UNIVERSITY OF SOUTHERN CALIFORNIA
Department of Biological Sciences

TAXONOMIC GUIDES

to

ARCTIC ZOOPLANKTON(I):

Amphipods of the central Arctic
by John R. Tencati

Euphausiids of the Arctic Basin
and peripheral seas
by Yuk Maan Leung

Edited by Yuk Maan Leung
and
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Artificial Key to the Pelagic and Under-ice Amphipods of the Central Arctic Basin

by

John R. Tencati

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Introduction

This key was designed for use only on amphipods which inhabit the Central Arctic Basin. The species represented here are primarily those which have been collected from the drift stations ARLIS I, ARLIS II, and T-3. A few additional pelagic species not collected from ice stations are also included because their distribution patterns suggest that they are also arctic species. The only benthic amphipods included are those which Barnard (1959) and others found associated with the underside of ice floes. Species found only in the continental shelf regions are not included, but information regarding these species is generally available in the papers of Sars (1895), Stebbing (1906), Gurjanova (1951) and Shoemaker (1955).

This key was constructed so that identification could be made without dissection. In addition, every effort was made to use simple terminology so that the key would be useful to non-specialists. Notes on amphipod development, figures of all species, and notes on general distribution in addition to other pertinent features of the most common species have been included. This taxonomic guide incorporates, with modifications and additions, the key devised by Stephensen (1935) for species of Pseudalibrotus and that devised by Dunbar (1963) for Hyperiids. Illustrations included were obtained from sources listed on page 22. Necessary modifications were made by Y. M. Leung. Plates 1a-1c identify the structures and appendages necessary to use the following key.

Artificial Key to the Non-Benthic Amphipods of the Central Arctic Basin

by

John R. Tencati

1a. Maxilliped palp absent; eyes usually present and generally large, often covering entire surface of head; coxal plates usually small or absent. (Hyperiidea). 2

1b. Maxilliped palp present; eyes generally small or absent; coxal plates present and usually large. (Gammaridea). 9

2a. Eyes small, often difficult to locate 3

2b. Eyes bulbous, covering entire surface of head 4

3a. Article 7 of pereiopods 3-5 partially encased by distal process on article 6 (Pl. 3, Fig. 2b); uropods normal (Pl. 1b, Fig. a), with two rami each . . . .*Lanceola clausi* Bovallius Pl. 3, Fig. 2

3b. Article 7 of pereiopods 3-5 normal, not partially encased by article 6; uropods with one ramus of each pair often reduced or absent (Pl. 2, Fig. 1b). . . . . .Genus *Scina* Prestandrea Pl. 2, Fig. 1

4a. Pereiopods 3-5 longer than pereiopods 1 and 2. Genus *Parathemisto*. 5

4b. Pereiopods 3-5 not longer than pereiopods 1 and 2 7

5a. Pereiopod 3 about the same length as pereiopods 4 and 5. . . . .*Parathemisto abyssorum* Boeck, Pl. 2, Fig. 2

5b. Pereiopod 3 distinctly longer than pereiopods 4 and 5. 6

6a. Dactyl (article 7) of pereiopod 3 with dense growth of spinules at the inner margin near the base. . . . . *Parathemisto libellula* (Lichtenstein) Pl. 2, Fig. 3

6b. Dactyl of pereiopod 3 without dense growth of spinules at inner margin . . . . *Parathemisto gaudichaudii* (Guerin) Pl. 8, Fig. 1

7a. Article 5 of gnathopods 1 and 2 with a process extending to the distal end of article 6 (Pl. 3, Fig. 1c). . . . . *Hyperoche medusarum* (Kröyer) Pl. 3, Fig. 1

7b. Article 5 of gnathopods 1 and 2 with a short process not extending to the distal end of article 6 or no process at all (Pl. 3, Fig. 3c). 8

8a. Article 5 of gnathopod 1 with a process opposing article 6 (Pl. 3, Fig. 3c); gnathopods 1 and 2 with a few stout setae and distinctly shorter than pereiopods 1-5 . . . . *Hyperia galba* (Montagu) Pl. 3, Fig. 3

8b. Article 5 of gnathopod 1 without a process (Pl. 4, Fig. 2b); gnathopods 1 and 2 as long or nearly as long as pereiopods 1-5 and with dense stout setae . . . . *Hyperia medusarum* (Müller) Pl. 4, Fig. 2

9a. Gnathopods 1 and 2 similar in both size and structure 10

9b. Gnathopods 1 and 2 not similar in both size and structure. 14

10a. Telson bilobed, joined near base. . . . . *Gammarus wilkitzkii* Birula, Pl. 4, Fig. 1

