland (*c.* 68°N), off East Greenland and North and East Iceland, and northwest of the 600 m line to Nordkap in Northern Norway belong to the Arctic Ocean. No subdivision of the Arctic Ocean could be made.

The Antarctic Ocean includes areas south of a line which almost follows the 60° lat. south. Temperatures are from −1.9 - *c.* 0°C. A subdivision into an

Atlantic, Indian, and Pacific Antarctic section was not possible.

The Atlantic Ocean has been divided below into (1) the North Atlantic, ranging southwards to about 35°N, (2) the Central Atlantic, ranging southwards to about 20°S and including i.a. the Azores and Ascension, and (3) the South Atlantic, including i.a. the Subantarctic (lowantarctic) South Georgia.

The Indian Ocean has not been subdivided owing to the paucity of asellote species recorded from this ocean. South African species occurring east of The Cape of Good Hope and at the Subantarctic (antiboreal) islands (e.g. Kerguelen) are included.

The Pacific Ocean has been divided into (1) the Northwest Pacific ranging southwards to south of Japan, (2) the Northeast Pacific ranging southwards to the southern end of Baja California, (3) the Southwest Pacific which extends northwards to about 30°S and includes the Subantarctic (cold-temperate) islands south of New Zealand, (4) the Southeast Pacific ranging northwards to about 12°S, and (5) the Tropical Pacific which includes not only the large Central Pacific (with Hawaii and the scattered island groups) but also tropical regions in the West and East Pacific.

Finally, the *Mediterranean* and the *Indo-Malayan Seas* have been regarded as separate bodies. The latter sea includes the regions east and north of Malaya – Sumatra – Java – the Sunda Islands and west of the Philippines – New Guinea.

a. Species

1. Occurring in one ocean only.

Exclusive of subspecies, freshwater species and *Nannoniscus caspius* (but inclusive of the pelagic species), a total of 536 species of marine asellotes (87 %) are recorded from one ocean only. Based on the data supplied in Table 18 (p. 249), the number of species in each ocean (or section of it) and at various depth intervals is presented in Table 21.

Of the 536 species, 40 % are known from at least two finds, 15 % from at least four.

Shelf species. A total of 164 species (30 % of the species restricted to one ocean) occur exclusively on the Continental Shelf (above the 200 m line). Only two of these species have a fairly wide distribution within the ocean in which they occur, viz. the eulittoral *Ianiropsis tridens* which ranges from Central California to Northern Chile and *I. kincaidi*, of which one subspecies occurs in the Bering Sea and along the Californian coast, and another in the Sea of Japan (perhaps it is a separate species).

The distribution of the eulittoral species shows a maximum in Tropical and Subtropical regions of the Indian and Pacific Oceans, while only eleven species are known from the Atlantic (excl. of the Mediterranean); another six species are from the Mediterranean and two species are recorded from both the Atlantic and the Mediterranean (*Jaera hopeana* and *Jaeropsis brevicornis* – but the latter has an Atlantic and a Mediterranean subspecies). The shore ice prevents the occurrence of eulittoral asellotes in the Arctic and Antarctic Oceans[1]. Of the 90 eulittoral species, 40 % have been recorded from at least two localities and 22 % from at least four.

Of the more deeply occurring shelf species very few are from Tropical-Subtropical areas (10 of the 74 species)[2]. Another 13 are Arctic or Antarctic, while most of the remainder are from the fairly well investigated areas in Northern Europe, S. Africa and the North Pacific.[3] More than half of the shelf species with a deeper occurrence are known from at least two finds, and 23 % from at least four.

Slope species. The majority of the 29 species from lower shelf and upper slope areas are from the North Atlantic and N. Atlantic-Mediterranean (17 species), i.e. from the most thoroughly investigated part of the oceans. This is further borne out by the fact that all 29 species are known from at least two localities, and almost two-thirds from at least four localities.

There are about 140 typical slope species (including most of the 15 species which penetrate beyond the 2000 m line). Almost 60 % of the slope species are restricted to the Atlantic Ocean and practically all of them to only one section of it. A fair number occur in the Arctic and Antarctic Oceans, but very few in the Indian and Pacific Oceans. There is no doubt that this uneven distribution is primarily due to collecting activity being much more intensive at these depths in the former oceans than in the latter (see below on the Indian Ocean).

Of the 140 slope species, 31 % are recorded from at least two localities, 12 % from at least four.

1. The single eulittoral species recorded from the Antarctic (*Austrosignum incisa*) certainly migrates to greater depths during the winter.
2. This deficiency is probably correct as far as West Africa is concerned. According to BRIAN's study of the isopods of the *Atlantide* Expedition (in preparation) only two species (of a total of 46 obtained) are asellotes. The expedition worked almost exclusively at depths between about 20 and 200 m along the entire coast of Tropical West Africa.
3. Cf. footnotes on pp. 254 and 255.

Table 21. Distribution and depth occurrence of species recorded from one ocean only.

Depth (m) \ Area	Arctic Ocean	Atlantic Ocean (incl. the Mediterranean): North	Central	North + Centr.	South	North + South	Mediterranean	Medit. + Atl.	Total	Indian Ocean	Indo-Malayan	Pacific Ocean: Northwest	Northeast	Tropical	Southwest	Southeast	Widely distr.	Total	Antarctic	Total	Total (> 1 record)	Total (> 3 records)
0–4	–	1	6	–	4	–	6	2	**19**	**22**	–	7	14	11	7	8	1	**48**	**1**	**90**	36	21
0–150	–	2	–	–	–	–	1	1	**4**	**1**	–	–	4	–	–	3	1	**8**	**3**	**16**	16	9
0–1500	–	1	–	–	–	–	–	–	**1**	**1**	–	–	–	–	–	–	–	–	–	**2**	1	–
4-*c.* 200	**5**	9	3	–	10	–	3	1	**26**	**5**	–	4	5	2	3	3	–	**17**	**5**	**58**	24	8
4–2800	**5**	12	–	1	2	–	–	4	**19**	–	–	–	3	–	–	–	–	**3**	**2**	**29**	29	18
c. 200–*c.* 2000	**16**	37	15	–	18	–	1	–	**71**	**7**	**1**	8	–	1	3	–	–	**12**	**21**	**128**	34	10
300–*c.* 6000	–	4	1	1	–	4	–	–	**10**	–	–	1	–	1	–	–	–	**2**	**3**	**15**	15	9
c. 2000–*c.* 6000	**4**	25	25	1	72	3	–	–	**126**	**6**	–	14	1	9	9	2	1	**36**	**8**	**180**	48	6
2500–7900	–	–	–	–	–	–	–	–	–	–	–	2	–	–	3	–	–	**5**	–	**5**	4	1
c. 6000–10.000	–	–	–	–	–	–	–	–	–	–	**1**	6	–	1	5	–	–	**12**	–	**13**	6	1
	30	91	50	3	106	7	11	8	**276**	**42**	**2**	42	27	25	30	16	3	**143**	**43**	**536**	213	83

Abyssal species. Again, the preponderance of Atlantic species is great (71 %) and can be chiefly explained by the abyssal depths of this ocean being comparatively more thoroughly investigated.

However, it is remarkable that in the Indian Ocean neither the *Galathea* nor the John Murray Expedition (i.e. the only two expeditions which have worked on the deep-sea bottom north of the Subantarctic region[1]), has collected a single abyssal species of asellotes. The *Galathea* Expedition achieved a total of 29 successful trawlings and 6 successful bottom-samplings at abyssal depths in the Indian Ocean. Many of these yielded a large number of benthic animals (including amphipods (J. L. BARNARD 1961), tanaids (WOLFF 1956c) and cumaceans), but no asellotes; the same results were obtained by the John Murray Expedition during the course of 10 successful trawlings at depths exceeding 2000 m (SEWELL 1935; J. B. CATTLEY *in litt.)*.

(A similar deficit of Indian Ocean asellotes is apparently found at bathyal depths. On the *Galathea* a total of nine successful trawlings and eleven bottom-samplings between 200 and 2000 m gave only one species *(Munnopsis mandibularis)*. Similarly, the John Murray Exp. obtained only three asellote species during the course of about 45 successful trawlings and 17 bottom-samplings (SEWELL 1935; J. B. CATTLEY *in litt.)*. Three of the seven Indian Ocean slope species (Table 21) are Subantarctic).

Only one-fourth of the 178 abyssal species are known from at least two finds and only 3 % from at least four.

Hadal species are all restricted to one trench (or two adjacent trenches) in the western part of the Pacific – with the exception of *Macrostylis hadalis* from the Banda Trench (Indo-Malayan Region), a still undescribed species of *Haploniscus* in the Sunda Trench south of Java (BELJAEV & VINOGRADOVA 1961), and what can best be described as a species of *Ilyarachna,* from the Peru-Chile Trench (MENZIES *et al.* 1959, fig. 7 F).

More than half of the 18 exclusively or partly hadal species have been taken at least twice, but only two of them have been taken on at least four occasions.

2. Occurring in two oceans.

Of the remaining 77 asellote species, 59 are recorded from two oceans (9.6 % of all species studied). More than three-fourths of these 59 species are known from at least four finds and the majority are from shallow water: 32 are shelf species only, 22 from the shelf and the slope, 7 from the slope, 12 from the slope and abyssal depths and only 4 are abyssal or abyssal-hadal.

The Arctic and Atlantic Oceans: No less than 24 of the 59 species are from these two oceans. Twenty-one are Arctic-North Atlantic, two *(Haplomesus tenuispinis* and *Macrostylis abyssicola)* extend southwards to the Central Atlantic (on the slope in the Arctic, abyssally in the Atlantic), and one *(Haploniscus bicuspis)* is known from the Arctic, North and South Atlantic Oceans (occurring both on the slope and abyssally). Five of the 21 Arctic – N.

1. The six abyssal species known from the Indian Ocean (Table 21) were all taken in the Subantarctic (antiboreal) section by the *Challenger*.

Atlantic species are from the shelf (> 4 m), viz. *Janira tricornis, Munna groenlandica, M. fabricii, M. minuta,* and *Eurycope mutica;* the two first-mentioned are Arctic-Subarctic, the remainder boreo-arctic. Another nine shelf species are additionally found on the slope: *Munna hanseni, Pleurogonium inerme, P. spinosissimum, Desmosoma armatum, D. tenuimanum, Eurycope cornuta, E. producta, Munnopsis typica,* and *Ilyarachna longicornis;* the latter penetrates into the upper part of the abyssal zone. All nine species extend their range to boreal regions. Four species are known from the slope only: *Acanthaspidia typhlops, Munna acanthifera, Haplomesus angustus,* and *Eurycope inermis;* their occurrence in the North Atlantic is restricted to its northernmost part. Finally, three species occur on the slope in the Arctic Ocean and both on the slope and abyssally in the N. Atlantic, viz. *Heteromesus longiremis, Macrostylis subinermis,* and *Eurycope hanseni.*

The Atlantic and Indian Oceans: The slope species *Neasellus kerguelensis* was recorded from both the S.W. Atlantic (37°S) and from Kerguelen by Beddard (1886b), but no confirmation of the identity of the species has been made since that date.

The Mediterranean and the Indian Ocean: The eulittoral species *Angeliera phreaticola* and *Bagatus stebbingi* (both with an additional subspecies in the Mediterranean; the latter perhaps also known from the Azores). *Pleurocope dasyura,* with a slightly deeper occurrence, has a similar distribution (not known from the Azores).

The Atlantic and Pacific Oceans: Only three species are common to both. *Janira maculosa* (0–1500 m) is recorded from the North and Central Atlantic, the Mediterranean and the N.E. Pacific. *Storthyngura pulchra* has one (bathyal) subspecies in the West Indies *(caribbea),* another (abyssal) in the Tropical E. Pacific *(pulchra),* and a third (hadal) in the Kermadec Trench in the S.W. Pacific *(kermadecensis).* Finally, the abyssal-hadal *Bathyopsurus nybelini* is found both in the Puerto Rico Trench area and in the Tasman Sea and the Kermadec Trench.

The Indian and Pacific Oceans: Only four species are common to both. The eulittoral *Bagatus stylodactylus* is recorded from the N.W. Indian Ocean and Central Pacific, the eulittoral *Jaeropsis curvicornis* from the N. and S.W. Indian Ocean and the S.W. and S.E. Pacific, and the eulittoral *Iais californica* from the N. Indian Ocean, the Indo-Malayan Region and the S.W. and N.E. Pacific.[1] *Stenetrium chiltoni,* with a slightly deeper occurrence, is known from the N. and W. Indian Ocean and the Central Pacific.

A number of species occur either exclusively in the West Wind Drift of the Southern Hemisphere or are also recorded from the Antarctic Continent. Of the former, seven have so far been found in two oceans only, but are probably circumsubpolar. They are all shelf species, as follows:

The S. Atlantic and S. Indian Oceans: *Munna maculata, M. pallida, M. studeri,* and *Antias marmoratus.*

The S. Atlantic and S.E. Pacific: *Munna nana* – with an additional subspecies ("form") in the latter ocean (same section).

The S. Indian and S. Pacific Oceans: *Munna schauinslandi* and *Paramunna kerguelensis.*

To these seven species should perhaps be added the S. Atlantic – S.E. Pacific *Jaeropsis intermedia* (also restricted to the shelf), although it does occur as far north as N. Argentine in the Atlantic.

The following 15 species are distributed in the Antarctic Ocean and the southern part of one of the three major oceans (except the pelagic *Paramunnopsis oceanica* which is recorded from Greenland to Antarctica).

The Antarctic and S. Atlantic Oceans: Three shelf species *(Ectias turqueti, Munna neglecta,* and *Paramunna antarctica);* two species from both the shelf and the slope *(Ianthopsis nasicornis* and *Austrosignum glaciale);* two slope species *(Coulmannia australis* and *Eurycope frigida);* one *(Eurycope antarctica)* from the slope in the Antarctic and abyssally in the S. Atlantic Ocean, and two abyssal species *(Stylomesus inermis* and *Eurycope vicarius).*

The Antarctic and S. Indian Oceans: Two eurybathic species, viz. *Coulmannia frigida* from the shelf and the slope, and *Munnopsis australis* from the slope in the Antarctic and abyssally in the S. Indian Ocean.

The Antarctic and S. Pacific Oceans: Two shelf species *(Antias mawsoni* and *Austrosignum grande).*

Bipolar: Finally, one species *(Eurycope brevirostris)* appears to be bipolar, having been taken three times in the North Atlantic between 900 and 1500 m and once in the Antarctic Indian Ocean at

1. Provided that Hurley (1956) is right in believing *I. californica* (Richardson) and *singaporensis* Menzies & Barnard to be conspecific.

3400 m. It was found impossible to divide the specimens into separate species (WOLFF 1956a, p. 132).

3. A wide distribution.

Only 18 of the 613 asellote species under consideration (3 %) are recorded from more than two oceans and the majority of these are circumsubpolar in the Southern Hemisphere.

The Arctic, N. Atlantic and N. Pacific Oceans: This northern distribution is found in three species, viz. (1) *Munnopsurus giganteus* (from both the shelf and the slope in all three oceans); (2) *Haplomesus insignis* (with one subspecies occurring on the slope in the Arctic Ocean and abyssally in the Atlantic, and another subspecies occurring abyssally in the N.W. Pacific); (3) *Haplomesus quadrispinosus* with exactly the same distribution as *insignis* (with the exception that it has been taken also on the slope in the N. Atlantic and lacks subspeciation).

Circumsubpolar (Subantarctic-circumpolar): One eulittoral species *(Iais pubescens)*; two more shelf species *(Iathrippa longicauda* and *Jaeropsis patagoniensis)*; one shelf species which is also apparently found on the upper part of the slope *(Neojaera antarctica)*.

Antarctic-circumsubpolar: Eight species belong to this group, viz. four shelf species *(Neojaera furcata, Munna antarctica, Paramunna serrata,* and *Antias hispidus)* and four species which occur both on the shelf and the slope *(Ianthopsis bovalii, Iathrippa sarsi, Paramunna rostrata,* and *Ilyarachna quadrispinosa)*. To the last four may be added *Pleurosignum magnum* which, however, extends northwards to warm-temperate regions in the S.E. Pacific. The eulittoral *Paramunna subtriangulata* probably also belongs to this group although it has not yet been recorded from the S. Indian Ocean.

Cosmopolitan: One species only, the bathy- and abysso-pelagical *Munneurycope murrayi*, which has been recorded on many occasions from the N. Atlantic and on a few from the S. Atlantic, the N. Indian Ocean and the N.W. Pacific.

b. Genera

Freshwater genera

Only one genus, *Heterias*, has a wide distribution, having one species in Brazil and one in Australia. *Microcharon* (with four freshwater and two marine species) is Mediterranean, with the exception of one interstitiel species known from N.W. France. The two species of *Microparasellus* are likewise Mediterranean, the two species of *Protojanira* are South African, and the two species of *Protocharon* are from small islands in the southern part of the Indian Ocean. *Mackinia* and *Pseudasellus* (with one species each) are from Japan and Tasmania respectively.

Marine genera

1. Known from one ocean only.

Of a total of 91 marine genera, no less than 39 (43 %) are restricted to one ocean, but 32 of these are monotypic and 24 known from only a single find.

The Arctic Ocean (see definition p. 286) has one endemic genus, the monotypic slope genus *Pseudomesus* which is, however, known only from one find.

The Atlantic Ocean (including the Mediterranean) contains – according to our present knowledge – no less than 25 endemic genera, most of which (20) are even restricted to one section. The following six are North Atlantic: *Rhacura, Thambema, Schistosoma, Nannoniscella, Pseudarachna,* and *Lipomera*. They are all monotypic; five are known from one find only while *Pseudarachna* has been taken 35 times in the boreal N.E. Atlantic (see HULT 1941, map 38), and is probably restricted to this area.

Seven genera are Central Atlantic: *Abyssijaera, Carpias, Janthura, Echinothambema, Urias, Dactylostylis,* and *Mesosignum*. The first six are monotypic and known from one find only, while *Mesosignum* has two species which, so far, have been taken only in the Caribbean Sea (5 finds in all).

The following five are South Atlantic: *Vemathambema, Xostylus, Antennulosignum, Spinianirella,* and *Notoxenoides*. The first four are monotypic, the first three are known from one find only and *Spinianirella* from two finds; *Notoxenoides* has two species (but both of them have been recorded only once).

Three genera have a wider distribution. *Dendrotion* has two North and one Central Atlantic species (6 finds in all). *Abyssianira* is Central and South Atlantic (2 species, 5 finds) and *Syneurycope* is North-South Atlantic (4 species, 6 finds in all).[1]

Two monotypic genera, *Microjaera* and *Gnatho-*

1. *Hydroniscus* whose currently described species are known from 8 finds in the Atlantic Ocean has been transferred to the group of genera recorded from two oceans, since a new, as yet undescribed species, is common in the N.W. Pacific (WOLFF 1960, p. 112; BIRSTEIN 1960, p. 24).

stenetroides (one and two finds, respectively) are known only from the Mediterranean. The monotypic *Munella* (3 finds) and *Echinopleura (c.* 65 finds) occur in the Mediterranean and the adjacent N.E. Atlantic.[1] *Microcharon* has the same distribution as *Munella* but was mentioned together with the purely freshwater genera.

Two of the Atlantic (and Mediterranean) genera are eulittoral, three occur at a deeper level on the shelf, three also on the slope, four only on the slope, and thirteen are abyssal (see below).

The Indian Ocean has two monotypic, eulittoral genera, *Pseudojanira* and *Kuphomunna* (known from one and three finds, respectively).

The Pacific Ocean contains nine apparently endemic genera; seven of them are, however, monotypic and six of these are known from one find only. Three are N.W. Pacific: *Jaerella* (one find), *Microthambema* (one find), and *Gomphomesus* (two finds); two are N.E. Pacific: *Caecijaera*[2] and *Haplomunna* (one find each); one is from the Tropical Pacific: *Trichopleon* (one find); one is S.W. Pacific: *Mixomesus* (one find). The remaining two genera have a wider distribution: The ten species of *Janiralata*[2] are all restricted to the N.W. and especially the N.E. Pacific (*c.* 30 finds in all). The two species of *Paropsurus* have been recorded from the Tropical E. and W. Pacific and from the S.W. Pacific (three finds).

One of the Pacific genera is eulittoral, one occurs at a deeper level on the shelf, three on the slope and four are abyssal; i.e. with almost the same depth distribution as the Atlantic genera, although with proportionally fewer abyssal genera.

The Antarctic Ocean has two endemic genera, viz. the monotypic shelf genus *Notoxenus* (five finds), and *Echinomunna* with a slightly deeper occurrence (one find).

2. Known from two oceans.

This group contains 19 genera (21 % of the total number); only three of these are monotypic but ten of the remainder have only two species. Of the 18 benthic genera, two are eulittoral, another four occur at a deeper level on the shelf, one primarily on the slope, two on the slope only, five both on the slope and abyssally, two are abyssal, and two abyssal-hadal.

Arctic-Atlantic: Two genera, viz. *Katianira* with three Arctic and one N. Atlantic species (7 finds in all) and *Nannoniscoides* with one Arctic-N. Atlantic and one S. Atlantic species (3 finds).

Arctic-Pacific: *Helomesus* (Fig. 182) with one Arctic and one N.W. Pacific species (2 finds in all).

Atlantic-Indian Ocean: *Neasellus* (monotypic, 2 finds).

Mediterranean-Indian Ocean: *Pleurocope* (monotypic, 2 finds) and *Angeliera* (one species in both oceans, another in the Indian; *c.* 10 finds).

Atlantic-Pacific: Seven genera are common to both oceans. *Hydroniscus* has three species in the N.-S. Atlantic (8 finds) and one (still undescribed) species in the N.W. Pacific. *Janirella* has ten species in the N.-S. Atlantic and one in the Mediterranean (15 finds in all); according to BIRSTEIN (1960) there are six (still undescribed) species in the N.W. Pacific. Three genera (each with two species) are known from a few finds: *Bathyopsurus* (Cent. Atlantic, S.W. Pacific), *Bactromesus* (S. Atlantic, N.W. Pacific), and *Dendromunna* (S. Atlantic, S.W. Pacific). Two more genera, *Jaera* and *Acanthocope,* are primarily Atlantic. *Jaera* has its main distribution in the N. Atlantic and Mediterranean (a few are freshwater species) but one, although it is a somewhat dubious species, has been recorded once (in 1865!) from the N.E. Pacific. Of the five Atlantic-Mediterranean marine species, two are known from one find, one from approx. 20, one from approx. 40, and one from several hundred finds. *Acanthocope* has one Central Atlantic and three S. Atlantic species (plus three records of unidentified specimens); one species is from south of Australia, one from the Tropical East- and one from the S.E. Pacific. All of these seven species are known from one find only.

Indian Ocean-Pacific: Provided the reference (by MENZIES & PETTIT 1956) of *Austroniscus ectiformis* to *Caecianiropsis* is correct, this genus is known from Kerguelen and California (one find in each locality).

Atlantic-Antarctic: The three species of the pelagic genus *Paramunnopsis* seem to be restricted to these two oceans, but the two purely Atlantic species have been recorded on one or two occasions only. *Ectias* (one species, five finds) is S. Atlantic-Antarctic.

S. Indian Ocean-Antarctic: *Astrurus* (two species, two finds in all) and *Coulmannia* (two species, eight finds).

Pacific-Antarctic: *Microprotus* with one N.W. Pacific and one Antarctic species (two finds).

1. *Janirella* which was hitherto considered endemic in the Atlantic (and Mediterranean) has also been moved from this group since BIRSTEIN (1960) reports that six (still undescribed) species have been found in the N.W. Pacific.
2. Cf. footnote 4 on p. 254.

3. Known from three oceans.

This group contains 15 genera (16.5 % of the total number). None are monotypic and the majority have many species (one even 29). One genus is eulittoral, two more are restricted to the shelf, two occur both on the shelf and the slope, five range from the shelf to abyssal or hadal depths, three occur both on the slope and abyssally, one ranges from the slope to hadal depths, and one is abyssal.

Arctic-Atlantic-Indian Ocean: *Heteromesus* (Fig. 183) is primarily Atlantic, having five species in the N. Atlantic and three in the Central Atlantic; one species is common to both the N. Atlantic and Arctic Oceans, one is Arctic and one is from the Indian Ocean (off Kenya). Six of the 11 species are known from one find, the others from 2-7 finds.

Arctic-Atlantic-Pacific: *Macrostylis* is mainly Atlantic, 16 of the 19 species having been exclusively or in part recorded from this ocean. Two are Arctic-N. Atlantic or Arctic-N.-Cent. Atlantic, five N. Atlantic, six Cent. Atlantic and three (plus one unidentified specimen) S. Atlantic. One species is N.W. Pacific, one S.W. Pacific and one from the Indo-Malayan Region. Eleven species are known from one find, one from approx. 45, and the remainder from 2-7 finds.

Haplomesus (Fig. 184) has most species in the N.W. Pacific (six); another species has one N.W. Pacific and one Arctic-Atlantic subspecies, and one species ranges from the N.W. Pacific through the Arctic to the Atlantic Ocean; two species are Arctic-Atlantic, one is N. Atlantic, two S. Atlantic and one Central Atlantic and perhaps Mediterranean. Five of the 14 species are known from one find, the others from 2-13 finds.

Arctic-Atlantic-Antarctic: Of the 29 species of *Desmosoma,* four are Arctic, two Arctic-N. Atlantic and one Antarctic. The remaining 22 species are all Atlantic (and Mediterranean): thirteen are N. Atlantic, one N. Atlantic-Mediterranean, one (plus one unidentified specimen) Mediterranean, two (plus one unidentified) Central Atlantic, and five (plus four records of unidentified specimens) are S. Atlantic. Of the 29 species, 14 are known from one find only, 5 from two finds, 2 from four finds, while no less than eight species are known from 13 to around 70 finds.

Nannoniscus has almost the same distribution as *Desmosoma*. Of the twenty species, five are Arctic, two Antarctic and one is from the Caspian Sea. The remaining twelve species are Atlantic: eight are N. Atlantic, two (plus one unidentified specimen) Cent. Atlantic, one (plus one specimen) S. Atlantic, and one N.-S. Atlantic. The genus has not been recorded from the Mediterranean. No less than 15 of the 20 species have been taken only once, the others from 2 to around 9 times.

One of the four species of *Acanthaspidia* is Arctic-N. Atlantic, one is Central Atlantic, one S. Atlantic, and one Antarctic. The species are known from 9 finds in all.

Atlantic-Indian Ocean-Pacific: Five genera, of which *Ischnomesus* is mainly Atlantic, *Bagatus,* and especially *Ianiropsis,* primarily Pacific, and *Jaeropsis* and *Iais* mainly with a southern distribution.

One species of *Ischnomesus* (Fig. 181) is N. Atlantic, one N. Atlantic-Mediterranean, one N.-Cent. Atlantic, two Cent. Atlantic, and eight S. Atlantic (with eight additional records of Cent. and S. Atlantic, unidentified specimens). There is one species in the N.W. Pacific, four in the S.W. (plus one unidentified specimen), one in the S.E., and two in the Tropical East Pacific. Finally, one species is from south of Australia and one from off Kenya. Of the 23 species, no less than 16 are known from one find only, 6 from two finds, and one from approx. 37 finds.

Bagatus is a shelf genus with a purely tropical distribution (with the exception of one species (and subspecies) recorded from the Mediterranean). Four are known from the Central Pacific, two from the Indian Ocean, two from the Central Atlantic and two have a wider distribution in the Indian Ocean and the Mediterranean or the Pacific. Seven of the species are known from one find, the remaining three from 5-15 finds. *Ianiropsis*[1] has three species in the N.W. Pacific, one in the N.W.-N.E. Pacific, six in the N.E., and two in the S.E. Pacific; one species is N. Atlantic, and two occur in the Indian Ocean close to The Cape of Good Hope. Of the 15 species, only 3 are known from one find and 3 from 2-3 finds; the others were recorded 5-10 times.

Jaeropsis[1] has two, more or less circumsubpolar species and a third, which is in addition, known from the N. Indian Ocean. Two species are from the N.E. Pacific, one from the Central, one from the S.W., and one from the S.E. Pacific. One is Mediterranean-N. Atlantic, one Mediterranean-Cent. Atlantic, one Cent. Atlantic, and two are from the S. Indian Ocean. Only two species are known from a single find, the other eleven species from 2-19 finds. There are as many as 78 finds in all. One of

1. Cf. footnote 4 on p. 254.

the two species of *Iais* occurs in the Indian Ocean, the Indo-Malayan Region and the N.E. and S.W. Pacific, and the other is circumsubpolar. There are many finds of both species.

Atlantic-Pacific-Antarctic: *Stylomesus* (Fig. 182) is primarily S. Atlantic (6 species, plus records of two unidentified specimens); one species is S. Atlantic-Antarctic and one occurs in the N.W. Pacific. No less than six of the eight species are known from one find only, the other two from 3-4 finds. *Acanthomunna* has four species (5 finds), viz. one N. Atlantic, one S. Atlantic, one Antarctic and one S.W. Pacific. *Pleurosignum* is mainly Antarctic (three species, one of which is also S. Atlantic and another is in addition, S. Pacific); the fourth species is S.E. Pacific. The species are known from 10 finds in all. *Austroniscus* has one Atlantic, one N.W. Pacific, and two Antarctic species (6 finds).

4. Known from four oceans.

This group contains 14 genera (15.5 % of the total number). No genus has less than five species and two have 32 and 36 species respectively. One genus is from the shelf, six both from the shelf and the upper slope, four range from the shelf to abyssal depths, two from the slope to abyssal or hadal depths and one is abyssal-hadal.

Arctic-Atlantic-Indian Ocean-Pacific: Four genera, of which *Pleurogonium* and *Iolella* are mainly Atlantic, *Janira* and *Munneurycope* more evenly distributed.

Pleurogonium[1] has two Arctic-N. Atlantic, four N. Atlantic, and one S. Atlantic species; two are from the S. Indian Ocean and one from the N.E. Pacific. Five of the ten species are known from one find, two from 3 finds and three from 30-40 finds. *Iolella* has one Arctic, four N. Atlantic, one S. Atlantic-Indian Ocean, and one N.W. Pacific species. Four species are known from one find, the other three from 5-15 finds.

One species of *Janira* is Arctic-N. Atlantic, two are Atlantic, one is from the S. Atlantic-S. Indian Oceans, three are Tropical- or N.W. Pacific and one is Atlantic-Mediterranean-N.E. Pacific. Four species are known from one find, three from 6-30 finds and one from at least 100 finds. *Munneurycope* has one Arctic, two N. Atlantic, two S.W. Pacific, and one Atlantic-Indian Ocean-Pacific species. Five species are from one find only, one from *c.* 50 finds.

Arctic-Atlantic-Pacific-Antarctic: *Haploniscus* has one Arctic, one Arctic-Atlantic, two Antarctic, and three Pacific species (one Tropical E. Pacific and two S.W. Pacific spp., thus, it seems to be absent from the N. Pacific). All remaining 29 species are Atlantic. Three are N. Atlantic, three (plus four records of unidentified specimens) are Cent. Atlantic, no less than twenty (plus seven records of unidentified) S. Atlantic, one N.-S. Atlantic, and two Cent.-S. Atlantic. However, 22 of the 36 species are known from one find only and 10 from two finds; the remaining four are from 3-21 finds.

One species of *Munnopsurus* is Arctic-N. Atlantic-N. Pacific, two are N. Atlantic, one S. Atlantic, two N.W. Pacific and one Antarctic. One species is recorded once, five 2-4 times, and one 57 times.

Atlantic-Indian Ocean-Pacific-Antarctic: Of the eight genera of this group, only one (*Storthyngura*) has a mainly northern distribution; all the remaining genera have only a few or no representatives in the Northern Hemisphere.

Storthyngura has most of the 28 species in the Atlantic (9) and Pacific Oceans (13). Two are N.W. Atlantic (none N.E. Atlantic!), three Cent. Atlantic and four (plus two records of unidentified specimens) S. Atlantic. Eight species are N.W. Pacific, one Tropical E. Pacific, and four (plus one unidentified) S.W. Pacific. One is Atlantic-Pacific, two (plus two unidentified) from the S. Indian Ocean and three are Antarctic. No less than 18 of the 28 species are known from one find only, the others from 2-6 finds.

Stenetrium is unique in having an approximately equal number of species in the Atlantic, Indian and Pacific Oceans (nine or ten in each). One species is Mediterranean-Cent. Atlantic, four are Cent. Atlantic and four S. Atlantic. There are two species in the North, four in the S.W., and four in the S.E. Indian Ocean. One species ranges from the Indian Ocean to the Cent. Pacific, six more are Cent. Pacific and three S.W. Pacific. Finally, two are Antarctic. Of the 31 species, 15 are known from one find, 10 from two finds, 5 from 3-4 finds and one from approx. 20 finds.

The two following genera have a definite southern distribution but, one or two species are N. Atlantic. Of the 16 species of *Paramunna*, two are N. Atlantic; the remainder are S. Atlantic (two), from the S.W. Indian Ocean (three), S.E. Pacific (one), circumsubpolar (one), Antarctic-S. Atlantic (one), more or less Antarctic-circumsubpolar (three) or Antarctic (three). Five species are known from one find, five from two, and six from 3-15. *Ianthopsis* has one N. Atlantic species, one (unidentified) from the S. Indian Ocean, one from the Tropical W.

1. Cf. footnote 1 on p. 255.

Pacific, one from the S.W.- and one from the S.E. Pacific; one is Antarctic-S. Atlantic, one Antarctic-circumsubpolar and five are Antarctic. Six species are from one find, the other five from 2-9 finds.

The next two genera also have a pronounced southern distribution, but both have one N.E. Pacific species. In addition, *Antias* has one species in each of the S. Atlantic, S. Indian and S.W. Pacific Oceans; two are S.E. Pacific, one circumsubpolar, one Antarctic-S.E. Pacific, one Antarctic-circumsubpolar, and one is Antarctic. Four species are known from one find, the other six from 2-6 finds. In addition to the single N.E. Pacific species, *Austrosignum* has one S. Atlantic, two S.E. Pacific, one Antarctic-S. Atlantic, one Antarctic-S. Pacific, and two Antarctic species. Four of the eight species are from one find, the remainder from 2-5 finds.

Finally, the two following genera are exclusively southern: *Neojaera* has one S. Atlantic, one S. Indian Ocean and one S.E. Pacific species,one is circumsubpolar, one Antarctic-circumsubpolar and two are Antarctic. Three species are from one find, the other four from 2-9 finds. One species of *Iatrippa* is S.W. Pacific, two S.E. Pacific, one circumsubpolar, and one Antarctic-circumsubpolar. Three species have been taken on one occasion, the two remaining species 16 and 28 times respectively.

5. Known from all five oceans.

The remaining four genera (4.5 % of the total number) are very widely distributed. It is characteristic that three of them are very large: *Munna* and *Eurycope* are the two asellote genera richest in species and *Ilyarachna* is surpassed only by *Haploniscus* (which is also widely distributed). The four genera are also very eurybathic, two of them ranging from the shelf to abyssal depths and two from the shelf to hadal depths. The majority of the species of *Ilyarachna* and *Eurycope* are Atlantic, while *Munna* and the fourth genus, *Munnopsis*, are more evenly distributed.

Ilyarachna has four Arctic and one Arctic-N. Atlantic species; six are N. Atlantic, one (plus three records of unidentified specimens) Cent. Atlantic, no less than thirteen (plus five records of unidentified) are S.Atlantic and one (unidentified), Mediterranean. There are two species in the N.W. Pacific, one (plus one unidentified) in the N.E.-, and two in the S.W. Pacific. Four species are from the Antarctic Ocean and one from the Antarctic-S. Atlantic-S. Indian Oceans. Thus, the single species recorded from the Indian Ocean is found only in its southernmost part (Kerguelen). Of the 35 species, 17 are known from one find, 10 from two, seven from 3 to around 16 finds and one from more than 100 finds.

Eurycope has three Arctic and five Arctic-N. Atlantic species; eight are N. Atlantic, and one N.-Cent. Atlantic; there are eight records of unidentified specimens from the Central Atlantic, five species (plus eight records of unidentified specimens) are S. Atlantic and one species (plus three different, unidentified specimens) is Mediterranean. One species is from the S. Indian Ocean, two from the N.W.-, three from the S.W.-, and one from the Tropical East Pacific. One is recorded from the N. Atlantic and Antarctic Oceans, three are S. Atlantic-Antarctic and finally, four are Antarctic. Again, the only Indian Ocean species is from the southernmost part (Marion Island). Of the 38 species, 20 are known from one find, twelve from 2-11 finds, five from approx. 30-50, and one from more than 100 finds.

One species of *Munnopsis* is Arctic-N. Atlantic, one N. Atlantic, one N.-S. Atlantic, one from the western Indian Ocean, one Indo-Malayan, one N.W. Pacific, one S.W. Pacific, one from the Tropical East Pacific, and one from the S. Indian-Antarctic Oceans. Three of the nine species are from one find, five from 2-5 finds, and one from almost 200 finds.

Munna[1] has three Arctic and four Arctic-N. Atlantic species; twelve are Atlantic, viz. five N. Atlantic, one N.-Cent. and one Cent. Atlantic, three (plus one unidentified) S. Atlantic and two Mediterranean. One species (plus two records of unidentified specimens) is from the N. Indian Ocean and two from the S. Indian Ocean; thirteen species are Pacific, viz. three in the N.W., six in the Central, two in the S.W.- and two in the S.E. Pacific. Five species are more or less circumsubpolar, one Antarctic-S. Atlantic, one Antarctic-circumsubpolar and three are Antarctic. Slightly more than half the species are found in the Northern Hemisphere. Of the 45 species, 16 only are known from one find, 8 from two, 8 from 3-4 finds, 11 from 7-27 finds, and two from 52 to around 60 finds.

c. Families

Three families have only one genus, each known from a single find: Gnathostenetroidesidae, Schistosomatidae, and Pseudomesidae. The occurrence of the three genera is given above.

Another three families have also one genus each,

1. Cf. footnote 1 on p. 255.

all with, however, many species (13-32): Stenetriidae, Jaeropsidae and Macrostylidae. The distribution of the three genera is given above.

Five families have two genera each. Echinothambematidae and Thambematidae (with two monotypic genera each) are Cent.-S. Atlantic and N. Atlantic-N.W. Pacific, respectively, while the distribution of Haploniscidae, Ilyarachnidae, and Munnopsidae is the same as that of the type genus, which (especially in the first two) is the larger of the two genera per family. Thus, the last two are found in all five oceans while the former appears to be absent from the Indian Ocean (cf. above).

Four families have – according to our present knowledge – a rather limited distribution. Nannoniscidae and Desmosomatidae, which are fairly closely related, are both restricted to the Arctic, Atlantic and Antarctic Oceans. The first family contains 4 genera and 26 species which are known from a total of approx. 47 finds[1], while Desmosomatidae contains 3 genera and 31 species known from no less than approx. 385 finds. Similarly, Antiasidae and Dendrotionidae, which are yet more closely related, both lack species in the Arctic Ocean. The former (with 3 genera and 13 species known from 36 finds) has a pronounced southern distribution; only one species *(Abyssianira dentifrons)* having been taken on a single occasion in the Northern Hemisphere (N. of the West Indies). Dendrotionidae (with 5 genera and 11 species, but known from only 18 finds) is primarily Atlantic (7 species) but its distribution is considerably more scattered than that of the Antiasidae.