10b. Telson entire or cleft less than 1/2 its length. 11

11a. Article 6 of gnathopods 1 and 2 as broad as article 5 . . . . *Apherusa glacialis* (Hansen) Pl. 4, Fig. 3

11b. Article 6 of gnathopods 1 and 2 much broader than article 5 12

12a. All thoracic and abdominal segments with one tooth each on the dorsal midline. . . . . *Gammaracanthus loricatus* (Sabine) Pl. 1a

12b. Only last segment of thorax and first 2 segments of abdomen with a tooth on the dorsal midline. Genus *Eusirus* 13

13a. Telson cleft about 1/2 its length; article 2 and 6 of pereiopods 3-5 nearly equal in length . . . . *Eusirus cuspidatus* Kröyer, Pl. 8, Fig. 2

13b. Telson only slightly cleft; article 6 of pereiopods 3-5 nearly 3 times as long as article 2. . . . . *Eusirus holmii* Hansen Pl. 5

14a. Telson entire or only apically notched. 15

14b. Telson deeply cleft. 19

15a. Article 6 of gnathopod 1 distinctly larger than article 6 of gnathopod 2; telson longer than broad. . . . . *Eusirogenes arctica* Tencati, Pl. 10

15b. Article 6 of gnathopod 1 equal in size to article 6 of gnathopod 2; telson only about as long as broad 16

16a. Coxal plate 4 very large, about three times as broad as coxal plate 3 distally. . . . . ?*Andaniexis abyssi* (Boeck), Pl. 9, Fig. 2

16b. Coxal plate 4 less than twice as broad as coxal plate 3. Genus *Pseudalibrotus* 17

17a. Inner ramus of uropod 2 deeply notched, and with a long spine at the proximal end of the notch. (Pl. 7, Fig. 1b) . . . . . . Pseudalibrotus litoralis*(Kröyer) Pl. 7, Fig. 1

17b. Inner ramus of uropod 2 not notched as above 18

18a. Distal end of article 6 of gnathopod 2 obliquely truncate; dactylus located peripherally (30X mag.) (Pl. 7, Fig. 3b) . . . Pseudalibrotus glacialis* Sars, Pl. 7, Fig. 3

18b. Distal end of article 6 of gnathopod 2 transversely truncate; dactylus located medially. (Pl. 7, Fig. 2b) . . . . Pseudalibrotus nanseni* Sars, Pl. 7, Fig. 2

19a. Article 7 of pereiopod 5 not similar in structure to article 7 of pereiopods 3 and 4; inner ramus of uropod 3 much longer than outer. . . . . Astyra longipes (Stephensen) Pl. 9, Fig. 1

19b. Article 7 of pereiopod 5 similar in structure to article 7 of pereiopods 3 and 4; rami of uropod 3 subequal 20

20a. Article 3 of gnathopod 1 twice as long as article 4; inner margin of outer ramus of uropod 3 not spinose. . . . . Cyclocaris guilelmi Chevreux, Pl. 6, Fig. 1

20b. Article 3 of gnathopod 1 nearly equal in length to article 4; inner margin of both rami of uropod 3 spinose . . . . Eurythenes gryllus (Lichtenstein) Pl. 6, Fig. 2

*According to Barnard (1969), all species of genus Pseudalibrotus must be transferred to genus Onisimus due to earlier error in classification.