The remaining four families are all rich in genera and species and are distributed in all five oceans (as Ilyarachnidae and Munnopsidae).

Although recorded from all five oceans, Ischnomesidae is by no means evenly distributed (Figs. 181-184). The general picture of its distribution, presented in the following, is probably more reliable than that of any other family (with abyssal species), since the rich collections of the abyssal-hadal Ischnomesidae from the *Vitjaz* expeditions in the N.W. Pacific are the only collections which have so far been worked up (apart from those of the genus *Storthyngura)*.

According to the present paper, Ischnomesidae contains 8 genera and 62 species but there is only a total of approx. 166 finds. Two species are Arctic and four more have part of their distribution in the Arctic Ocean. Thirty-two species are Atlantic and six more are, in part, Atlantic. Two are from the western Indian Ocean, twenty are Pacific, and two additional species are, in part, Pacific. Thus, Ischnomesidae is not only rare in the Indian Ocean (as is the case with almost all asellotes) but also in the Antarctic Ocean. There is only one record of the family in the Antarctic (the S. Atlantic-Antarctic *Stylomesus inermis)*.

Munnidae contains 12 genera and 93 species with a total of no less than approx. 550 finds. The distribution of the family is somewhat different from that of the largest genus, *Munna*. While *Munna* has more species restricted to the Pacific than to the Atlantic, the opposite is the case when taking the family as a whole (25 Atlantic against 19 Pacific species). In *Munna* there are 7 species which are exclusively or in part Arctic, against 5 exclusively or partly Antarctic species; however, in all Munnidae the corresponding numbers are 11 and 23. In *Munna* 44 % of the species are from the Southern Hemisphere; in all Munnidae the corresponding percentage is 62.

Eurycopidae contains 9 genera with 96 species, in a total of approx. 485 finds. Four species are Arctic and six others have part of their distribution in the Arctic Ocean. Including one Mediterranean, 40 species are Atlantic (plus records of 19 unidentified specimens) and 12 additional species are, in part, Atlantic. Three are from the S. Indian Ocean. There are 28 Pacific species and two more are, in part, Pacific. Eight species are Antarctic and four additional species are, in part, Antarctic. It is remarkable that not a single species of Eurycopidae has been recorded from the shelf or the slope in the whole of the E. Pacific Ocean.

Janiridae contains – according to the present paper – 35 genera and 136 species; these are known from about 575 finds when the very commonly recorded *Jaera albifrons* and *Janira maculosa* are not included. The distribution of the family is very even; a fair number of species have also been recorded from the Indian Ocean. There are, in particular, many Janiridae in the Mediterranean (both freshwater and marine). Six species are exclusively or, in part, Arctic, 48 are Atlantic with 15 additional species having part of their distribution in the Atlantic (14 species are exclusively Mediterranean, another 6, in part, Mediterranean). There are 12 species from the Indian Ocean and another 13 which are partly distributed in this ocean. In the Pacific are 45 species and 10 more are, in part,

1. With the records of unidentified specimens added.

Pacific. Finally, 9 species are Antarctic and in addition, 6 species have part of their distribution in the Antarctic Ocean.

d. Conclusions

It would, in my opinion, appear premature to attach too much significance to the distribution data presented above. Many species of shallow water asellotes and an overwhelming number of deep-sea species (and even genera) are known from a single or two finds only, and each major work on deep-sea asellotes contains descriptions of many new species. Three examples show this very clearly: (1) In the *Ingolf* collections (from the already, at that time, fairly well explored North Atlantic Ocean) 61 species of a total of 105 (58 %) were new and 38 of the new species were recorded from one station only (HANSEN 1916). (2) Of a total of 120 bathyal and abyssal asellote species taken by the *Vema* Expedition (working in the adjacent Central and South Atlantic Ocean), no less than 108 were new (90 %); 79 of the new species were known from one find only and another 18 from two finds (compiled from MENZIES 1956a, 1956b, 1962b). (3) The *Galathea* Expedition collected 35 asellote species, 32 of which were new and 24 of these were taken at one station only.

In view of this, it is only considered necessary to give the following general statements.

1. Species

It seems obvious that the great majority of asellote species have a very restricted distribution. This is shown not only by the addition of many new species in papers on asellotes from all depths[1], but also by the limited distribution of many species which are very common in places but, at the same time, absent in adjacent areas (cf. Table 21, p. 288).

As shown above, 87 % of the species occur in one ocean only and, as far as we know, practically all of these are restricted to one section of the said ocean. Although the majority of these species are known from one find only, 15 % have been recorded at least four times, and many of the species from intermediate depths are known from a considerable number of finds (often more than a hundred records).

There is little doubt that eulittoral species are practically absent from the well explored North Atlantic. In spite of the fact that the eulittoral zones of the tropical regions are the least investigated ones (as far as the asellotes are concerned), the majority of the eulittoral species are, nevertheless, known from the tropics. On the other hand, the dominance of Atlantic species from all other depths is obvious (Table 21), but it cannot be stated whether they do actually predominate or whether it is merely that the Atlantic Ocean has been subjected to a more concentrated study. As pointed out above, there are, however, reasons to believe that the Indian Ocean (apart from its southernmost part) is poor in bathyal and abyssal species.

Of the 77 species occurring in more than one ocean, 12 are more or less circumsubpolar, being restricted to the southernmost part of the Atlantic, Indian and Pacific Oceans. Most of them belong to *Munna* or allied genera. They are all small species which live on the vegetation close to the shore line and can easily be transported along with the large amount of drifting kelp, etc. found in these regions. Another 10 shelf species have a similar distribution but are, in addition, recorded from the adjacent Antarctic Continent.

No less than 21 of the remaining 55 species are restricted to the North Atlantic and, primarily, the adjacent part of the Arctic Ocean; although these species thus have a limited geographical distribution they are all very eurythermic and additionally, most of them are eurybathic (cf. p. 288). Another 14 species from the lower shelf, the slope and abyssal depths are restricted to the Antarctic Ocean and the southernmost part of the Atlantic or Indian Oceans. Eight of the said species common to the Arctic-Atlantic Oceans or the Antarctic-S. Atlantic or S. Indian Oceans occur both on the slope and abyssally. It is characteristic that all of these are recorded from the slope only in the polar part of their distribution and abyssally (five), or both abyssally and on the slope (three), in the Atlantic or S. Indian Ocean. No exclusively abyssal species are common to the Arctic and Atlantic Oceans or to the Antarctic and S. Indian Oceans, and only two are common to the Antarctic and S. Atlantic Oceans.

The remaining 20 species (3 % of all species considered) have a wider distribution in two or more oceans, viz. two Arctic-Cent. Atlantic, one Arctic-S. Atlantic, one S. Atlantic-Indian Ocean, three Mediterranean-Indian Ocean, three Atlantic-Pacific, four

1. The only important exception is HULT's paper (1941) on the isopods of the Skagerrak. The very large collection consisted of 28 sublittoral and bathyal species – and not a single one of them was new! This tends to show that the isopod fauna at intermediate depths in the boreal N.E. Atlantic is now extremely well known.

Indian Ocean-Pacific, three N. Atlantic-Arctic-Pacific, one Atlantic-Antarctic, one bipolar, and one cosmopolitan species. As stated above, the only cosmopolitan species is the mainly pelagic *Munneurycope murrayi* which, in all probability is, however, absent in the two polar seas, and has not (as yet) been recorded from the southern Indian and Pacific Oceans.

Of the 19 fairly widely distributed benthic species, five are eulittoral and three more are from the shelf, three occur also on the slope, six on the slope and abyssally and two are abyssal. The eight species last-mentioned will be dealt with below (p. 301).

2. Genera

As stated above, the majority of the 91 marine genera are either monotypic and rarely recorded, or the species are known from a single or a few finds only. The latter disadvantage applies especially to the primarily or exclusively abyssal genera. Thus, even more than in the case of the species it would seem premature to base far-reaching conclusions on the above data.

An obvious example of too premature a conclusion is found in our past and present knowledge of the distribution of the genera of Ischnomesidae. Based on his study of the abyssal and hadal species of this family from the N.W. Pacific (collected by *Vitjaz)*, and on the literature, BIRSTEIN (1960) demonstrated that the distribution of the four recognized genera of the family *(Ischnomesus, Stylomesus, Haplomesus* and *Heteromesus)* was bipolar and amphiboreal, no species having been found south of lat. 28°N. or north of lat. 30°S. (1. c., fig. 16)[1].

However, the recent addition of records of Ischnomesidae from the *Vema* (MENZIES 1962b), the *Galathea* (this paper), and the John Murray Expedition (J.G. CATTLEY, in press), has added much new information (Figs. 181-184), and the following new species or new records of previously described species or of unidentifiable specimens, all occur in decidedly tropical areas:

Ischnomesus armatus Hansen (north of the W. Indies).
Ischnomesus sp. (north of the W. Indies).
Ischnomesus sp. (Cent. Caribbean Sea).
Ischnomesus multispinis Menzies (S. Caribbean Sea).
Ischnomesus caribbicus Menzies (S. Caribbean Sea).
Ischnomesus sp. (east of Central Brazil).
Ischnomesus n. sp., CATTLEY (off Tanganyika).
Ischnomesus planus n. sp. (off Costa Rica).
Ischnomesus roseus n. sp. (off Costa Rica).
Heteromesus bifurcatus Menzies (Cent. Caribbean Sea).
Heteromesus n. sp., CATTLEY (off Kenya).
Haplomesus tenuispinis Menzies (north of the W. Indies).
Haplomesus insignis Menzies (north of the W. Indies).
Haplomesus tropicalis Menzies (Cent. Caribbean Sea).

One of these, the new species of *Ischnomesus* from the Indian Ocean, is typically bathyal, and thus, does not even show tropical submergence.

A possible generic endemism or limited distribution can only be given in those rather rare cases where a considerable number of finds of monotypic genera, or several finds of most of the species of polytypic genera, are restricted to a single or a few oceans. This applies to the following genera:

Probably endemic in one ocean: *Janiralata* (10 species, approx. 30 finds) has been recorded only from the N.W.-N.E. Pacific and is, thus, unknown in e.g. the well-explored N. Atlantic Ocean (depth range: 0-350 m). The monotypic *Echinopleura* (approx. 65 finds) seems to be restricted to the N.E. Atlantic-Mediterranean (depth range 25-700 m). The equally monotypic *Pseudarachna* (35 finds) is known only from the N.E. Atlantic (depth range 30-480 m). The two Atlantic genera *Dendrotion* and *Syneurycope* (with three and four species respectively) are known from only 6 finds each, and may easily prove in the future to be distributed also in e.g. the N.W. Pacific – as is *Hydroniscus*, which until recently, was believed to be restricted to the Atlantic (cf. above).

Jaera seems to be a pronounced N. Atlantic-Mediterranean genus (8 species, one of which is recorded from several hundred finds, the others from a total of approx. 90). One additional species has been recorded once (in 1865) from the N.E. Pacific, but this find is very dubious.

Perhaps restricted to two oceans: None of the following genera have been recorded a sufficient number of times to state with certainty whether they are, in reality, restricted to two oceans: *Katia-*

1. BIRSTEIN also mentioned that no Ischnomesidae were present in the *Vitjaz* collections from the Bougainville Trench east of New Guinea.

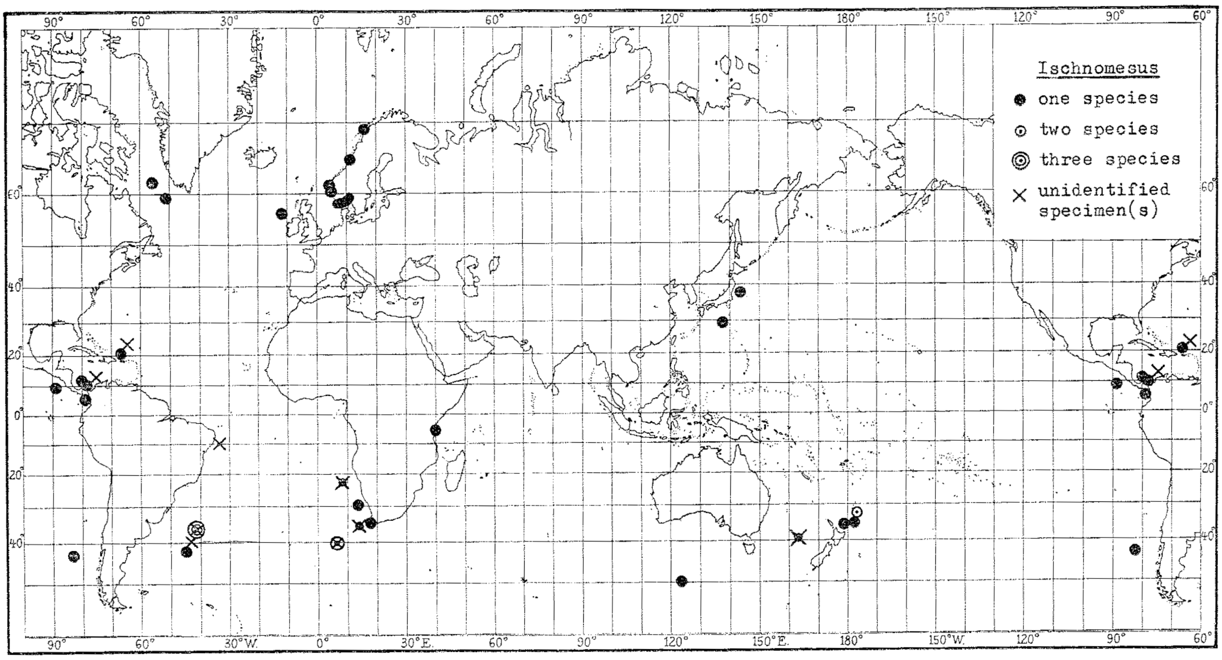


Fig. 181. Distribution of *Ischnomesus*.

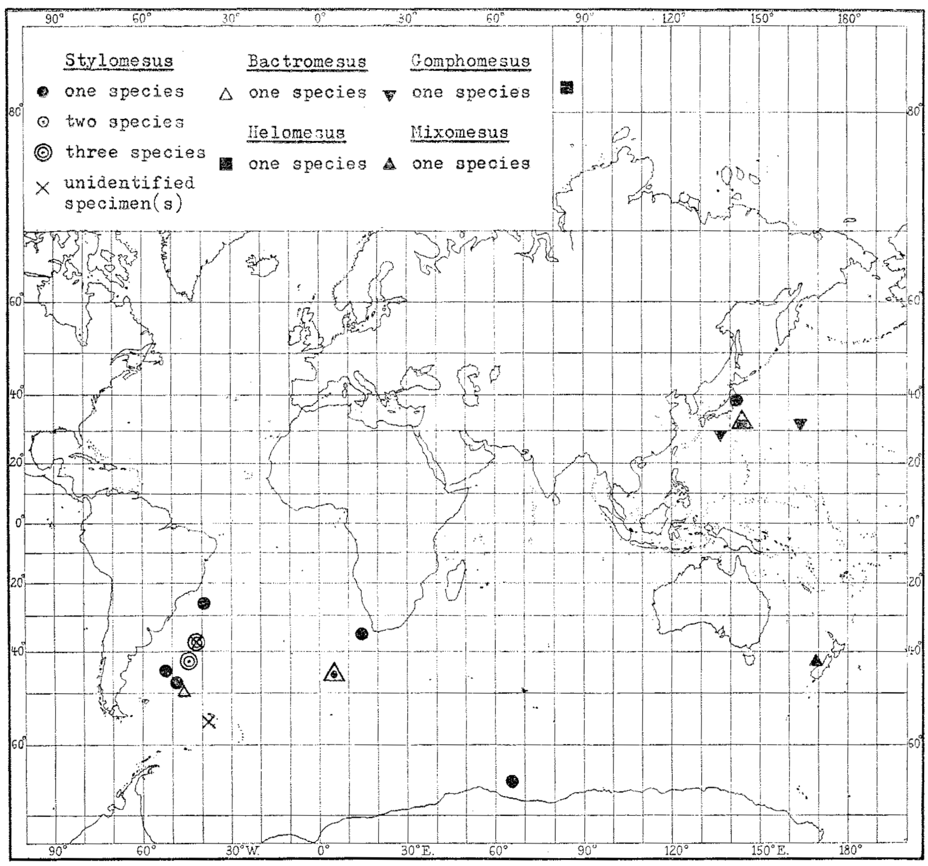


Fig. 182. Distribution of *Stylomesus*, *Bactromesus*, *Helomesus*, *Gomphomesus*, and *Mixomesus*.

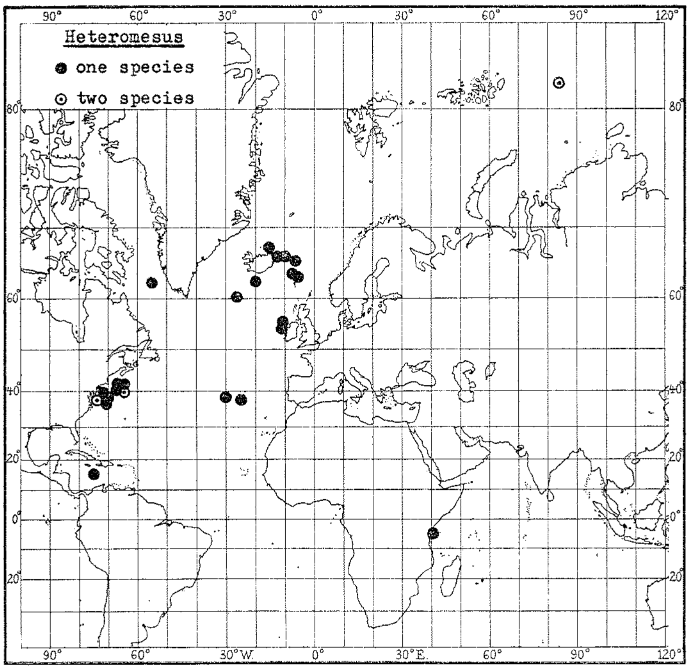


Fig. 183. Distribution of *Heteromesus*.

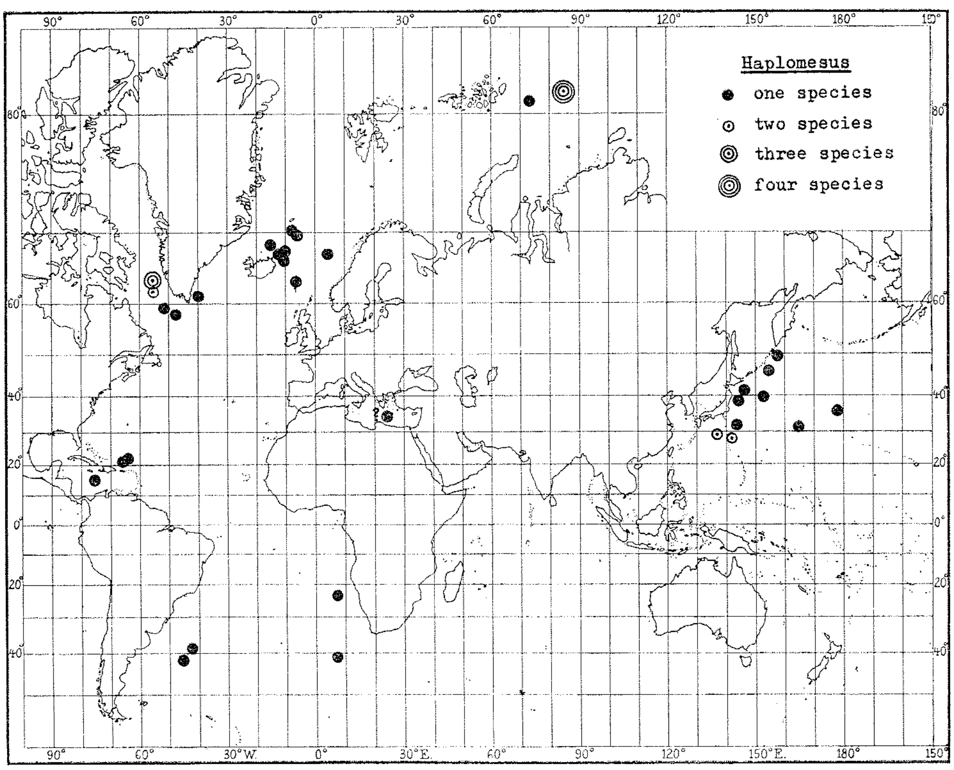


Fig. 184. Distribution of *Haplomesus*.

nira (4 species but only 7 finds in all) is Arctic-N. Atlantic (depth range: 75-1500 m). The three species of the bathypelagic genus *Paramunnopsis* are Atlantic-Antarctic (9 finds). *Coulmannia* (2 species, 8 finds) is restricted to the S. Indian-Antarctic Oceans (depth range: 90-400 m). The interstitiel genus *Angeliera* (2 species, 8 finds) is at present known to be restricted to the Mediterranean and the Indian Ocean but will probably also be found in other oceans when this special fauna element becomes better known.

Finally, the following larger genera have been recorded so often that there seems little likelihood of their presence in the ocean(s) where they have not yet been found (their absence from the Indian Ocean is not under consideration since knowledge of this ocean is incomplete). The number of finds includes all records of unidentifiable specimens.

Absent from the Arctic-N. Atlantic Oceans:

Stenetrium (31 spp., *c.* 74 finds).
Storthyngura (two species in the N.W., none in the N.E. Atlantic) (28 spp., 59 finds).
(*Stylomesus* (8 spp., 15 finds)).

Absent from the Arctic and N. Pacific Oceans:

Paramunna (16 spp., 57 finds).
Ianthopsis (11 spp., 37 finds).

Absent from the Northern Hemisphere:

Iathrippa (5 spp., 47 finds).
(*Antias* (10 spp., 28 finds)).
(*Neojaera* (7 spp., 25 finds)).
(*Austrosignum* (8 spp., 18 finds)).

Absent from the Arctic and Antarctic Oceans:

Jaeropsis (also absent from the N. Atlantic) (13 spp., *c.* 78 finds).[1]
Ianiropsis (15 spp., 76 finds).[1]
Ischnomesus (23 spp., 73 finds).
Bagatus (also absent from northern and southern temperate areas) (10 spp., 35 finds).

Absent from the Southern Hemisphere:

(*Janirella* (17 spp., at least 21 finds)).

Absent from the Antarctic Ocean:

Janira (8 spp., *c.* 160 finds).
Pleurogonium (10 spp., 116 finds).[1]
Macrostylis (19 spp., 86 finds).
Munneurycope (6 spp., *c.* 55 finds).
Haplomesus (14 spp., 41 finds).
Iolella (7 spp., 32 finds).

Absent from the Antarctic and Pacific Oceans:

(*Heteromesus* (11 spp., 26 finds)).

Absent from the Pacific (and Indian) Oceans:

Desmosoma (29 spp., *c.* 320 finds).
Nannoniscus (20 spp., 38 finds).

3. Families

The distribution of the marine asellote families known from a considerable number of finds can be summarized as follows:

Four have a somewhat restricted distribution:

Desmosomatidae (3 genera, 31 spp., *c.* 385 finds) and Nannoniscidae (4 genera, 26 spp., *c.* 47 finds) seem to be absent from the Indian and Pacific Oceans.

Macrostylidae (1 genus, 19 spp., 86 finds) is not recorded from the Arctic, Antarctic and Indian Oceans.

Jaeropsidae (1 genus, 13 spp., 78 finds) is certainly absent from the N. Atlantic and probably also from the Arctic and Antarctic Oceans.

The remaining seven families have all (except Haploniscidae) been recorded from all five oceans:

Haploniscidae (2 genera, 40 species, *c.* 100 finds) is still unknown from the Indian Ocean; it is primarily Atlantic.

Eurycopidae (9 genera, 96 spp., *c.* 485 finds) and Ilyarachnidae (2 genera, 36 spp., *c.* 210 finds) are very rare in the Indian Ocean; they are also primarily Atlantic.

Ischnomesidae (8 genera, 62 spp., *c.* 166 finds) is very rare in the Indian, the East Pacific and Antarctic Oceans, but is otherwise evenly distributed.

Munnidae (12 genera, 93 species, *c.* 550 finds) is evenly distributed, although with a preponderance of southern genera and species.

Janiridae (35 genera, 136 species, *c.* 850 finds) and Munnopsidae (2 genera, 12 species, *c.* 225 finds) have a very even distribution throughout the oceans.

e. Remarks on the regional distribution of the abyssal fauna

It is evident from data on the geographical distribution of asellote species, genera and families presented above that the number of finds is still too

1. Cf. the footnotes on pp. 254 and 255.

small to permit any general considerations on the complex problem of the distribution of the abyssal fauna. However, with our present knowledge of the abyssal asellotes it is possible to state with certainty that: *A great many abyssal species of Asellota must have a very restricted regional distribution.*

This is first and foremost shown by the fact that of a total of 202 benthic species occurring deeper than 2000 m (cf. p. 272), none are cosmopolitan, only three (1.5 %) are known from more than one ocean, and another five have a comparatively wide distribution within the ocean of their reported occurrence (see below)[1]. The extensive rate of endemism is also very evident when considering the large number of new species from abyssal depths found by each new expedition (cf. p. 296). The last feature contrasts strikingly to the fact that not a single species of a total of 469 specimens of Porcellanasteridae (a pronounced abyssal family of sea-stars), obtained in 27 dredgings spread along the whole circumnavigation route of the *Galathea,* proved to be new to science (MADSEN 1961 b, p. 215).

The comparatively wide-spread, truly abyssal (-hadal) asellotes are:

Bathyopsurus nybelini: Puerto Rico Trench (Cent. Atlantic) and Kermadec Trench – Tasman Sea S.W. Pacific), 4400-7900 m.

Stylomesus inermis: E. of Argentine and Antarctic Indian Ocean, 2450-6079 m.

Eurycope vicarius: S. of Cape Horn – Antarctic Indian Ocean, 3423-3839 m.

Ischnomesus armatus: Davis Strait and N. of the West Indies, 2702-5497 m.

Haploniscus percavix: W. of the Azores and off S.W. and S. Africa, *c.* 2000-4885 m.

Hydroniscus quadrifrons: N. of the West Indies and E. of Argentine, 5163-5684 m.

Abyssianira dentifrons: N. of the West Indies, E. of N. Argentine and S. W. of S. Africa, 4588-5293 m.

Paropsurus giganteus: Tropical East Pacific and S. W. Pacific, 3570-4400 m.

The only two species with a really wide distribution are *Bathyopsurus nybelini* and *Paropsurus giganteus.* They are closely related and are very large species with a curious parchment-like integument. Although they take their food on the bottom they may be optionally abysso-pelagic, this feature explaining the wide distribution. It is also possible that their very strange diet, consisting in part or almost exclusively, of fucalean algae (cf. p. 243), may be of some importance in this respect. It is very interesting that two of the very few, primarily or exclusively abyssal, benthic amphipods with a wide distribution, viz. *Bathyceradocus stephenseni* (Madagascar – Gulf of Panama) and *Onesimoides chelatus* (Cent. Atlantic – Indo-Malayan Region) are also vegetarians, feeding on water-logged wood on the bottom (J. L. BARNARD 1961).

It is characteristic that the percentage of comparatively wide-spread species is much higher among asellotes which occur both on the slope and abyssally. This cannot be due only to the fact that these species are, on the whole, known from more finds than are the abyssal species. In many regions the slope areas have not been investigated more thoroughly than the abyssal depths, and a fair number of abyssal species with a very restricted distribution are known from more than one find. BARNARD (1961, p. 120) also found that the bathyal-abyssal amphipods have a wider distribution than the truly abyssal species.

There exists a total of 12 species recorded both from the slope and abyssally, which occur in more than one ocean (their names are enumerated above, pp. 288-289): two Arctic-N. Atlantic, two Arctic-Cent. Atlantic, one Arctic-N.-S. Atlantic, one S. Atlantic-Antarctic, one S. Indian Ocean-Antarctic, one bipolar (the N. Atlantic and Antarctic Indian Oceans), two N. Atlantic-Arctic-N. Pacific and one Cent. Atlantic-E. Pacific-S.W. Pacific species. Thus, only four of these species have a really wide geographical distribution: the apparently bipolar *Eurycope brevirostris,* the Atlantic-Arctic-Pacific *Haplomesus quadrispinosus* and *H. insignis* (although the latter has a separate subspecies in the Pacific), and *Storthyngura pulchra* with one (bathyal) subspecies in the West Indies, an abyssal subspecies in the Gulf of Panama area and a hadal subspecies in the Kermadec Trench.

A restricted distribution similar to that characteristic of the abyssal asellotes is found in a few other important groups at abyssal depths, viz. Amphipoda, Mollusca, and Pogonophora.

J. L. BARNARD (1961) enumerated 81 definitely benthic amphipods and another 78 which are probably benthic. Of these, only four have a wider distribution, but three of them (i. a. the above-mentioned *Bathyceradocus stephenseni* and *Onesimoides chela-*

1. *Haplomesus tropicalis* which was recorded from the Cent. Caribbean Sea and the East Mediterranean (2526-4071 m) has not been included. If the Mediterranean record is correct (cf. footnote on p. 265) the species is not abyssal, occurring in the Mediterranean at temperatures far above 4°C. (13.7°).

tus) have also been recorded bathyally. BARNARD has also noted the abundance of hitherto unknown species: "The most striking aspect of the evidence supporting regional endemism is the high rate of recovery of new benthic species by each abyssal expedition and the low recovery of previously described species from other regions" (1. c., p. 119).

A pronounced endemism also seems to prevail in the abyssal cirripeds, and especially in the two remaining orders of primarily-benthic Peracarida, viz. the cumaceans and the tanaids. Unfortunately, in none of these groups has the deep-sea element been the subject of a recent comprehensive study.

Nor is an up to date survey of the distribution of abyssal, benthic Mollusca available. However, according to a brief abstract by CLARKE (1961), non-cephalopod species of abyssal molluscs have been recorded from an average of only 2.0 ocean basins per species (out of an approximate number of 45 separate world-ocean basins). Furthermore, in a preliminary report on the *Vema* molluscs from four basins in the abyssal South Atlantic Ocean, CLARKE (1959) recorded 96 species found in one basin only, 13 in two or three basins, and four species only occurred in non-adjacent basins.

With the inclusion of the most recent literature, at least 47 species of Pogonophora have now been described. According to a map of the world distribution of the species (IVANOV 1960a, p. 96), not a single species has been recorded outside a remarkably restricted section of any one ocean. The most wide-spread geographical distribution appears to belong to *Lamellisabella zachsi* from the Central Bering Sea and the southern part of the adjacent Sea of Okhotsk (IVANOV 1960b, fig. 1468).

On the other hand, other significant groups are reported to have a fairly large number of cosmopolitan[1], abyssal species (when the incomplete knowledge of the abyssal zone is taken into account). This applies especially to many coelenterates, polychaetes echinoderms, and ascidians.

MADSEN (1961 b, p. 205) reviewed the distribution of some of the most characteristic abyssal coelenterates, pointing out the cosmopolitanism of pennatularians and *Stephanoscyphus simplex*. KIRKEGAARD's survey (1954) on the distribution of abyssal polychaetes did not include the results of the recent *Galathea, Vitjaz* and *Vema* Expeditions. Nevertheless, he found that 11 of 219 abyssal species were cosmopolitan and another 64 had been recorded from two oceans.

The following percentages of cosmopolitan species of echinoderms recorded from depths exceeding 3000 m (MADSEN 1961 b, p. 204) are also based on material which does not include material from the said expeditions. MADSEN found that about 5 % of the asteroids in question and about 10 % of the ophiuroids and holothurians were known to be cosmopolitan. The percentage of cosmopolitan asteroids is no doubt higher since MADSEN's revision of the family Porcellanasteridae (1961 a). Of the 24 exclusively abyssal species of this family, six are cosmopolitan, four are known from two oceans, and three have a wide distribution in one ocean; of the remaining eleven species, ten are known from one find only. Thus, no less than 43 % of the 14 species known from at least two finds are cosmopolitan. The study of the *Galathea* holothurians, and the revision of the literature, now in progress will also considerably increase the number of cosmopolitan species of this group (BENT HANSEN, personal communication).

Finally, according to a list of the 45 species of ascidians recorded from depths exceeding 2000 m (MILLAR 1959), three are cosmopolitan and another eight are known from two oceans per species.

No conclusive statements can be made on corresponding features in those remaining groups which have a fair number of species in the abyssal zone. None of the more recent surveys of deep-sea fishes make a distinction between benthic and demersal species. Three of the 36 species of pycnogonids recorded from depths greater than 2000 m (FAGE 1954) are cosmopolitan, but almost all the species known from more than one find are extremely eurybathic. Among the benthic decapod crustaceans there is a considerable number of wide-spread species at abyssal depths, especially within the Natantia, Paguridea and Eryonidea. However, several of these species are badly in need of revision and may prove to consist of more than one species; on the other hand it is likely that a number of synonyms will be found in other species, e. g. in the genus *Munidopsis*.[1]

In view of the striking differences in the distribution of abyssal species, as demonstrated above (especially

1. I follow MADSEN's definition (1961 b), according to which an abyssal species is cosmopolitan when it has been recorded from the main deep-sea basin of each of the three major oceans (the Atlantic, Indian and Pacific Oceans).

1. In a survey of the distribution of the (described or identified up to date) species collected at a single abyssal loca-

between the Asellota, Amphipoda and Mollusca on one side and the Echinoderma on the other), I find it unadvisable to talk in general terms of the distribution of the abyssal fauna. In my opinion, it is misleading to define the abyssal fauna as being either "generally cosmopolitan" or "geographically subdivided on the species level". The pattern of distribution varies so greatly from one group to another that they must be dealt with separately.

It is possible that the differences can, to a certain degree, be explained by divergent opinions on the species concept, but on the whole, there is no doubt that the differences of distribution are primarily due to one or more of the following factors: geological age, ability to adapt to changes of environment (e.g. at the onset of the Glacial Age), time of migration into the abyssal zone and means of dispersal once there, present day rate of speciation, dependence on type of substratum, choice of food, and type of reproduction.

With respect to our lack of knowledge on the geological history of the asellotes, and our very fragmentary knowledge of the ecology and biology of the deep-sea forms, it is difficult to judge the relative importance of these factors. However, there can be very little doubt that to a large degree the brood protection found in the Peracarida accounts for their restricted range. The abilities of newly hatched young to disperse are as limited as those of their parents. In other groups with a pelagic larval development in shallow water, a non-pelagic development is undoubtedly the rule at abyssal depths (THORSON 1950). But even so, it is quite likely that eggs of e.g. echinoderms, may float along the bottom for some distance, as may also the larvae before settling (MADSEN 1961b, p. 204). In abyssal bivalves, viviparity, which strongly prevents the dispersal of the brood, may prove to be much more common than anticipated, and thus, be an important reason for endemism prevailing in that group.

H. Summary

1. A special chapter is devoted to the terminology of body segments, appendages, etc. Reasons for adopting the spellings pereonite, pereopod, etc. are given. The oceanographical terms used are also defined in detail.

2. During the *Galathea* Expedition a total of 23 bathyal and abyssal species of asellotes (15 genera) were collected along the whole circumnavigation route. All species (except two) were new, and three were referred to new genera. In addition, a considerable number of families, genera and species have been revised, re-described or diagnosed, and keys to the genera of all families and to the species of all genera treated in some detail have been prepared. The classification of the Asellota and the Paraselloidea is discussed and keys are provided to the subtribes of the former and the families of the latter.

The large amount of revision resulted in the cancellation of the following recently, or fairly recently, established families: Janirellidae, Acanthaspidiidae, Microparasellidae, Pleurogoniidae, and Abyssianiridae. Eurycopidae has been divided into the following subfamilies: Acanthocopinae, Syneurycopinae, Eurycopinae, and Bathyopsurinae. A number of genera and species are considered invalid. Three new genera are established for previously described species and (based on material borrowed from numerous sources or found in this Museum) seven species and two subspecies have been described as new.

A special chapter deals with the significance of various characters in the taxonomy. The length, shape and direction of dorsal and ventral setae and body spines or keels are found to vary considerably in certain genera (especially in *Ilyarachna, Munnopsis,* and *Haploniscus)*; caution should be used not to attach too much significance to these characters. The same applies to the number of pleonites, absence of eyes, shape of the molar process on the mandibles, and the number of coupling hooks on the maxillipeds. A very curious state of underdevelopment in pereonite 7 and its pereopods (or even total lack of the pereopods) is found in adult specimens of *Dendromunna mirabile* n.sp., *Munella danteci* and *Lipomera lamellata,* as well as in all four species of three genera of the Anthuridea. However, this feature is probably without taxonomic significance. Old and recently introduced characters for the separation of the families of Paraselloidea are also discussed.

3. The postmarsupial development of four bathyal and abyssal species of *Haploniscus* is described and correlated with that of *Jaera albifrons*. In *Haplo-*

lity off Costa Rica in the East Pacific (WOLFF 1961, p. 158), I found that four of the five species of actiniarians, all six mollusc species, and eight of the eleven crustacean species were restricted to the East Pacific, while all three pycnogonid species and almost half of the echinoderms were cosmopolitan.

niscus, maturity is reached in stage VI. Immature specimens with a female operculum and developing pleopods 1 (so far described in species of *Haploniscus, Janirella, Echinothambema* and *Ilyarachna)* are typical representatives of the male stage IV ("avant-prémâles") and not ambi-sexual specimens.

4. Based on a large material of Paraselloidea in the Copenhagen Museum (from depths exceeding 200 m) strong evidence was found to account for the total lack of adult females with developing oostegites in Haploniscidae, Munnidae and Macrostylidae, and of adult females without oostegites in Nannoniscidae; these four families having, thus, only one preparatory stage in advance of the incubatory stage(s) (with fully developed oostegites). The depth occurrences and recorded temperatures of the material of these families were found to be essentially the same as those of other families studied (with the two normal preparatory stages); thus, these factors cannot occount for the aberration. In two of the latter families (Dendrotionidae and Ilyarachnidae) a predominance of adult females without oostegites was found while contrariwise, a predominance of females with developing oostegites existed in the remaining five (Janiridae, Ischnomesidae, Desmosomatidae, Eurycopidae, and Munnopsidae). The latter case may be explained by suggesting that the stage without oostegites (in adults) only occurs once in each female, viz. just before sexual maturity is reached, while in the Dendrotionidae and Ilyarachnidae this stage is also found prior to each of the later incubatory stages. The length of the developing oostegites varies from one genus to another and sometimes within specimens of the same species. Occasional discrepancies in the number of oostegites were also found.

Possible reasons for the marked deficiency of ovigerous females and females with marsupium, in comparison with adult females without marsupium, are discussed. It is suggested that the deep-sea asellotes are primarily seasonal breeders, thus accounting for the low number of incubatory females found – the greater part of the material having been collected within a few months (the non-breeding seasons).