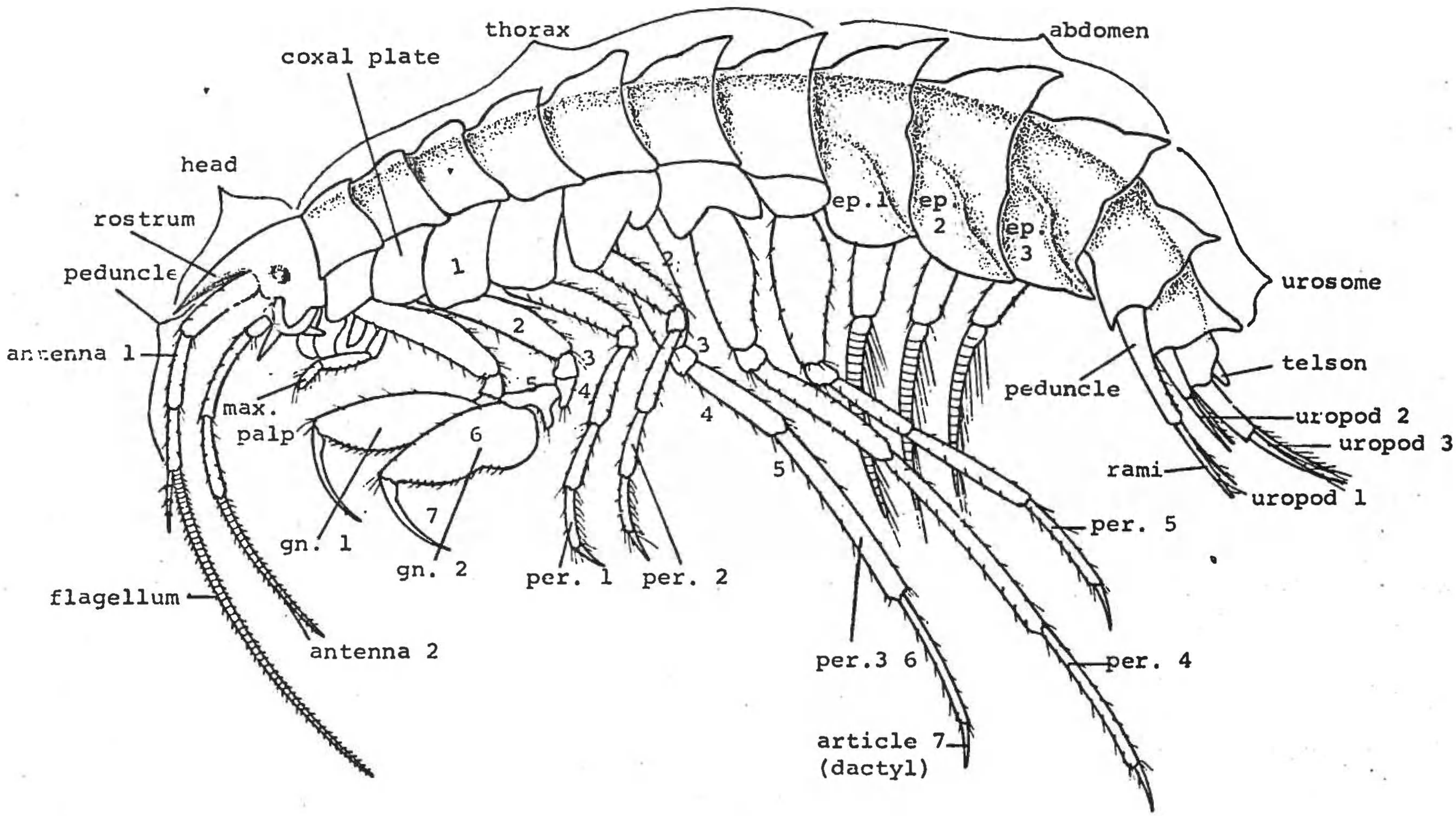


Plate 1 a

Gammaracanthus loricatus (Sabine). ♂; abbreviations: max. = maxilliped, Gn. = gnathopod, per. =pereiopod, Ep. = epimeral plate.