5. The comprehensive but very desultory literature on cases of hermaphroditism or "intersexes" in Isopoda is reviewed. Examples of functioning hermaphroditism are found only in Cymothoinae (Flabellifera), Cryptoniscidae (Epicaridea) and *Chaetophiloscia elongata sardoa* and Rhyscotidae (Oniscoidea).

In the extensive material of adult specimens of *Haploniscus b. bicuspis*, a single intermediate was found; four of a total of fourteen specimens of *H. helgei* n. sp. available were also intermediate. The anatomy of the sexual organs of the last four is described and compared to that of the true male and female of this species and of *Asellus aquaticus*. It is demonstrated that, at least in this species, the receptaculum duct opens on the segment connexion between pereonites 4 and 5, well separated from the oviduct opening, about halfway between the anterior and posterior margins of prn. 5. A curious bulbus (probably with radiating muscles) is situated on the receptaculum duct close to the opening. It is uncertain whether testes are present in the intermediate specimens or not, but in any case, a vas deferens is not present. It is suggested that the presence of the intermediate specimens in *bicuspis* and *helgei*, and of males with varying secondary sexual characters in *spinifer*, is due to an assumption previously put forward, viz. that in many isopods both kinds of sexual organs are present initially. This would also explain many of the recorded instances of intermediate specimens in e. g. *Nannoniscus, Sphaeroma, Platyarthrus,* and *Porcellio*.

6. A possible correlation between size and depth is investigated in all asellote genera with at least four species. It was found that in all larger genera with species ranging from sublittoral or upper bathyal depths to well into the abyssal zone, there is a more or less distinct indication of size-increase with increasing depth. The only definite exceptions to this rule are the genera *Haploniscus, Desmosoma* and *Munna,* but they all have a small size range within their species. The length of all species in the hadal zone exceeds the average length of the genus. No difference in size was found between eulittoral and sublittoral species of shelf genera. There is a tendency for deep-sea genera to attain a larger average size than shallow water genera, but there are several exceptions. Apart from *Stenetrium,* the only relatively large-sized genera with a preponderance of shelf species belong to Janiridae, and they are rather closely related within this family.

The low temperature of the abyssal zone is probably not the main reason for the existing correlation, although there are cases in which it seems to be the deciding factor. It is believed that the overgrowth is primarily caused by the intensified pressure which either produces an increased metabolic rate, or, alternatively, furthers the excess in size by e.g. retarded sexual maturity and/or greater longevity.

Other characteristics of deep-sea asellotes are occasional elongation of the legs, and blindness in all species (with the probable exception of two abyssal species of *Stenetrium).*

7. The intestine contents of 14 species and 29 specimens of benthic and pelagic asellotes were studied and compared to the scanty records found in the literature. Detritus and mineral fragments were abundant in the majority of benthic species.

One species, *Bathyopsurus nybelini,* contained – in addition to a few spicules of sponges and remains of amphipods – large amounts of masticated remains of *Sargassum* sp. (Puerto Rico Trench) or a fucalean alga related to *Sargassum* (Tasman Sea). On the algae were several identifiable hydroids. The algae had apparently been eaten in the fresh condition soon after having reached the bottom from the surface (they probably subsided as a result of heavy gales). Other species contained fragments of algae, wood or leaves. Additional examples of herbivorous feeding in benthic deep-sea animals include some amphipods, *Xylophaga, ? Teredo* and some echinoids.

Dead tests of diatoms, radiolarians and pelagic foraminifers (and some benthic species of the latter) were rather abundant, and were probably swallowed accidentally along with the sediments (as in all probability were the sponge spicules). Remains of hydroids (*Campanularia integra* and *C.* sp.) in *Storthyngura chelata,* polychaetes (of the families Cirratulidae and Aphroditidae), and especially arthropods (including one halacarid but mainly isopods and amphipods), were rather abundant in the intestine. This indicates a carnivorous diet in most of the species, in addition to the deposit feeding which is certainly the primary diet.

No evidence that the detritus had been sorted was found. The food-value of the detritus mainly depends on its bacteria content. The standing crop of organic carbon in the cells of living hetero-trophic bacteria from various trenches has previously been estimated at from 0.2-2.0 mg per liter, but very little is known about the rate of reproduction.

The two pelagic species studied mainly contained *Coccolithus Huxleyi* and remains of crustaceans (in a specimen of *Munneurycope murrayi* was also found a uropod of an extraordinarily large specimen of the same species). In one specimen of *Munneurycope murrayi* (which has on practically all occasions been collected pelagically), spicules of various sponges were found, clearly showing that this species is able to take at least part of its food from the bottom.

8. The substrata on which the *Galathea* asellotes were collected vary greatly, from sand to very stiff clay, globigerina or pteropod ooze. Several of the species are recorded from different types of sediment. *Janira operculata* was extracted from a waterlogged tree trunk at abyssal depths. Instances of abyssal amphipods and species of *Xylophaga* from a similar substratum are also discussed.

Mention is made of the small number of pelagic asellotes, and it is suggested that it is probably only on rare occasions that even the good swimmers among the benthic species move at any considerable distance away from the bottom.

9. Table 18 gives the regional and bathymetrical distribution, range or record(s) of temperature, maximum size, and number of finds of all the 633 species of Asellota (excl. of Aselloidea). Table 20 includes details of the depth range and the entire temperature range of all 97 benthic genera.

10. Almost 30 % of the species are recorded from abyssal depths (between 2000 and 6000 m) and another 21 % from the slope (200-2000 m). However, more than half of the 628 benthic species are known from one find only. The percentage of eurybathic species is of course greatly increased when only the 152 species known from at least four finds are considered, and the preponderance of species from moderate (i.e. more easily-available) depths is evident. This factor is yet more convincing when only the 52 species known from at least 10 finds are taken into account.

Owing to the main distribution of the asellotes being at high latitudes in both hemispheres, no less than 10 % are known exclusively from negative temperatures and another 14 % have a temperature range going below zero. Most species (37 %) occur between 0 and 4°C. More than half of the so-called bathyal species (on the slope between *c.* 200 and *c.* 2000 m) have been taken at temperatures below 4° and are, thus, entirely outside the ordinary temperature range of 4-10° for bathyal species. Lists are provided of asellotes truly representative of the various depth zones (agreeing with the definition not only in depth but also in temperature).

Twenty-five species have a vertical range of at least 2000 m, seven of at least 3000 m, four of at least 4000 m, and two (one with three subspecies) of at least 5000 m.

The genera are most richly represented between 2000 and 6000 m (21 %). The percentage of eurybathic genera is considerably increased when excluding those with one and two species only, and – in contradiction to conditions found in the species – the corresponding reduction in stenobathic genera is equally large at all depths. The number of records of each stenobathic genus with one or two species is also extremely low, and it is to be anticipated that most of these genera will prove to be much more eurybathic when better known. When proceeding downwards in depth an increase in the relative number of monotypic genera (similar to that demonstrated in amphipods) is not present in the asellotes.

Five of the 90 marine genera occur only at negative temperatures and no less than 41 range below zero (30 even below —1.5°C.). Genera with more than one, and those with more than two species, have a large temperature range, 50 % of the latter occurring at —1.8->10°. As in the case of the species, lists are supplied of those genera which are truly representative of the various depth zones.

The largest vertical distribution is found in *Macrostylis* (4-10.000 m). Another five genera show a range of between 7000 and 8000 m, one between 6000 and 7000 m and four between 5000 and 6000 m. Half of them are pronounced cold water genera.

Of the larger families, Munnidae and Janiridae are primarily from shallow water, while Ischnomesidae and Haploniscidae are the most pronounced deep water families.

The vertical zonation in the abyssal zone is discussed in connexion with the zonation of the asellotes. With the exclusion of species known from one find only it is demonstrated that – at least in the asellotes – there is no indication of the "lower-abyssal subzone" claimed by VINOGRADOVA. Similarly, due to the presence of many cold stenothermic, eurybathic species at high latitudes in both hemispheres, there is no sharp upper limit towards the bathyal zone.

11. The geographical division between the five oceans is discussed. Although many species are so far known from one or a few finds only, there is no doubt that the greater part of the asellotes have a very restricted distribution. No less than 87 % of a total of 613 marine species have been recorded from one ocean only, and practically all of them are restricted to one section of it. The majority of the 77 species with a wider distribution occur only in a very limited area of two or more adjacent oceans, being mainly circumsubpolar or Antarctic-circumsubpolar (22 species), Arctic-North Atlantic (21 species), or from the Antarctic-South Atlantic or the Antarctic-South Indian Oceans (14 species). Eight of the latter 35 species occur on the slope only in the polar part of their distribution and abyssally (five), or abyssally and on the slope (three) in the Atlantic or the S. Indian Ocean. No truly abyssal species are common to the Arctic and N. Atlantic or to the Antarctic and S. Indian Oceans and only two to the Antarctic and S. Atlantic Oceans.

Of the remaining 20 species (3 % of the total number), only four are known from more than two oceans: three N. Atlantic-Arctic-Pacific and one cosmopolitan (the pelagic *Munneurycope murrayi)*. One species, *Eurycope brevirostris*, is apparently bipolar.

Eulittoral species are not found in the Arctic and Antarctic Oceans and are practically absent from the North Atlantic; the majority are from the tropical and subtropical regions of the Indian and Pacific Oceans. On the other hand, there are very few records of shelf species with a deeper occurrence from these regions. The majority of the slope species are from the Atlantic and a fair number from the Arctic and Antarctic Oceans. The same pattern applies to the abyssal species and is probably mainly due to collecting activities being mostly concentrated in these oceans. However, the results of the John Murray and *Galathea* Expeditions seem to indicate that the Indian Ocean is actually poor in bathyal and abyssal species of Asellota.

Of a total of 91 marine genera, 39 are restricted to one ocean, but 32 of these are monotypic and 24 are known from a single find only. The Atlantic (and the Mediterranean) contain 25 of the 39 genera. Only a few genera have sufficient species or are known from enough finds to state their restricted distribution with any certainty. This applies to the North Pacific *Janiralata*, the N.E. Atlantic *Pseudarachna*, the N.E. Atlantic and Mediterranean *Echinopleura*, and the N. Atlantic-Mediterranean (and perhaps N.E. Pacific) *Jaera*. Several genera known from a considerable number of finds appear to be absent from two or three oceans or from one of the hemispheres. The most remarkable example is *Desmosoma* (29 species known from 320 finds in all) which has never been recorded in the Pacific and Indian Oceans.

Only 11 of the 19 marine asellote families are known from > 80 finds (the remainder from < 40 finds). Jaeropsidae seems to be absent from the N. Atlantic, Arctic and Antarctic Oceans, Macrostylidae from the two latter and the Indian Ocean, Desmosomatidae and Nannoniscidae from the Pacific and Indian Oceans, and Haploniscidae from the latter. The remaining six families are recorded from all five oceans. Munnidae, and especially Janiridae, have a very even distribution throughout the oceans. None of the families are bipolar or amphi-boreal.

12. The very restricted, general distribution of the truly abyssal species of Asellota is evident, not only through the available records of only three species (1.5 %) occurring in more than one ocean but also with respect to the overwhelming number of new species found by each expedition working at abyssal depths. *Bathyopsurus nybelini, Stylomesus inermis*, and *Eurycope vicarius* are reported from two oceans; *Ischnomesus armatus, Haploniscus percavix, Hydroniscus quadrifrons, Abyssianira dentifrons* and *Paropsurus giganteus* have a fairly wide distribution in one ocean. The only two really widely distributed species, the first and the latter, are closely related, and their wide range may be due to herbivorous feeding, or possibly to an optional abysso-pelagic occurrence.

Twelve species which occur both on the slope and abyssally have been recorded from more than one ocean. Of these, only four have a really wide range. These are the apparently bipolar *Eurycope brevirostris*, the Atlantic-Arctic-Pacific *Haplomesus quadrispinosus* and *H. insignis* (the latter with two subspecies), and *Storthyngura pulchra* in the Atlantic (one subsp.), the East Pacific (one subsp.) and the S.W. Pacific Oceans (one subsp.).

A similar, very restricted distribution of the species is found in Amphipoda (and Cumacea and Tanaidacea), Mollusca and Pogonophora. However, other important abyssal groups, including several coelenterates, the polychaetes, ascidians, and in particular, the echinoderms, have a considerable number of cosmopolitan species. It is, therefore, unadvisable to discuss the distribution of the abyssal fauna in terms which are too general, as the pattern of distribution obviously varies greatly from one group to another.

One obvious reason for the pronounced endemism in Asellota (and other Peracarida) is to be found in their brood protection. Although other factors are mentioned, our present limited knowledge prevents an evaluation of their possible importance with regard to the distribution of abyssal Asellota.

J. References

(Abbreviations according to "World List of Scientific Periodicals". Papers marked * were not available).

AMAR, R., 1957a: Gnathostenetroides laodicense nov. gen., nov. sp. Type nouveau d'Asellota et classification des Isopodes Asellotes. – Bull. Inst. océanogr. Monaco, No. 1100: 1-10.

– 1957b: Isopodes psammiques du Golfe de Marseille. I. – Parasellidae du "Sable à Amphioxus". – Rec. Trav. Stat. Mar. Endoume **22**: 75-82.

ARCANGELI, A., 1923: Caratteri sessuali secondari e conformazione dell apparato copulatore di *Philoscia elongata* Dollf. (= *Ph. pulchella* B. L.) nel periodo riproduttivo. – Boll. Mus. Zool. Anat. comp. Torino **28**: 1-7

– 1925: Ermafroditismo e partenogenesi negli Isopodi terrestri. – Monit. zool. ital. **36**, 6: 105-122.

– 1927: Isopodi terrestri raccolti nell'Estremo Oriente dal Prof. Filippo Silvestri. – Boll. Lab. Zool. Portici **20**: 211-269.

– 1929: Ricerche faunistiche nelle Isole Italiane dell'Egeo. Isopodi. – Arch. zool. ital. Napoli **13**, 1-2: 259-268.

– 1931: L'ermafroditismo negli Isopodi terrestri. Ipotesi sopra la natura e l'origine dello stesso e considerazioni su quello di altri animali. – Ibid. **17**: 165-256.

– 1932: Escursione zoologica all'Oasi di Marrakesch nell'aprile 1930. Isopodi terrestri. – Boll. Zool. Anno III, 5: 225-232.

– 1941: Missione biologica Sagan – Omo. Vol. XII, Zoologia VI, Crustacea. – Reale Accad. Italia 1941: 5-18.

– 1942: Ermafroditismo ed intersessualità in Crostacei Isopodi terrestri. – Boll. Mus. Zool. Anat. comp. Torino **49**, ser. IV: 139-143.

– 1951: Un nuovo caso di ermafroditismo proterandro in *Armadillium cinereum* (Zenk.) = *A. vulgare* Auct. (Crostacei Isopodi terrestri). – Ibid. **18**: 103-106.

BARNARD, J. L., 1961: Gammaridean Amphipoda from Depths of 400 to 6000 Meters. – Galathea Rep. **5**: 23-128.

*– 1962: South Atlantic abyssal amphipods collected by R. V. *Vema*. – Vema Research Ser. **1**. (In press).

BARNARD, K. H., 1914a: Contributions to the Crustacean Fauna of South Africa. 1. Additions to the Marine Isopoda. – Ann. S. Afr. Mus. **10**, 7: 197-230.

– 1914b: Contributions to the Crustacean Fauna of South Africa. 3. Additions to the Marine Isopoda, with Notes on some Previously Incompletely Known Species. – Ibid. **10**, 11: 325a-442.

– 1920: Contributions to the Crustacean Fauna of South Africa. 6. Further Additions to the List of Marine Isopodes. – Ibid. **17**: 319-438.

– 1925a: Contributions to the Crustacean Fauna of South Africa. 9. Further Additions to the List of Isopoda. – Ibid. **20**: 381-412.

– 1925b: A Revision of the Family Anthuridae (Crustacea Isopoda), with Remarks on certain Morphological Peculiarities. – J. Linn. Soc. London, Zool. **36**: 109-160.

– 1927: A study of the Freshwater Isopodan and Amphipodan Crustacea of South Africa. – Trans. R. Soc. S. Afr. **14**, 2: 139-215.

– 1936: Isopods collected by the R. J. M. S. "Investigator". – Rec. Indian Mus. **38**, 2: 147-191.

– 1940: Contributions to the Crustacean Fauna of South Africa. 12. Further Additions to the Tanaidacea, Isopoda, and Amphipoda, together with Keys for the Identification of the hitherto Recorded Marine and Freshwater Species. – Ann. S. Afr. Mus. **32**, 5: 381-543.

BATE, C. SPENCE, 1856: On the British Edriophthalma. – Rep. Brit. Ass. for 1855: 18-62.

BATE C. SPENCE, 1857: A Synopsis of the British Edriophthalmous Crustacea. Part I. Amphipoda. – Ann. Mag. nat. Hist., ser. 2, **19**: 135-152.
– 1859: On some British Diastylidae. – Ibid., ser. 3, **3**: 273-274.
– & J. O. WESTWOOD, 1868: A History of the British Sessile-Eyed Crustacea II. – London.
BEDDARD, F. E., 1885: Preliminary Notice of the Isopoda collected during the Voyage of H. M. S. "Challenger". Part II. Munnopsidae. – Proc. zool. Soc. Lond. 1885: 916-925.
– 1886a: Preliminary Notice of the Isopoda collected during the Voyage of H. M. S. "Challenger". Part III. – Ibid. 1886: 97-122.
– 1886b: Report on the Isopoda collected by H. M. S. Challenger during the Years 1873-76. Part II. – Challenger Rep. **17**: 1-178.
BELJAEV, G. M. & N. G. FILATOVA, 1961: An investigation of the Java Trench deep-sea bottom fauna. – Oceanology, Moscow **1**: 125-135. (In Russian).
– – & Z. A. FILATOVA, 1958: Trawling at a depth of 10.5 km in the Tonga Trench. – C. R. Acad. Sci. U. R. S. S. **121**, 1: 74-77. (In Russian).
BENEDICT, J. E., 1901: See RICHARDSON, H., 1901.
BIANCO, S. LO, 1903: Le pesche abissali Esequite da F. A. Krupp col Yacht Puritan nelle adiacenze di Capri ed in altre località del Mediterraneo. – Mitt. zool. Sta. Neapel **16**: 109-280.
BIRSTEIN, J. A., 1951: Freshwater asellotes (Asellota). Fauna SSSR, Rakoobraznie 7, No. 5: 1-143. (In Russian).
– 1957: Certain peculiarities of the ultra-abyssal fauna at the example of the genus *Storthyngura* (Crustacea Isopoda Asellota). – Zool. Zh. **36**: 961-985. (In Russian, English summary).
– 1959: Deep-Sea Malacostraca of the north-western part of the Pacific Ocean, their distribution and relations. – Proc. XVth Intern. Congr. Zool. London: 226-229.
– 1960: The family Ischnomesidae (Crustacea, Isopoda, Asellota) in the north-western part of the Pacific and the problem of amphiboreal and bipolar distribution of the deep sea fauna. – Zool. Zh. **34**, 1: 3-28. (In Russian, English summary).
– 1961: Microthambema tenuis n. gen., n. sp. (Isopoda Asellota) and relations of some asellote isopods. – Crustaceana **2**, 2: 132-141.
– 1962: Ueber eine neue Art der Gattung *Austroniscus* Vanhöffen (Crustacea, Isopoda, Asellota) aus grossen Tiefen des nord-westlichen Teiles des Stillen Ozeans. – Izdanija. Publ. Zavoda za ribarstvo NRM, Skopje, **3**, 2: 33-38.
– & M. E. VINOGRADOV, 1958: Pelagic gammarids from the north-western part of the Pacific Ocean. – Trud. Inst. Okean. **27**; 208-257. (In Russian).
– & J. G. TCHINDONOVA, 1954: Vertical zonation of plankton of the Kurile-Kamtchatka Trench. – C. R. Acad. Sci. U. R. S. S. **95**, 2: 389-392. (In Russian).
BLAKE, CH. H., 1929: Part 3. Crustacea. New Crustacea from the Mount Desert Region. – Biol. Surv. Mount Desert Reg. Philad.: 1-34.
BOCQUET, C., 1950: Le problème taxonomique des *Jaera marina* (Fabr.) (*J. albifrons* Leach). – C. R. Acad. Sci. Paris 230: 132-134.
– 1953: Recherches sur le polymorphisme naturel des *Jaera marina* (Fabr.) (Isopodes Asellotes). Essai de systematique évolutive. – Arch. Zool. exp. gén. **90**: 187-450.
BOCQUET, C., & A. LEMERCIER, 1958: Les *Jaeropsis* (Isopodes Asellotes) des côtes de France. – Ibid. **96**, 1: 38-55.
– & C. LÉVI, 1955: *Microjaera anisopoda*, nov. gen., n. sp., Isopode psammique de la sous-famille nouvelle des *Microjanirinae*. – Ibid. **92**, 9: 116-134.
BONNIER, J., 1896: Édriophthalmes. – Ann. Univ. Lyon 1895: 527-689.
BOVALLIUS, C., 1881: Ianthe, a new genus of Isopoda. – Bih. svensk. VetenskAkad. Handl. **6**, 4: 1-14.
– 1886: Notes on the Family Asellidae. – Ibid. **11**, 15: 1-54.
BOWMAN, T. E., 1960: Description and Notes on the Biology of *Lironeca puhi*, n. sp. (Isopoda: Cymothoidae), Parasite of the Hawaiian Moray Eel, *Gymnothorax eurostus* (Abbott). – Crustaceana **1**, 2: 84-91.
BRATTSTRÖM, H., & E. DAHL, 1951: Reports of the Lund University Chile Expedition 1948-49. 1. General Account, Lists of Stations, Hydrography. – Lund Univ. Årsskr. N. F., 2, **46**, 8: 1-88.
BROCH, HJ., 1933: Einige Probleme der biogeographischen Abgrenzung der arktischen Region. – Mitt. zool. Mus. Berl. **19**: 1-20.
BROEKHUYSEN, G. J., 1936: On Development, Growth and Distribution of *Carcinides maenas* (L.). – Arch. néerl. Zool. **2**: 257-399.
BRUNS, E., 1958: Ozeanologie. Band I. Einführung in die Ozeanologie und Ozeanographie. – Berlin: 1-420.
BRUUN, A. F., 1956: The abyssal fauna: Its ecology, distribution and origin. – Nature **177**: 1105-1108.
– 1957: Chapter 22. Deep Sea and Abyssal Depths. In: Treatise on Marine Ecology and Paleoecology. – Geol. Soc. Amer. Mem. **67**, 1: 641-672.
– 1959: General Introduction to the Reports and List of Deep-Sea Stations: Galathea Rep. **1**: 7-48.
BULLAR, J. F., 1877: The generative organs of the parasitic Isopoda. – J. Anat. Lond. **11**: 118-123.
BÖHNECKE, G. & G. DIETRICH, 1951: Monatskarten der Oberflächentemperatur für die Nord- und Ostsee und die angrenzenden Gewässer. – Dtsch. hydrogr. Inst. Hamburg.
CADENAT, J., 1959: Notes d'Ichtyologie ouest-africaine. XIX. Les *Antennarius*. – Bull. Inst. franc. Afr. noire **21 A**, 1: 361-394.
CAULLERY, M., 1908: Recherches sur les Liriopsidae, Epicarides cryptonisciens parasites des Rhizocéphales. – Mitt. zool. Sta. Neapel **18**: 583-642.
– & F. MESNIL, 1899: Sur la morphologie et l'évolution sexuelle d'un Epicaride parasite des Balanes (*Hemioniscus balani* Buchholz). – C. R. Acad. Sci. Paris **129**: 770-773.
– – 1901: Recherche sur l'*Hemioniscus balani* Buchholz, Epicaride parasite des Balanes. – Bull. sci. Fr. Belg. **34**: 316-362.
CHAPPUIS, P.-A., 1944: Die Grundwasserfauna der Körös und des Szamos. – Math. term. Közl. **40**: 5-43.
– 1951: Un nouveau Parasellide de Tasmanie, Pseudasellus Nichollsi, n. gen., n. sp. – Arch. Zool. exp. gén. **88**, 1: 7-19.
– 1958: Crustacés des eaux douces de l'île Amsterdam *Protocharon antarctica* n. sp. (Recoltes P. Paulian 1955-1956). – Mém. Inst. sci. Madagascar, sér. A, **12**: 13-24.
– & C. DELAMARE DEBOUTTEVILLE, 1952: Nouveaux Isopodes (Crustacés) du sable des plages du Roussillon. – C. R. Acad. Sci. Paris **234**: 2014-2016.
– – 1954: Recherches sur les crustacés souterrains. VII. Les Isopodes psammiques de la Mediterranée. – Arch. Zool. exp. gén. **91**, 1: 103-138.

Chappuis, P.-A., & C. Delamare Deboutteville, 1960: Chapitre XV. Etat de nos connaissances sur une famille et une sous-famille: Les Microparasellides et les Microcerberines (Isopodes). In: C. Delamare Deboutteville: Biologie des eaux souterraines littorales et continentales. – Paris: 1-740.

– – & R. Paulian, 1956: Crustacés des eaux souterraines littorales d'une résurgence d'eau douce à la Réunion. – Mém. Inst. sci. Madagascar **11**: 51-78.

Chilton, Ch., 1884: Additions to the Sessil-Eyed Crustacea of New Zealand. – Trans. Proc. N. Z. Inst. **16**: 249-265.

– 1894: The Subterranean Crustacea of New Zealand: with some General Remarks on the Fauna of Caves and Wells. – Trans. Linn. Soc. Lond., ser. 2, Zool. **6**, 2: 163-284.

– 1909: The Crustacea of the Subantarctic Islands of New Zealand. – Subantarct. Is. N. Z., Wellington. 26: 601-671.

Clarke, A. H., 1959: Preliminary Report on Abyssal Atlantic Mollusks from the Theta and Vema Expeditions. – Amer. Malacolog. Union Bull., No. 25: 3.

– 1960: A giant ultra-abyssal *Cocculina* (Mollusca, Gastropoda) from the Argentine Basin. – Nat. Hist. Pap. Nat. Mus. Canada, No. 7: 1-4.

– 1961: Structure, Zoogeography and Evolution of the Abyssal Mollusk Fauna. – Amer. Malacolog. Union Bull., No. 27: 20-21.

Collinge, W. E., 1946: Hermaphroditism in a Terrestrial Isopod. – Nature **157**: 304.

Costa, A., 1853: Genere Jaera; Jaera Leach. – In: O. G. Costa: Fauna del Regno di Napoli. Crostacei Isopodi, Fasc. 83: 1-4.

Dahl, E., 1954: The distribution of the deep sea Crustacea. – Intern. Union biol. Sci., ser. B, No. 16: 43-48.

– 1959: Amphipoda from Depths Exceeding 6000 Meters. – Galathea Rep. **1**: 211-241.

Deacon, G. E. R., 1937: The Hydrology of the Southern Ocean. – Discovery Reps. **15**: 1-124.

Department of Oceanography, University of Washington, 1956: Eastern North Pacific and Gulf of Alaska offshore physical and chemical data. April 1954 – January 1955. – Tech. Rep. 49, Seattle: 1-33.

Dougherty, E. C. & J. E. Steinberg, 1953: Notes on the Skeleton Shrimps (Crustacea: Caprellidae) of California. – Proc. biol. Soc. Wash. **66**: 39-50.

– – 1954: Key to the Caprellidae of California. In: S. F. Light et al.: Intertidal Invertebrates of the Central California Coast. – Univ. Calif. Press: 168-171.

Drygalski, E. von, 1927: Ozean und Antarktis. Meereskundliche Forschungen und Ergebnisse der Deutschen Südpolar-Expedition 1901-1903. – Dtsch. Südpol. Exped. **7**: 387-556.

Dunbar, M. J., 1957: The Determinants of Production in Northern Seas: a Study of the Biology of *Themisto libellula* Mandt. "Calanus" Series No. 14. – Canad. J. Zool. **35**: 797-819.

Fage, L., 1954: Remarques sur les pycnogonides abyssaux. – Intern. Union. biol. Sci., ser. B, No. 16: 49-57.

Filatova, Z. A., 1958: On some new species of bivavle molluscs from the north-western part of the Pacific Ocean. – Trud. Inst. Okean. **27**: 208-218. (In Russian).

Forsman, B., 1944: Beobachtungen über *Jaera albifrons* Leach an der schwedischen Westküste. – Ark. Zool. **35 A**, 11: 1-33.

– 1949: Weitere Studien über die Rassen von *Jaera albifrons* Leach. – Zool. Bidr. Uppsala **27**: 450-463.

Forsman, B., 1952: Über das Vorkommen der Gattung *Sphaeroma* in nordischen Gewässern. – Ark. Zool., ser. 2, **4**, 7: 153-158.

Gnanamuthu, C. P., 1954: Two new sand-dwelling isopods from the Madras sea-shore. – Ann. Mag. nat. Hist., ser. 12, **7**: 257-274.

Goldschmidt, R., 1931: Die sexuellen Zwischenstufen. – Berlin: 1-528.

Gorbunov, G. P., 1946: Bottom Inhabitants of the Siberian Shallow Water and Central Parts of the North Polar Sea. – Trud. Drej. Eksled. Glavs. Ledok. Paroch. "G. Sedov" 1937-1940 (Rep. Driftway Icebraker "G. Sedov" 1937-1940), **3**: 30-138. (In Russian).

Green, J., 1957: The feeding mechanism of *Mesidotea entomon* (Linn.) (Crustacea: Isopoda). – Proc. zool. Soc. Lond. **129**: 245-254.

Grey, M., 1954: Fishes found below a depth of 2000 metres. – Intern. Union. biol. Sci., ser. B, No. 16: 57-61.

Gröntved, J. & G. Seidenfaden, 1938: The Godthaab Expedition 1928. The Phytoplankton of the Waters West of Greenland. – Medd. Grønland **82**, 5: 1-380.

Gunther, E. R., 1936: A Report on Oceanographical Investigations in the Peru Coastal Current. – Discovery Reps. **13**: 107-275.

Gurjanova, E., 1930: Beiträge zur Fauna der Crustacea-Malacostraca des arktischen Gebietes. – Zool. Anz. **86**, 9/10: 231-248.

– 1932: Les Isopodes des mers Arctiques. Tableaux analytiques de la faune de l'U.R.S.S., publiés par l'Institut zoologique de l'Académie des Sciences. – Leningrad: 1-181. (In Russian).

– 1933a: Contribution to the Isopoda-Fauna of the Pacific Ocean. – Explor. de la mer de U.S.S.R. **19**: 79-91.

– 1933b: Die marinen Isopoden der Arktis. – Fauna arct., Jena **6**, 5: 390-470.

– 1936: Crustacées. Isopodes des mers orientales. – Faune de l'U.R.S.S. **7**, 3: 1-278.

– 1946: New Species of Isopoda and Amphipoda from the Arctic Ocean. – Trud. Drej. Eksled. Glavs. Ledok. Paroch. "G. Sedov" 1937-1940 (Rep. Driftway Icebraker "G. Sedov" 1937-1940), **3**: 272-297. (In Russian).

– 1951: Amphipods of the Seas of the U.S.S.R. and Adjacent Waters. – Keys to the Fauna of the U.S.S.R. **41**: 1-1031. (In Russian).

Hale, H. M., 1937: Isopoda and Tanaidacea. – Sci. Rep. Aust. antarct. Exped., ser. C, Zool. Bot. **2**, 2: 1-45.

Hansen, H. J., 1887: Oversigt over de paa Dijmphna-Togtet indsamlede Krebsdyr. – Dijmphna-Togtets zool.-bot. Udbytte, Kjøbenhavn: 183-286.

– 1895: Isopoden, Cumaceen u. Stomatopoden der Plankton-Expedition. – Ergebn. Plankton-Exp. **2**, G. c.: 1-105.

– 1897: Reports on the Dredging Operations off the West Coast of Central America to the Galapagos, to the West Coast of Mexico, and in the Gulf of California ... by the ... "Albatross", during 1891 ... XXII. The Isopoda. – Bull. Mus. comp. Zool. Harvard **31**, 5: 93-129.

– 1905: On the Morphology and Classification of the Asellota-Group of Crustaceans, with Descriptions of the Genus *Stenetrium* Hasw. and its Species. – Proc. zool. Soc. Lond. 1904, 2: 302-331.

– 1909: Revideret Fortegnelse over Danmarks marine Arter af Isopoda, Tanaidecea, Cumacea, Mysidacea og Euphausiacea. – Vidsk. Medd. dansk naturh. Foren. Kbh. 1909: 197-262.

HANSEN, H. J., 1916: Crustacea Malacostraca III. – Dan. Ingolf Exped. **3**, 5: 1-262.

HARGER, O., 1879: Notes on New England Isopoda. – Proc. U. S. nat. Mus. **2**: 157-165.

– 1880: Report on the Marine Isopoda of New England and Adjacent Seas. – Rep. U. S. Comm. Fish., Part IV for 1878: 297-462.

HARTMAN, O. & J. L. BARNARD, 1958: The benthic Fauna of the deep basins off Southern California. – Allan Hancock Pacif. Exped. **22**, 1: 1-67.

HASWELL, W. A., 1881: On some New Australian Marine Isopoda. – Proc. Linn. Soc. N.S.W. **5** (4): 478-479.

– 1882: Catalogue of the Australian Stalk- and Sessile-Eyed Crustacea. – Sydney: 1-324.

– 1885: A Revision of the Australian Isopoda. – Proc. Linn. Soc. N.S.W. **9**: 1001-1015.

HATCH, M. H., 1947: The Chelifera and Isopoda of Washington and Adjacent Regions. – Univ. Wash. Publ. Biol. **10**, 5: 155-274.

HEDGPETH, J. W., 1957: Chapter 2. Classification of Marine Environments. – In: Treatise on Marine Ecology and Paleoecology, Geol. Soc. Amer. Mem. **67**, 1: 17-27.

HEEGAARD, P. E. & L. B. HOLTHUIS, 1960: Proposed use of the Plenary Powers to validate the generic name *Idotea* J. C. Fabricius, 1798 (Class Crustacea, Order Isopoda) and matters connected therewith. – Bull. zool. Nom. **17**, 6-8: 178-184.

HEMMING, F., 1953: Copenhagen Decisions on Zoological Nomenclature. – London: 1-135.

HODGSON, T. V., 1902: Crustacea. – In: Report on the Collections of Nat. Hist. ... "Southern Cross", London: 228-261.

– 1910: Crustacea. IX. Isopoda. – Nat. Ant. Exped., nat. Hist., **5**: 1-77.

HULT, J., 1936a: On some Species and Genera of Parasellidae. – Ark. Zool. **29A**, 6: 1-14.

– 1936b: On some Species and Genera of Parasellidae, II. – Ibid. **29B**, 5: 1-6.

– 1941: On the Soft-Bottom Isopods of the Skager-Rak. – Zool. Bidr. Uppsala **21**: 1-234.

HURLEY, D. E., 1956: The New Zealand species of *Iais* (Crustacea Isopoda). – Trans. R. Soc. N. Z. **83**: 715-719.

IVANOV, A. V., 1960a: Pogonophora. – In: Fauna U.S.S.R. No. 75. (In Russian).

– 1960b: Embranchement des Pogonophores. – In: Traité de Zoologie **5**, 2: 1521-1622.

JACKSON, H. G., 1928: Hermaphroditism in *Rhyscotus*, a Terrestrial Isopod. – Quart. J. micr. Sci. **71**, 4: 527-539.

JANCKE, O., 1924: Die Brutpflege einiger Malakostraken. – Zool. Anz. **58**, 9/10: 273-278.

– 1926: Über die Brutpflege einiger Malakostraken. – Arch. Hydrobiol. **17**: 678-698.

Japan Meteorological Agency, 1959: The Results of Marine Meteorological and Oceanographical Observations. No. 24. July-December 1958. – Tokyo: 1-289.

JENSEN, J. P., 1955: Biological Observations on the Isopod *Sphaeroma hookeri* Leach. – Vidsk. Medd. dansk naturh. Foren. Kbh. **117**: 305-339.

JOHNSON, G., 1957a: Morphogenèse de la gonade de l'Oniscoïde hermaphrodite *Rhyscotoides Legrandi*. – C. R. Acad. Sci. Paris **244**: 806-809.

JOHNSON, G., 1957b: Étude de la spermatogenèse chez l'Oniscoïde hermaphrodite *Rhyscotoides Legrandi*. – Ibid.: 1087-1089.

– 1957c: Fonctionnement mâle chez les ♀ pubères de l'Oniscoïde hermaphrodite *Rhyscotoides Legrandi*. – Ibid.: 3181-3183.

KARAMAN, S., 1933: Neue Isopoden aus unterirdischen Gewässern Jugoslawiens. – Zool. Anz. **102**: 16-22.

– 1934: Beiträge zur Kenntnis der Isopoden-Familie Microparasellidae. – Mitt. Höhlen- u. Karstforsch. 1934: 42-44.

– 1953: Über die *Jaera*-Arten Jugoslaviens. – Acta adriat. **5**, 5: 1-20.

KESSELYAK, A., 1938: Die Arten der Gattung *Jaera* Leach (Isopoda, Asellota). – Zool. Jb. Syst. Ökol. Geogr. Tiere **71**: 219-252.

KINDLE, E. M. & E. J. WHITTAKER, 1918: Bathymetric Check-list of the Marine Invertebrates of Eastern Canada with an Index to Whiteaves' Catalogue. – Contr. Canad. Biol. 1917 (1918): 229-258.

KINNE, O., 1954: Eidonomie, Anatomie und Lebenszyklus von *Sphaeroma hookeri* Leach (Isopoda). – Kieler Meeresforsch. **10**: 100-120.

KIRKEGAARD, J. B., 1954: The Zoogeography of the abyssal Polychaetes. – Intern. Union biol. Sci., ser. B., No. 16: 40-42.

KNUDSEN, J., 1961: The Bathyal and Abyssal *Xylophaga* (Pholadidae, Bivalvia). – Galathea Rep. **5**: 163-209.

KNUDSEN, M., 1899: Hydrography. – Dan. Ingolf Exped. **1**: 21-161.

KOEHLER, R., 1885: Description d'un Isopode nouveau, le *Jaeropsis brevicornis*. – Ann. Sci. nat., sér. 6, **19**: 1-7.

Koninklijk Nederlands Meteorologisch Instituut, 1957: Middellandse Zee. Oceanographische en meteorologische gegevens. – 's-Gravenhage: 1-91.

KOSSMANN, R., 1884: Neueres über Cryptonisciden. – S. B. preuss. Akad. Wiss. **22**: 1-17.

KRAMP, P. L., 1958: Stephanoscyphus (Scyphozoa). – Galathea Rep. **1**: 173-185.

KRØYER, H., 1839: Munna, en ny Kræbsdyrslægt. – Naturhist. Tidsskr. Kjøbenhavn **2**: 612-616.

– 1847: Karcinologiske Bidrag. – Ibid., 2. Rk., **2**: 366-446.