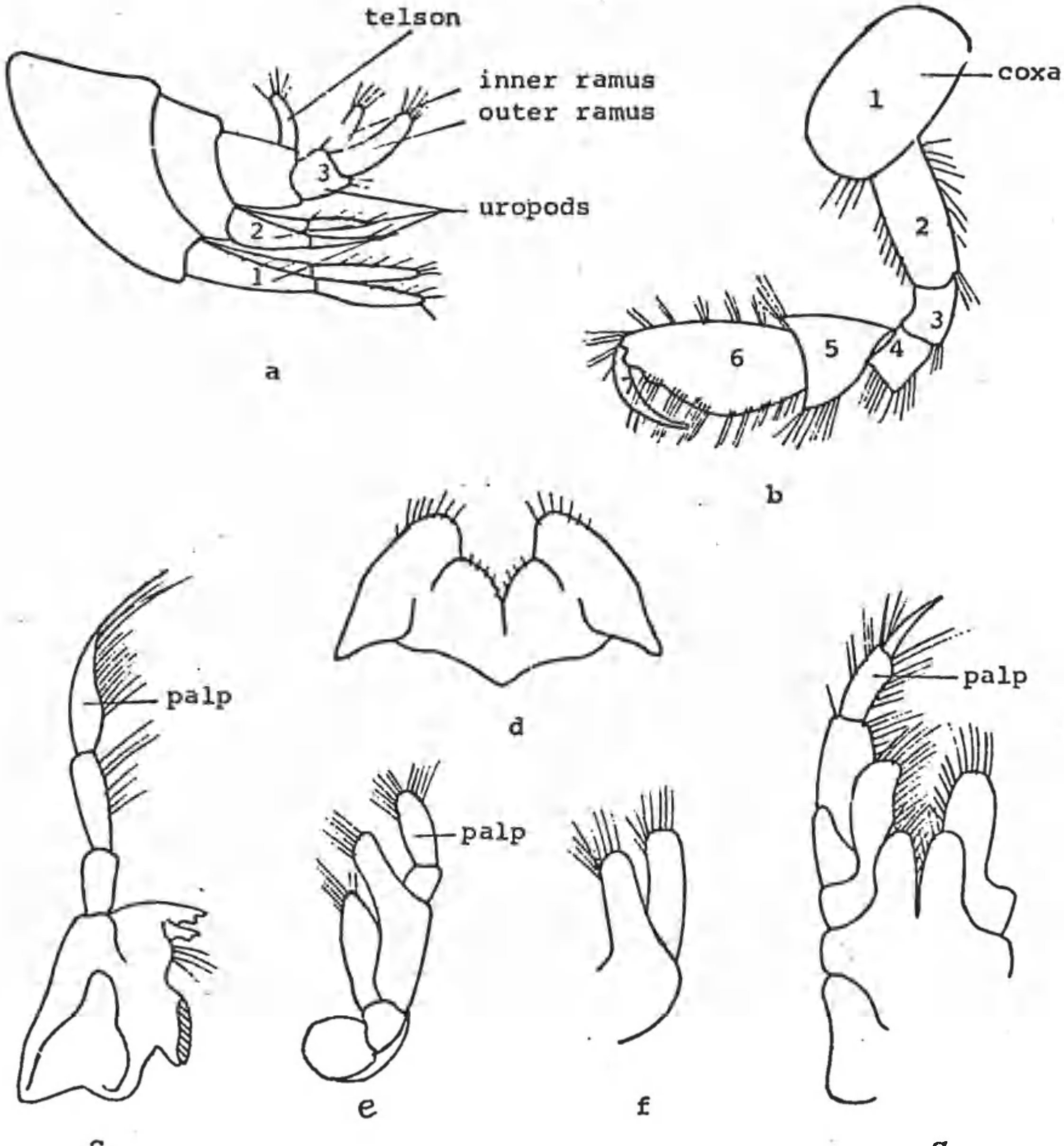


Plate 1b

Generalized amphipod appendages

a. urosome; b. gnathopod; c. mandible; d. lower lip; e. maxilla 1; f. maxilla 2; g. maxilliped (after J. L. Barnard)

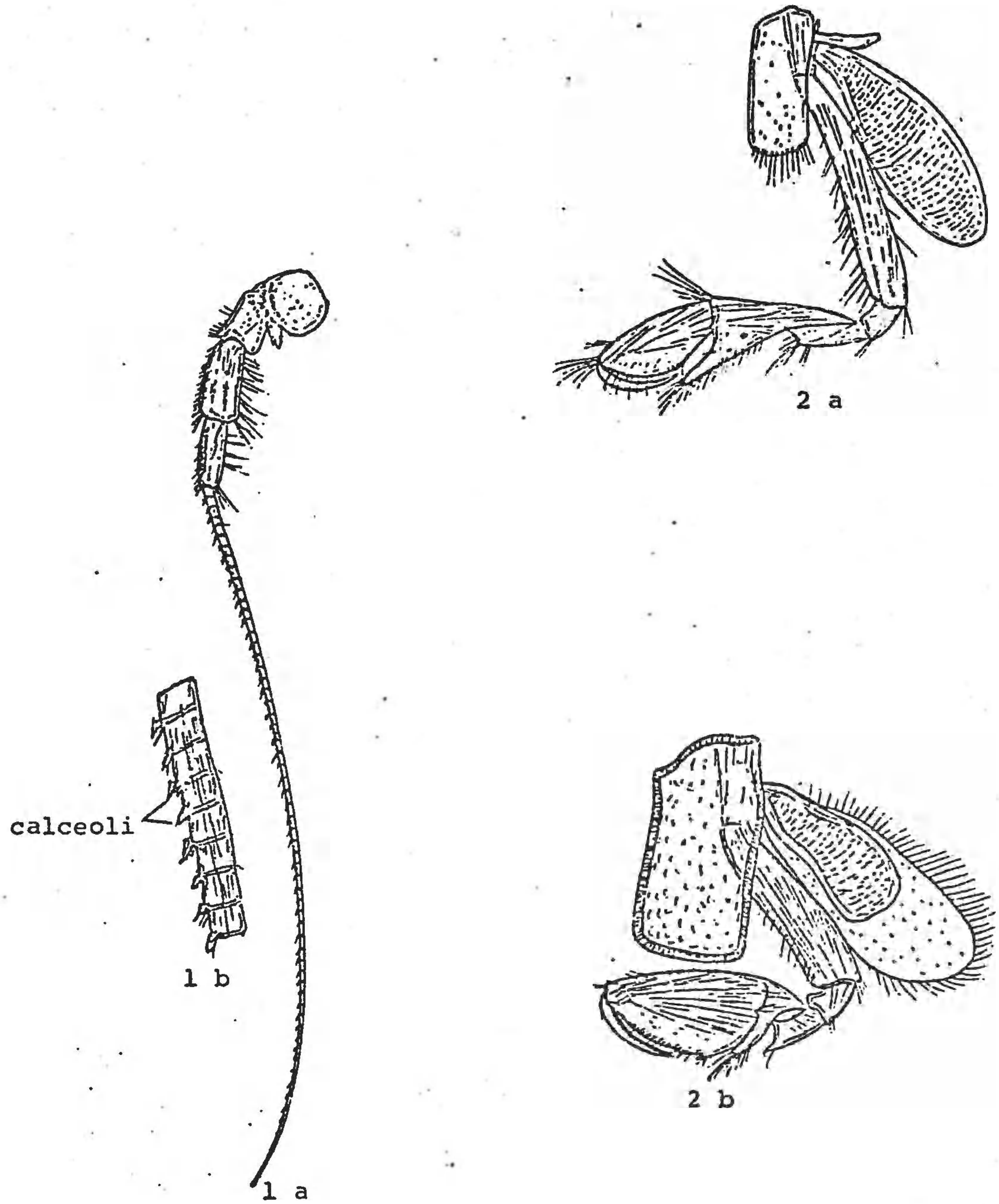


Plate 1 c
Generalized Adult Amphipod Characteristics

Fig. 1. a)antenna, b)enlargement showing calceoli (usually only present on males). Fig. 2. a)gnathopod 2 of female with small brood plate, b)gnathopod 2 of female with well developed brood plate.