KUSSAKIN, O. G., 1961: Representatives of the Family Jaeropsidae (Crustacea, Isopoda, Asellota), New for the USSR Fauna in the Eastern Seas. – Zool. Zh. **40**: 666-674. (In Russian, English summary).

– 1962a: On the Fauna of Janiridae (Isopoda, Asellota) from the Seas of the USSR. – Trud. Zool. Inst. Moskva Leningrad **30**: 17-65. (In Russian).

– 1962b: On the Fauna of Munnidae (Isopoda, Asellota) from the Far-Eastern Seas of the USSR. – Ibid.: 66-109.

LANG, K., 1953: Apseudes hermaphroditicus n. sp. A hermaphroditic Tanaide from the Antarctic. – Ark. Zool., ser. 2, **4**, 18: 341-350.

– 1958: Protogynie bei zwei Tanaidaceen-Arten. – Ibid. **11**, 32: 535-540.

LATREILLE, P. A., 1829: Crustacés, Arachnides et Partie des Insectes. In: G. CUVIER: La Regne Animal. IV. – Paris.

LEACH, W. E., 1814 (1813): Crustaceology. – In: Brewster's Edinburgh Encyclopaedia, London **7**: 383-437.

LEGRAND, J.-J., 1941: Cas d'intersexualité chez l'Isopode terrestre *Armadillidium vulgare* (Latreille). – C. R. Acad. Sci. Paris **213**: 808-810.

LEGRAND, J.-J., 1947: Cas d'inversion du sexe chez *Porcellio dilatatus* Brdt. – Ibid. **224**: 1029-1031.
– 1950a: Étapes de la croissance chez l'hermaphrodite protandrique *Anilocra physodes* L. (Crustacé, Isopode, Cymothoïdé). – Ibid. **231**: 668-670.
– 1950b: Étude expérimentale des facteurs du changement de sexe chez *Anilocra physodes* (Crustacé, Isopode, Cymothoïdé). – Ibid.: 717-719.
– 1951: Étude statistique et expérimentale de la sexualité d'*Anilocra physodes* L. (Crustacé, Isopode, Cymothoïdé). – Bull. Soc. Hist. nat. Toulouse **86**: 176-183.
– 1952: Contribution à l'étude expérimentale et statistique de la biologie d'*Anilocra physodes* L. (Crustacé Isopode Cymothoïdé). – Arch. Zool. exp. gén. **89**: 1-55.
– 1956: Sur un nouveau type d'intersexualité chez l'Oniscoide *Porcellio dilatatus*, révélé par l'élevage au laboratoire. – C. R. Acad. Sci. Paris **243**: 1363-1365.
– & H. LEGRAND, 1947: L'intersexualité chez l'Oniscoide *Porcellio dilatatus* Brdt. – Ibid. **224**: 853-855.
– & A. VANDEL, 1948: Le développement post-embryonnaire de la gonade chez les Isopodes terrestres, normeaux et intersexués. 1. Evolution morphologique de la gonade. – Bull. biol. **82**, 4: 79-94.
LEICHMANN, G., 1891: Beiträge zur Naturgeschichte der Isopoden. – Bibliotheca Zool. **3**, 10: 1-44.
LEMERCIER, A., 1955: Caractères morphologiques des pieces buccales de *Jaera marina* (Fabr.). – Mém. Soc. nat. Sci. Cherbourg. 47, sér. 5, **7**: 86-95.
– 1958: Sur l'existence d'un complexe *Jaera nordmanni* (Rathke) (Isopode Asellote). – C. R. Acad. Sci. Paris **246**: 3687-3690.
– 1960: La super-espèce *Jaera nordmanni* (Rathke) (Isopodes Asellotes, Janiridae). – Crustaceana **1**, 1: 9-27.
LÉVI, C., 1950: *Duslenia tessieri*, nov. gen., n. sp. nouveau Parasellidé des côtes de France. – Arch. Zool. exp. gén. **87**, 1: 42-47.
LUCAS, H., 1849: Histoire naturelle des animaux articulés. 1e partie. Crustacés, Arachnides, Myriapodes et Hexapodes. – Explor. sci. Algérie. Sci. phys. Zool. **1** & **4**: 1-403. & Atlas.
MACKINTOSH, N. A., 1946: The Antarctic Convergence and the Distribution of Surface Temperatures in Antarctic Waters. – Discovery Reps. **23**: 177-212.
MAERCKS, H. H., 1931: Sexualbiologische Studien an *Asellus aquaticus* L. – Zool. Jb. Abt. algem. Zool. Phys. Tiere **48**, 3: 399-507.
MAYER, P., 1879: Carcinologische Mittheilungen. VI. Über den Hermaphroditismus bei einigen Isopoden. – Mitt. Zool. Sta. Neapel **1**, 2: 165-179.
MCMURRICH, J. P., 1895: Embryology of the Isopod Crustacea. – J. Morph. **11**: 63-154.
MADSEN, F. J., 1961a: The Porcellanasteridae. A Monographic Revision of an Abyssal Group of Sea-Stars. – Galathea Rep. **4**: 33-174.
– 1961b: On the Zoogeography and Origin of the Abyssal Fauna in View of the Knowledge of the Porcellanasteridae. – Ibid.: 177-218.
MARGALEF, R., 1952: Une Jaëra dans les eaux douces des Baléares, Jaëra balearica nov. sp. (Isopoda Asellota). – Hydrobiologica **4**: 209-213.
MARSHALL, N. B., 1953: Egg Size in Arctic, Antarctic and Deep-Sea Fishes. – Evolution **7**, 4: 328-341.
MATSUMOTO, K., 1956: On the two new subterranean water Isopods, *Mackinia japonica* gen. et sp. nov. and *Asellus hubrichti* sp. nov. – Bull. Jap. Soc. sci. Fish. **21**: 1219-1225.
MEDNIKOV, B. M., 1961: On the sex ratio in deep water Calanoida. – Crustaceana **3**, 2: 105-109.
MEINERT, F., 1877: Crustacea Isopoda, Amphipoda et Decapoda Daniae: Fortegnelse over Danmarks isopode, amphipode og decapode Krebsdyr. – Naturhist. Tidsskr. Kjøbenhavn, 3. Rk., **11**: 57-248.
– 1890: Crustacea Malacostraca. – Vid. Udbytte af Kanonbaaden "Hauch's" Togter 1883-86, Kjøbenhavn: 147-232.
MENZIES, R. J., 1951a: New marine isopods, chiefly from northern California, with notes on related forms. – Proc. U. S. nat. Mus. **101**: 105-156.
– 1951b: A new genus and new species of asellote isopod, *Caecijaera horvathi* from Los Angeles Long Beach Harbor. – Amer. Mus. Novit., No. 1542: 1-7.
– 1952: Some marine asellote isopods from northern California, with descriptions of nine new species. – Proc. U. S. nat. Mus. **102**: 117-159.
– 1956a: New Bathyal Isopoda from the Caribbean with Observations on their Nutrition. – Breviora, Mus. comp. Zool., No. 63: 1-10.
– 1956b: New Abyssal Tropical Atlantic Isopods, with Observations on their Biology. – Amer. Mus. Novit., No. 1798: 1-16.
– 1962a: The Zoogeography, Ecology, and Systematics of the Chilean Marine Isopods. – Lund Univ. Årsskr., N. F., Avd. 2, **56**: 1-162.
– 1962b: The Isopods of Abyssal Depths in the Atlantic Ocean. – Vema Research Ser. **1**: 79-206.
– & J. L. BARNARD, 1951: The Isopodan Genus *Iais* (Crustacea). – Bull. S. Calif. Acad. Sci. **50**, 3: 136-151.
– – 1959: Marine Isopoda on Coastal Shelf Bottoms of Southern California: Systematics and Ecology. – Pacif. Naturalist 1959, **1**, 11: 1-35.
– & M. EWING, J. L. WORZEL & A. H. CLARKE, 1959: Ecology of the Recent Monoplacophora. – Oikos **10**, 2: 168-182.
– & J. IMBRIE & B. C. HEEZEN, 1961: Further considerations regarding the antiquity of the Abyssal Fauna with evidence for a changing abyssal environment. – Deep-Sea Res. **8**, 2: 79-94.
– & M. A. MILLER, 1955: Marine Asellote Isopods of the Genus *Antias* with the Description of a New Species from New Zealand. – Trans. R. Soc. N. Z. **83**, 2: 383-389.
– & J. PETTIT, 1956: A new genus and species of marine asellote isopod, *Caecianiropsis psammophila*, from California. – Proc. U. S. nat. Mus. **106**: 441-446.
– & M. TINKER, 1960: *Haploniscus robinsoni*, a New Species of Asellote Deep Sea Isopod from Eastern Tropical Pacific Ocean. – Pacif. Naturalist **1**, 18: 1-3.
Meteorological Office, Marine Branch, 1949: Monthly Sea Surface Temperature of the North Atlantic Ocean. – M. O. 527, H. M. Stat. Off., London.
MILLAR, R. H., 1959: Ascidiacea. – Galathea Rep. **1**: 189-209.
MILLER, M. A., 1941: The Isopod Crustacea of the Hawaiian Islands, II. Asellota. – Occ. Pap. Bishop Mus. **16**: 305-320.
MILNE-EDWARDS, M., 1840: Histoire naturelle des crustacés. – Paris, **3**: 1-605.
MONOD, TH., 1922: Sur un essai de classification rationelle des Isopodes. – Bull. Soc. zool. Fr. **47**: 134-140.
– 1925a: Isopodes et Amphipodes de l'Expédition antarctique

belge (s. y. Belgica). II. – Bull. Mus. Hist. nat. Paris **31**: 296-299.

MONOD, TH., 1925b: Tanaidacés et Isopodes aquatiques de l'Afrique Occidentale et Septentrionale. 2e partie. – Bull. Soc. Sci. nat. Maroc **5**, 6: 233-247.

– 1926: Tanaidacés, Isopodes et Amphipodes. – Rés. Voyage Belgica 1897-99: 1-67.

– 1933: Mission Robert Ph. Dollfus en Égypte. Tanaidacea et Isopoda. – Mém. Inst. Égypte **21**: 161-264.

– 1961: Sur un isopode Asellote du genre *Bagatus* recueilli sur un poisson du Sénégal. – Crustaceana **2**, 1: 68-77.

MONTALENTI, G., 1941: Studi sull'ermafroditismo dei Cimotoidi – I. *Emetha Audounii* (M. Edw.) e *Anilocra physodes* (L.) – Publ. Sta. Zool. Napoli **18**, 3: 337-394.

MORTENSEN, TH., 1938: On the Vegetation Diet of some Deep-sea Echinoids. – Annot. zool. jap. **17**, 3, 4: 225-228.

MUNRO, W. R., 1953: Intersexuality in *Asellus aquaticus* L. parasitized by a Larval Acanthocephalan. – Nature **172**: 313.

MÜLLER, F., 1892: Descripção da JANIRA EXUL, Crustaceo Isopode do Estado de Santa Catharina. – Arch. Mus. nac. Rio de J. **8**: 207-220.

NAME, W. VAN, 1942: A Second Supplement to the American Land- and Fresh-Water Isopod Crustacea. – Bull. Amer. Mus. nat. Hist. **80**, 7: 299-329.

NAYLOR, E., 1955a: The Life Cycle of the Isopod *Idotea emarginata* (Fabricius). – J. Anim. Ecol. **24**, 2: 270-281.

– 1955b: The Diet and Feeding Mechanism of *Idotea*. – J. Mar. biol. Ass. U. K. **34**: 347-355.

– D. J. SLINN & G. M. SPOONER, 1961: Observations on the British species of *Jaera* (Isopoda: Asellota) – Ibid. **41**: 817-828.

NEEDHAM, A. E., 1940: Abdominal appendages in the female and copulatory appendages in the male *Asellus*. – Quart. J. micr. Sci. **81**, N. S.: 127-150.

NÊMEC, B., 1896: Studie o Isopodech. – S. B. böhm. Ges. Wiss. 1896, 25: 1-55.

NICHOLLS, A. G., 1929: Some new species of *Stenetrium* from Western Australia. – Proc. Linn. Soc. N. S. W. **54**: 361-374.

– 1931: Studies on *Ligia oceanica*. Part II. The Processes of Feeding, Digestion and Absorption, with a Description of the Structure of the Foregut. – J. Mar. biol. Ass. U. K. **17**: 675-705.

NIELSEN, J. N., 1912: Hydrography of the Mediterranean and adjacent waters. – Rep. Danish oceanogr. Exped. Medit. **1**: 77-191.

NIERSTRASZ, H. F., 1913: Die Isopoden der Siboga-Expedition I. Isopoda Chelifera. – Siboga-Exped. **32a**: 1-56.

– 1918: Alte und neue Isopoden. – Zoöl. Meded. Leiden **4**, 2: 103-142.

– 1931: Die Isopoden der Siboga-Expedition III. Isopoda Genuina II. Flabellifera. – Siboga-Exped. **32c**: 1-111.

– 1941: Die Isopoden der Siboga-Expedition IV. Isopoda Genuina III. Gnathiidea, Anthuridea, Valvifera, Asellota, Phreatocoidea. – Ibid. **32d**: 231-308.

– & J. H. SCHUURMANS STEKHOVEN, 1930: Isopoda genuina. – Die Tierwelt der Nord- und Ostsee X e 2: 57-133.

NOBILI, G., 1906: Diagnoses préliminaires de Crustacés, Décapodes et Isopodes nouveaux recueillis par M. le Dr. G. Seurat aux îles Touamotou. – Bull. Mus. Hist. nat. Paris, 1906, 5: 256-270.

– 1907: Ricerche sui Crostacei della Polinesia. Decapodi, Stomatopodi, Anisopodi e Isopodi. – Mem. R. Accad. Torino, 2, **57**: 351-430.

NORDENSTAM, Å., 1933: Marine Isopoda of the families Serolidæ, Idotheidæ, Pseudidotheidæ, Arcturidæ, Parasellidæ, and Stenetriidæ mainly from the South Atlantic. – Further zool. Res. Swed. Antarct. Exped. 1901-1903, **3**, 1: 1-284.

– 1946: Marine Isopoda from Professor, Dr. Sixten Bock's Pacific Expedition 1917-1918. – Ark. Zool. **37A**, 7: 1-31.

– 1955: A new isopod from the deep sea. – Rep. Swed. Deep-Sea Exped. **2**, Zool., 16: 205-212.

NORMAN, A. M. & T. R. R. Stebbing, 1886: On the Crustacea Isopoda of the "Lightning", "Porcupine", and "Valorous" Expeditions. – Trans. zool. Soc. Lond. **12**, 4: 77-141.

NYBELIN, O., 1951: Introduction and Station List. – Rep. Swed. Deep Sea Exped. **2**, Zool., 1: 3-28.

OHLIN, A., 1901: Arctic Crustacea collected during the Swedish Arctic Expeditions 1898 and 1899 under the Direction of Professor A. G. Nathorst. I. Leptostraca, Isopoda, Cumacea. – Bih. svensk. VetenskAka. Handl. **26**, 4, 12: 1-54.

*OHWADA, M., 1960: Vertical distribution of living and dead diatoms down to one thousand metres off Sauriku, Northern Japan. – J. Oceanogr., Kobe **14**.

OMER-COOPER, J., 1921: *Janiropsis parva*. A New Species of Isopod from Fanning Island. – Proc. Bournemouth nat. Sci. Soc. **12**: 79-82.

*ORTMANN, A. E., 1900: Preliminary report on the Crustacea and Pycnogonida of the Princeton Arctic expedition, 1899. – Princeton Univ. Bull. **11**, 3: 39-40.

– 1901: Crustacea and Pycnogonida collected during the Princeton Expedition to North Greenland. – Proc. Acad. nat. Sci. Philad. 1901: 144-168.

ORTON, J. H., 1920: Sea-Temperature, Breeding and Distribution in Marine Animals. – J. Mar. biol. Ass. U. K. **12**: 339-366.

PEREZ, CH., 1900: Sur un Épicaride nouveau, *Crinoniscus equitans*. – Bull. sci. Fr. Belg. **33**: 483-492.

– 1903: Sur un Isopode parasite d'une Sacculine. – P. V. Soc. Sci. phys. nat. Bordeaux 1902-1903: 109-110.

PFEFFER, G., 1887: Die Krebse von Süd-Georgien nach der Ausbeute der Deutschen Station 1882-83. 1. Teil. – Jb. wiss. Anst. Hamburg **4**: 1-110.

PIGEAULT, N., 1957: L'étude de l'hermaphroditisme dans le genre *Sphaeroma* Bosc. – Trav. Inst. Sci. Chérifien, Zool. **13**: 1-60.

PIRLOT, J. M., 1933: Les Amphipodes de l'Expédition du Siboga II. Les Amphipodes Gammarides II. Les Amphipodes de la mer profonde. 1 (Lysianassidae, Stegocephalidae, Stenothoidae, Pleustidae, Lepechinellidae). – Siboga-Exped. **33c**: 113-167.

– 1934: Les Amphipodes de l'Expédition du Siboga II. Les Amphipodes Gammarides II. Les Amphipodes de la mer profonde. 2 (Hyperiopsidae, Pardaliscidae, Astyridae nov. fam., Tironidae, Calliopiidae, Paramphithoidae, Amathillopsidae nov. fam., Eusiridae, Gammaridae, Aoridae, Photidae, Ampithoidae, Jassidae). – Ibid. **33d**: 167-235.

– 1936: Les Amphipodes de l'Expédition du Siboga II. Les Amphipodes Gammarides II. Les Amphipodes de la mer profonde 3. Addendum et partie générale. – Ibid. **33e**: 237-252.

POSTMA, H., 1958: Chemical Results and a Survey of Water Masses and Currents. – Snellius Exped. **2**, Oceanogr. Res. 8: 1-116.