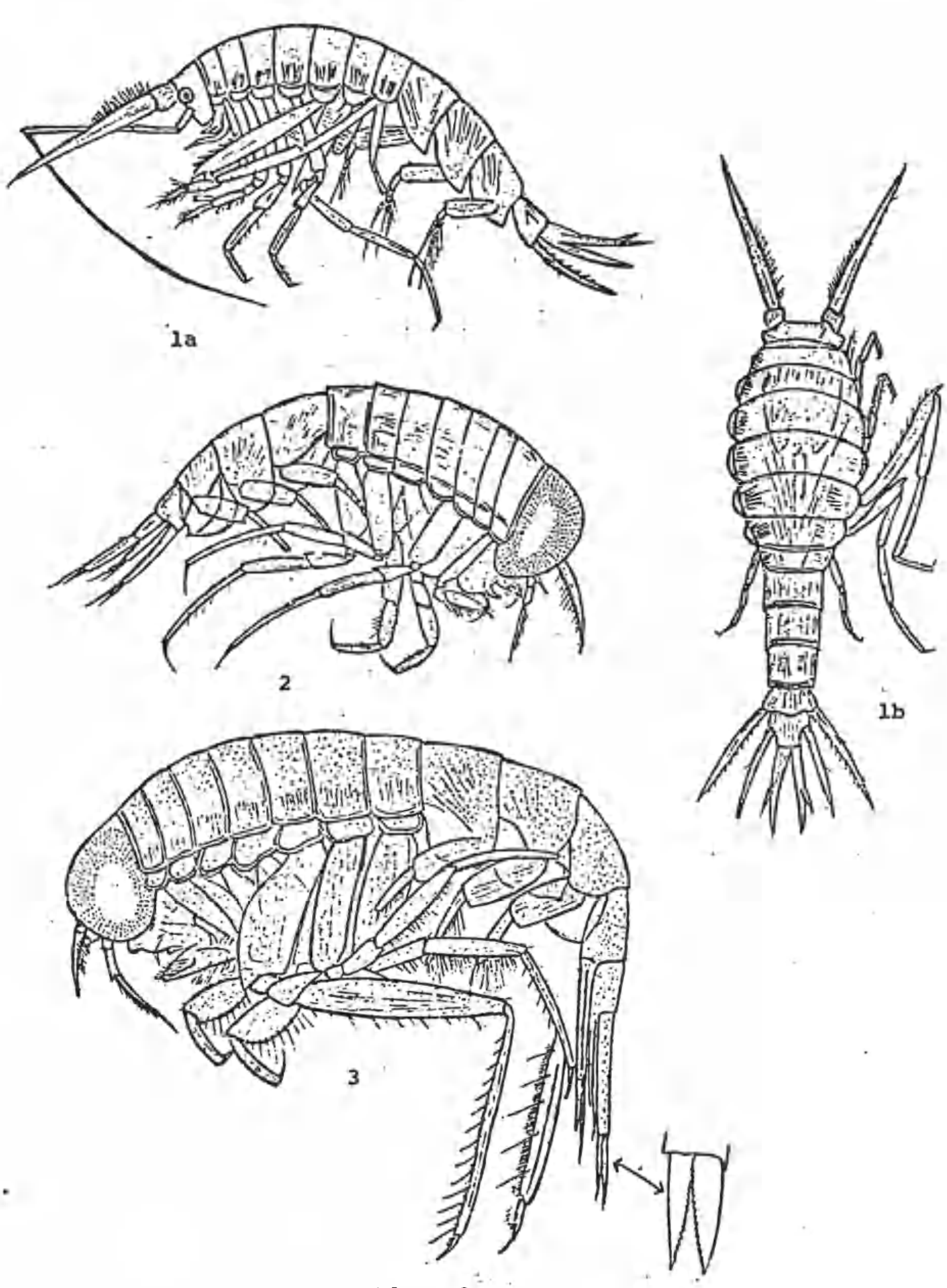


Plate 2

Fig. 1. Scina borealis Sars. a)♂, b)♀; Fig. 2, Parathemisto abyssorum Boeck . ♀; Fig. 3. Parathemisto libellula (Lichtenstein) ♀.

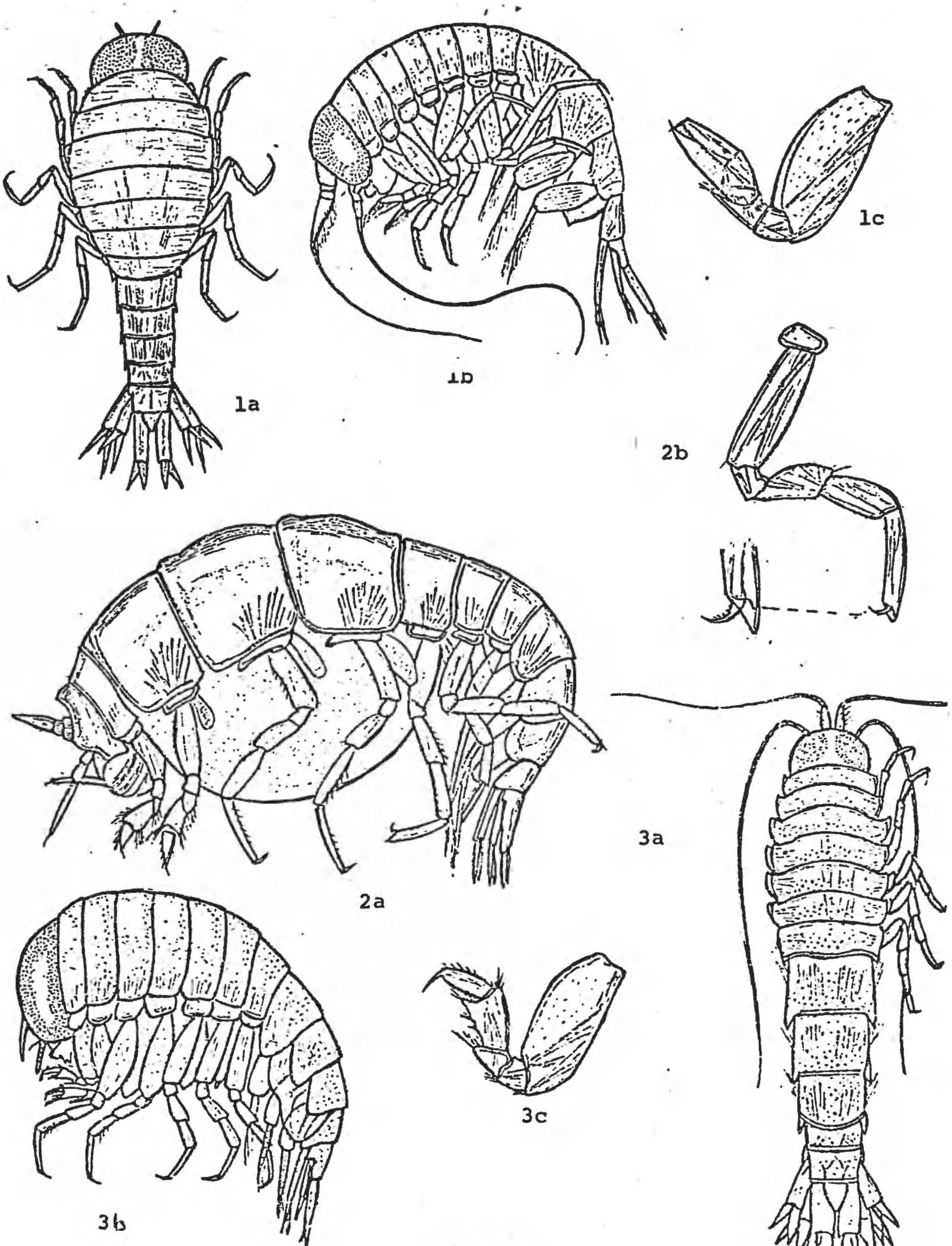


Plate 3

Fig. 1. Hyperoche medusarum (Kröyer). a) ♀, b) ♂, c) gnathopod 2; Fig. 2. Lanceola clausi Bovallius. a) ♀, b) perciopod 5; Fig. 3. Hyperia galba (Montagu). a) ♂, b) ♀, c) gnathopod 1.

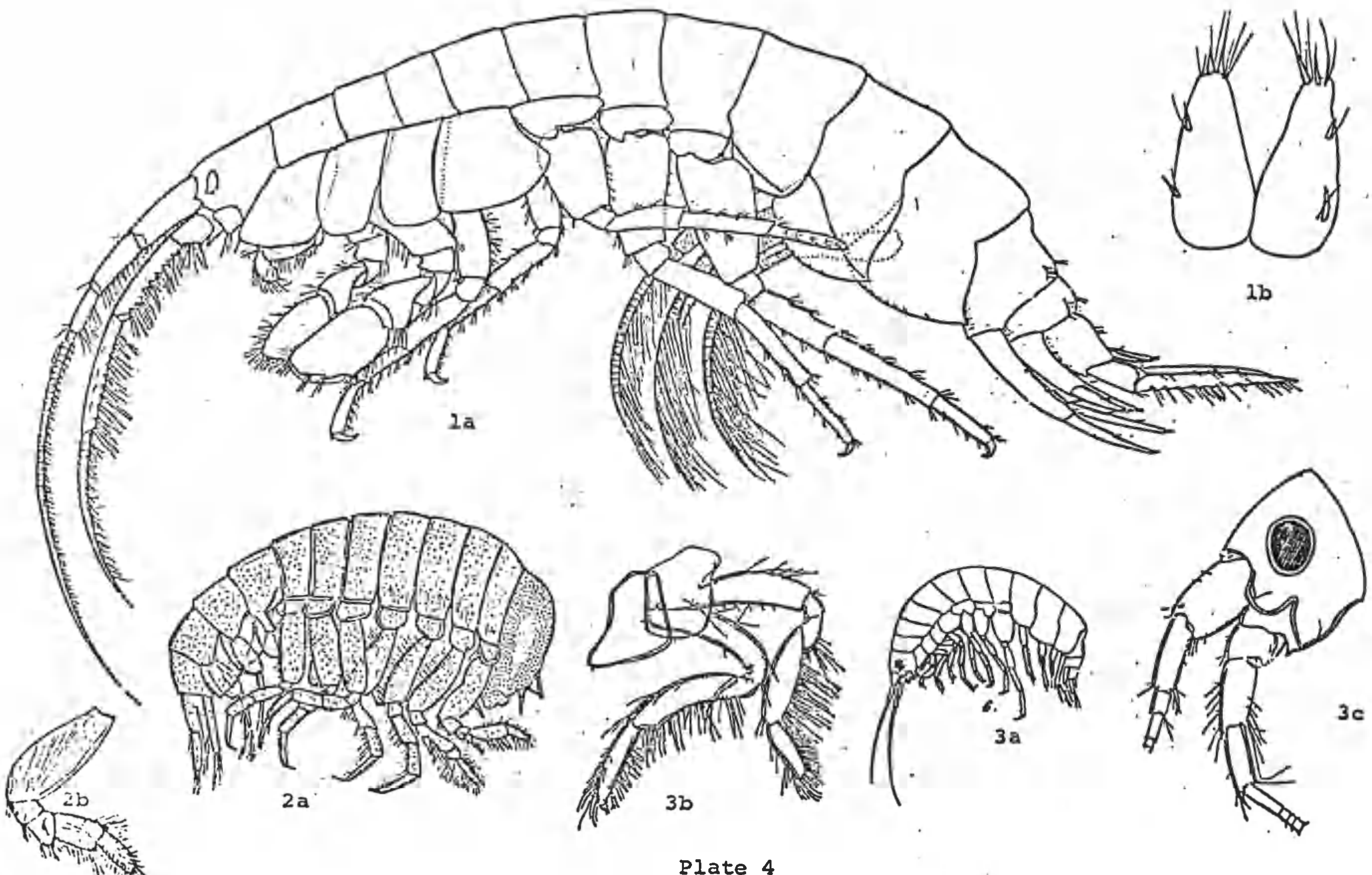


Plate 4

Fig. 1. *Gammarus wilkitzkii* Birula. a) ♂, b) telson; Fig. 2. *Hyperia medusarum* (Müller). a) ♀, b) gnathopod 1; Fig. 3. *Apherusa glacialis* (Hansen). a) ♀, b) gnathopod 1 & 2, c) head