PROCTER, W., 1933: Part V. Marine Fauna. – Biol. Surv. Mount Desert Reg., Philad.: 1-402.
PURCHON, R. D., 1941: On the Biology and Relationships of the Lamellibranch *Xylophaga dorsalis* (Turton). – J. Mar. biol. Ass. U. K. **25**: 1-39.
RACOVITZA, E. G., 1919: Notes sur les Isopodes. – Arch. Zool. exp. gén. **58**: 79-115.
– 1920: Notes sur les Isopodes. 7. Les pléopodes I et II des Asellides; morphologie et développement. – Ibid. **58**, Notes et Revue 4: 95-115.
– 1924: Notes sur les Isopodes. 12. Morphologie et morphogénie des pléopodes I et II des femelles des Asellides. – Ibid. **62**, Notes et Revue 2: 35-48.
RASS, T. S., 1958: Fishes of the greatest depths. – Priroda **47**, 7: 107-108. (In Russian).
– 1959: Some Regularities in the Geographical Distribution of the Deep-Sea Fishes. – Preprints Intern. Oceanogr. Congr. 1959: 379-381.
RATHBUN, M. J., 1905: Fauna of New England. 5. List of the Crustacea. – Occ. Pap. Boston Soc. nat. Hist. **7**: 1-117.
RATHKE, H., 1837: Beitrag zur Fauna der Krym. – Mém. Acad. Imp. Sci. St. Pétersbourg **3**: 388-390.
RAUSCHENPLAT, E., 1901: Ueber die Nahrung von Thieren aus der Kieler Bucht. – Wiss. Meeresuntersuch., N. F. **5**: 1-151.
REIBISCH, J., 1927: Amphipoda – Flohkrebse. – Handb. Zool. Berl. **3**, 1: 767-808.
RICHARDSON, H., 1899: Key to the Isopods of the Pacific Coast of North America, with Descriptions of Twenty-two New Species. – Proc. U. S. nat. Mus. **21**: 815-869.
– 1901: Key to the Isopods of the Atlantic Coast of North America, with Descriptions of New and Little Known Species. – Ibid. **23**: 493-579.
– 1902: The Marine and Terrestrial Isopods of the Bermudas, with Descriptions of the Genera and Species. – Trans. Conn. Acad. Arts Sci. **11**: 277-310.
– 1904: Contributions to the Natural History of the Isopoda. – Proc. U. S. nat. Mus. **27**: 1-89.
– 1905: A Monograph of the Isopods of North America. – Bull. U. S. nat. Mus., No. 54: 1-727.
– 1906: Isopodes. – Exped. antarct. Fr. (1903-1905), Paris, Crustacés: 1-22.
– 1908a: Description of a New Isopod of the Genus *Eurycope* from Marthas Vineyard. – Proc. U. S. nat. Mus. **34**: 67-69.
– 1908b: Some New Isopoda of the Superfamily Aselloidea from the Atlantic Coast of North America. – Ibid. **34**: 71-86.
– 1909: Isopods collected in the Nortwest Pacific by the U. S. Bureau of Fisheries Steamer "Albatross" in 1906. – Ibid. **37**: 75-129.
– 1910a: *Jaera longicornis* Lucas referred to the Genus *Stenetrium*. – Proc. biol. Soc. Wash. **23**: 109-110.
– 1910b: Marine Isopods Collected in the Philippines by the U. S. Fisheries Steamer "Albatross" in 1907-8. – Docum. U. S. Bur. Fish. 736: 1-44.
– 1911a: Les Crustacés Isopodes du Travailleur et du Talisman; formes nouvelles. – Bull. Mus. Hist. nat. 1911, 7: 1-17.
– 1911b: Descriptions of a new genus and species of Janiridae from the Northwest Pacific. – Proc. U. S. nat. Mus. **40**: 633-635.
– 1912a: *Munnopsurus arcticus* (n. g.; n. sp.). Description d'un nouveau genre d'Isopode appartenant à la famille des Munnopsidae, de la Nouvelle Zemble. – Bull. Inst. Océanogr., Monaco, No. 227: 1-7.
RICHARDSON, H., 1912b: Descriptions of two new isopods, an Apseudes and a Munnopsis, both from the Galapagos Islands. – Proc. U. S. nat. Mus. **43**: 159-162.
RIEL, P. M. VAN, 1956: The Bottom water. II. Temperature. – Snellius-Exped. **2**, Oceanogr. Res. 5: 1-60.
RIIS-CARSTENSEN, E., 1936: The Godthaab Expedition 1928. The Hydrographic Work and Material. – Medd. Grønland **78**, 3: 1-101.
ROBINSON, D. J. & R. J. MENZIES, 1961: *Munna spinifera*, a New Species of Isopod Crustacean from Bathyal Regions in the Gulf of Aden. – Crustaceana **3**, 2: 110-114.
SARS, G. O., 1864: Om en anomal Gruppe af Isopoder. – Forh. VidenskSelsk. Krist. 1863: 1-16.
– 1867: Histoire naturelle des Crustacés d'eau douce de Norvège. 1e livraison. Les Malacostracés. – Christiania: 1-146.
– 1868: Beretning om en i Sommeren 1865 foretagen zoologisk Reise ved Kysterne af Christianias og Christiansands Stifter. – Forh. VidenskSelsk. Krist. 1868: 1-47.
– 1869: Undersøgelser over Christianiafjordens Dybvandsfauna, anstillede paa en i Sommeren 1868 foretagen zoologisk Reise. – Christiania: 1-58.
– 1870: Nye Dybvandscrustaceer fra Lofoten. – Forh. VidenskSelsk. Krist. 1869: 145-286.
– 1872: Undersøgelser over Hardangerfjordens Fauna. I. Crustacea. – Ibid. 1871: 245-286.
– 1879: Crustacea et Pycnogonida nova in itinere 2do et 3tio expeditionis norvegicæ anno 1877 & 78 collecta. – Arch. Math. Naturv. **4**: 427-476.
– 1882: Oversigt af Norges Crustaceer med foreløbige Bemærkninger over de nye eller mindre bekjendte Arter. I. (Podophthalmata – Cumacea – Isopoda – Amphipoda). – Forh. VidenskSelsk. Krist. No. 18: 1-124.
– 1885: Crustacea, I. – Norweg. N. Atl. Exped., Zool. **1**: 1-276.
– 1897: On some Additional Crustacea from the Caspian Sea. – Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg 1897: 273-305.
– 1899: Isopoda. – Crustacea of Norway, Bergen **2**: 1-270.
SARS, M., 1861: Beskrivelse af en ny Slægt og Art af Isopoder: *Munnopsis typica* Sars. – Forh. VidenskSelsk. Krist. 1860: 1-2.
– 1868: Bidrag til Kundskab om Christianiafjordens Fauna. – Nytt Mag. Naturv. **15**: 218-322.
SAYCE, O. A., 1900: *Janirella*, a New Genus of Isopoda from Fresh-water, Victoria. – Proc. roy. Soc. Vict. **13** (N. S.), 1: 124-130.
SCHMIDT, J., 1929: Introduction to the Oceanographical Reports including List of the Stations and Hydrographical Observations. – Dan. "Dana" Exped. 1920-22, **1**: 1-87.
SCHOTT, G., 1902: Ozeanographie und maritime Meteorologie. – Wiss. Erg. "Valdivia" 1: 1-403.
– 1926: Geographie des Atlantischen Ozeans. – Hamburg: I-XVI, 1-368.
– 1935: Geographie des Indischen und Stillen Ozeans. – Ibid.: I-XIX, 1-413.
SCHULZ, E., 1953: *Jaera petiti* nov. spec., ein neuer Isopode von der französischen Mittelmeer-Küste. – Vie et Milieu **4**: 59-64.
SCHÖBL, J., 1860: *Typhloniscus*, eine neue blinde Gattung der Crustacea Isopoda. – S. B. Akad. Wiss. Wien **11**: 279-330.
SCOTT, T., 1905: A Report of the Free-Swimming Crustacea

found in the Firth of Clyde, 1901 to 1902. – Proc. roy. Soc. Edinb. **25**, 9: 792-804.

Scripps Institution of Oceanography, 1949: Oceanic Observations of the Pacific. – Berkeley and Los Angeles: 1-363.

– 1956: Data collected by Scripps Institution vessels on Easttropic Expedition, September-December 1955. – S 10 Reference 56-28: 1-151.

– 1960: Data Report. Surface water temperatures at shore stations. United States West Coast and Baja California. – S 10 Reference 60-27: 1-100.

SEITZ, I., 1954: Jahrezeitliche Schwankungen im Geschlechtverhältnis freilebender Populationen von *Asellus aquaticus* L. – Zool. Anz. **153**, 11-12: 269-275.

SEWELL, R. B. S., 1935: Introduction and List of Stations. – Sci. Rep. Murray Exped. **1**: 1-41.

SEXTON, E. W., 1924: The Moulting and Growth-stages of *Gammarus*, with Descriptions of the Normals and Intersexes of *G. chevreuxi*. – J. Mar. biol. Ass. U. K. **13**, 2: 340-396.

– & J. S. HUXLEY, 1921: Intersexes in *Gammarus chevreuxi* and Related Forms. – Ibid. **12**: 506-556.

SKOPINZEV, B. A., 1949: On the rate of decomposition of the organic matter of the dying off plankton. – Trud. Gidrobiol. **1**: 34-43. (In Russian).

SMITH, G., 1906: Rhizocephala. – Fauna u. Flora Neapel 29: 1-123.

SOKOLOVA, M. N., 1958: The Food of the Invertebrates on the Deep-Sea Bottom. – Trud. Inst. Okean. **27**: 123-153. (In Russian).

– 1959: Some Peculiarities in the Ecology of the Deep-Sea Bottom Fauna. – Preprints Intern. Oceanogr. Congr. 1959: 382-383.

STAIGER, H. & C. BOCQUET, 1954: Cytological Demonstration of Female Heterogamety in Isopods. – Experienta **10**: 64-66.

– 1956: Les chromosomes de la super-espèce *Jaera marina* (F.) et de quelques autres Janiridae (Isopodes Asellotes). – Bull. biol. **90**, 1: 1-32.

STEBBING, T. R. R., 1893: A History of Crustacea. – London: 1-466.

– 1905: Report on the Isopoda collected by Professor Herdmand, at Ceylon, in 1902. – Ceylon Pearl Oyster Fish., Suppl. Rep. No. XXIII: 1-64.

– 1910: Report on the Marine Biology of the Sudanese Red Sea. XIV. On the Crustacea Isopoda and Tanaidacea. – J. Linn. Soc. London, Zool. **31**: 215-230.

– 1913: On the Crustacea Isopoda of the "Porcupine" Expedition. – Trans. zool. Soc. Lond. **20**, 4: 231-246.

– 1919: Crustacea from the Falkland Islands collected by Mr. Rubert Vallentin, F. L. S. – Part III. – Proc. Linn. Soc. Lond. 1919: 327-340.

STEEL, E. A., 1961: Some observations on the life history of *Asellus aquaticus* (L.) and *Asellus meridianus* Racovitza (Crustacea: Isopoda). – Proc. zool. Soc. Lond. **137**, 1: 71-87.

STEINBERG, J. E. and E. C. DOUGHERTY, 1957: The Skeleton Shrimps (Crustacea: Caprellidae) of the Gulf of Mexico. – Tulane Stud. Zool. New Orleans **5**, 11: 267-288.

STEPHENSEN, K., 1913: Report on the Malacostraca collected by the "Tjalfe"-Expedition, under the direction of cand. mag. Ad. S. Jensen, especially at West Greenland. – Vidsk. Medd. dansk naturh. Foren. Kbh. **64**: 57-134.

– 1915: Isopoda, Tanaidacea, Cumacea, Amphipoda (excl. Hyperiidea). – Rep. Danish oceanogr. Exped. Medit. **2**, Biol.: 1-53.

STEPHENSEN, K., 1923: Crustacea Malacostraca. V. (Amphipoda I). – Dan. Ingolf Exped. **3**, 8: 1-100.

– 1936: The Godthaab Expedition 1928. Crustacea varia. – Medd. Grønland **80**, 2: 1-38.

– 1947: Tanaidacea, Isopoda, Amphipoda, and Pycnogonida. – Sci. Res. Norweg. antarct. Exped. 1927-28, No. 27: 1-90.

– 1948: Storkrebs IV. Ringkrebs. 3. Tanglus (marine Isopoder) og Tanaider. – Danmarks Fauna **53**: 1-187.

STIMPSON, W., 1853: Synopsis of the Marine Invertebrata of Grand Manan: or the Region about the Bay of Fundy, New Brunswick. – Smithson. Contr. Knowl. **6**, 5: 1-66.

STROUHAL, H., 1929: Die Landisopoden des Balkans. 3. Beitrag: Südbalkan. – Z. wiss. Zool. **133**: 57-120.

STUDER, T., 1884: Isopoden gesammelt während der Reise S. M. S. Gazelle um die Erde 1874-76. – Abh. preuss. Akad. Wiss. 1883: 1-28.

SVERDRUP, H. U., M. W. JOHNSON & R. H. FLEMING, 1942: The Oceans. Their Physics, Chemistry and General Biology. – New York: 1-1060.

SYE, C. G., 1887: Beiträge zur Anatomie und Histologie von *Iaera marina*. – Inaug.-Dissert. Univ. Kiel: 1-37.

TATTERSALL, W. M., 1905: The Marine Fauna of the Coast of Ireland. Part V. Isopoda. – Sci. Invest. Fish. Br. Ire. 1904, II, 1905: 1-90.

– 1911: Die nordischen Isopoden. – Nord. Plankt. Zool. Teil 6, 14: 181-307.

– 1921: Crustacea. Part VI. Tanaidacea and Isopoda. – Brit. Antarct. ("Terra Nova") Exped., Nat. Hist. Rep., Zool. **3**, 8: 191-258.

– 1925: New Tanaidacea and Isopoda from the West Coast of Africa. – In: TH. MONOD: Tanaidacés et Isopodes de l'Afrique occidentale et septentrionale, 1re partie. Bull. Soc. Sci. nat. Maroc **5**, 3: 77-84.

TCHINDONOVA, JU. G., 1959: Feeding in some groups of macroplankton in the northwestern Pacific Ocean. – Trud. Inst. Okean. **30**: 166-189. (In Russian).

THOMSEN, H., 1937: Hydrographical Observations made during the "Dana"-Expedition 1928-30. – Dana Rep. **2**, 12: 1-46.

THORSON, G., 1950: Reproductive and larval ecology of marine bottom invertebrates. – Biol. Rev. **25**, 1: 1-45.

UNWIN, E. E., 1920: Notes upon the Reproduction of *Asellus aquaticus*. – J. Linn. Soc. London, Zool. **34**: 335-343.

U. S. Navy Hydrographic Office, 1944: World Atlas of Sea Surface Temperatures. – H. O. Pub. No. 225, Washington, D. C.

– 1957: Oceanographic Atlas of the Polar Seas. Part I. Antarctic. – Ibid. No. 705: 1-70.

– 1958: Oceanographic Atlas of the Polar Seas. Part II. Arctic. – Ibid.: 1-139.

USSING, H., 1934: The Hydrographical Conditions in the Scoresby Sound Fjord Complex. – In G. THORSON: Contributions to the Animal Ecology of the Scoresby Sound Fjord Complex (East Greenland). – Medd. Grønland **100**, 3: 1-68.

VALKANOV, A., 1936: Notitzen über die Brackwässer Bulgariens. 2. Versuch einer hydrographischen und biologischen Erforschung derselben. – Annu. Univ. Sofia, phys.-math. **32**, 3: 209-341. (In Bulgarian, with German summary).

– 1938: Über der europäischen Vertreter der Gattung *Jaera* Leach 1813 (Isopoda genuina). – Ibid. **34**, 3: 53-78 (In Bulgarian, with German summary).

WALKER, A. O., 1898: Crustacea collected by W. A. Herdman in Puget Sound, Pacific Coast of N. A., September, 1897. – Trans. Liverpool biol. Soc. **12**: 268-287.
– 1901: Contributions to the Malacostracan Fauna of the Mediterranean. – J. Linn. Soc. London, Zool. **28**: 290-307.
– 1903: XVII. – Report on the Isopoda and Amphipoda collected by Mr. George Murray, F. R. S., during the Cruise of the "Oceana" in November 1898. – Ann. Mag. nat. Hist. ser. 7, **12**: 223-233.
VANDEL, A., 1925: Recherches sur le sexualité des Isopodes. Les conditions naturelles de la reproduction chez les Isopodes terrestres. – Bull. biol. Fr. Belg. **59**, 3: 317-371.
– 1941: Recherches sur la génétique et la sexualité des Isopodes terrestres. VI. Les phénomènes de Monogénie chez les Oniscoïdes. – Ibid. **75**: 316-363.
– 1947: L'intersexualité chez les Isopodes terrestres. – Bull. Mus. Hist. nat. Marseille **7**, 4: 170-174.
VANHÖFFEN, E., 1914: Die Isopoden der Deutschen Südpolar-Expedition 1901-1903. – Dtsch. Südpol Exped. **20**, Zool. 7: 449-598.
WEBER, M., 1902: Introduction et description de l'expédition. – Siboga-Exped. **1**: 1-159.
VERHOEFF, K. W., 1901: Über paläarktische Isopoden (7. Aufsatz). – Zool. Anz. **24**: 403-408.
– 1943: Zur Morphologie, Ökologie und Systematik von *Sphaeroma*, *Europosphaera* und *Jaera*. – Z. Morph. Ökol. Tiere **40**, 2: 276-290.
– 1949: Zur Kenntnis der maritimen Isopoden-Gattung *Sphaeroma*, die Incurvation derselben und *Jaera* als Gast von *Sphaeroma*. 81. Isopoden-Aufsatz. – Arch. Hydrobiol. **42**: 395-422b.
VINOGRADOV, M. E., 1961: The sources of alimentation of deep-water fauna (on the decomposition rate of dead Pteropoda). – C. R. Acad. Sci. U.R.S.S. **138**: 1439-1442. (In Russian).
– 1962a: Vertical zonation in the distribution of deep-sea benthic fauna of the ocean. – Deep-Sea Res. **8**: 245-250.
– 1962b: Feeding of the Deep-Sea Zooplankton. – Rapp. Cons. Explor. Mer. (In press).
VINOGRADOVA, N. G., 1958: The vertical distribution of the deep-sea bottom fauna of the ocean. – Trud. Inst. Okean. **27**: 88-122. (In Russian).
– 1959: Vertical Zonation of the Deep-Sea Bottom Fauna. – Preprints Intern. Oceanogr. Congr. 1959: 392-393.
WOLFF, T., 1956a: Isopoda from Depths Exceeding 6000 Meters. – Galathea Rep. **2**: 85-157.
– 1956b: Crustacea Tanaidacea from Depths Exceeding 6000 Meters. – Ibid. **2**: 187-241.
– 1956c: Six new abyssal species of *Neotanais* (Crust. Tanaidacea) – Vidensk. Medd. dansk naturh. Foren. Kbh. **118**: 41-52.
– 1960: The hadal community, an introduction. – Deep-Sea Res. **6**: 95-124.
– 1961: Animal Life from a Single Abyssal Trawling. – Galathea Rep. **5**: 129-162.
WOOSTER, W. S. & G. H. VOLKMANN, 1960: Indications of Deep Pacific Circulation from the Distribution of Properties at Five Kilometers. – J. geophys. Res. **65**, 4: 1239-1249.
WÜST, G. & A. DEFANT, 1936: Atlas zur Schichtung und Zirkulation des atlantischen Ozeans. Schnitte und Karten von Temperatur, Salzgehalt und Dichte. – Wiss. Ergebn. dtsch. atlant. Exped. "Meteor" 1925-1927, **6**, Atlas.
YONGE, C. M., 1937: Evolution and adaptation in the digestive system of the Metazoa. – Biol. Rev. **12**: 87-115.
ZENKEVICH, L. A., 1954: Erforschungen der Tiefseefauna im nordwestlichen Teil des Stillen Ozeans. – Intern. Union biol. Sci., ser. B, No. 16: 72-85.
– 1957: Caspian and Aral Seas. – In: Treatise on Marine Ecology and Paleoecology, Geol. Soc. Amer. Mem. **67**, 1: 891-916.
– 1958: The deep-sea echiurids of the north-western part of the Pacific Ocean, 2. part. – Trud. Inst. Okean. **27**: 192-203. (In Russian).
– & J. A. BIRSTEIN, 1956: Studies of the deep water fauna and related problems. – Deep-Sea Res. **4**: 54-64.
ZIMMER, C., 1926: Northern and Arctic Invertebrates in the Collection of the Swedish State Museum. X. Cumaceen. – K. svensk. VetenskAkad. Handl., ser. 3, **3**, 2: 1-88.
– 1927: Isopoda – Asseln. – Handb. Zool. Berl. **3**, 1: 697-766.
ZIRWAS, C., 1910: Die Isopoden der Nordsee. – Inaug.-Dissert. Univ. Kiel: 71-118.
ZOBELL, C. E., 1952: Bacterial Life at the Bottom of the Philippine Trench. – Science **115**: 507-508.
– 1954: The Occurrence of Bacteria in the Deep Sea and their Significance for Animal Life. – Intern. Union biol. Sci., ser. B, No. 16: 20-22.
– & R. Y. MORITA, 1959: Deep-Sea Bacteria. – Galathea Rep. **1**: 139-154.

K. Index of valid scientific names*

Italics refer to keys, bold type to text-figures and Roman numerals to plate-figures

* A list of generic synonyms is given on p. 206.