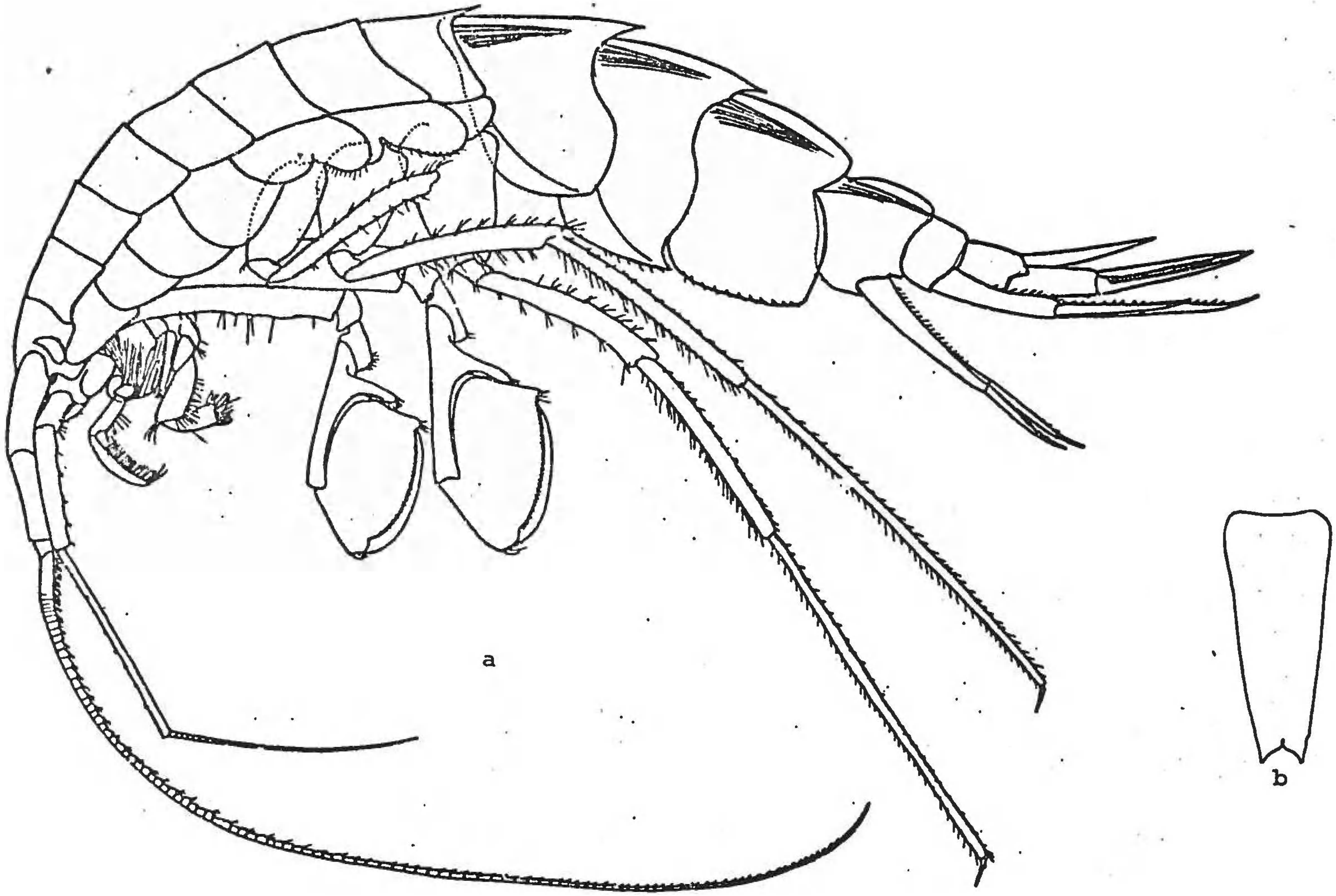


Plate 5

a) Eusirus holmii Hansen.♂ b) telson

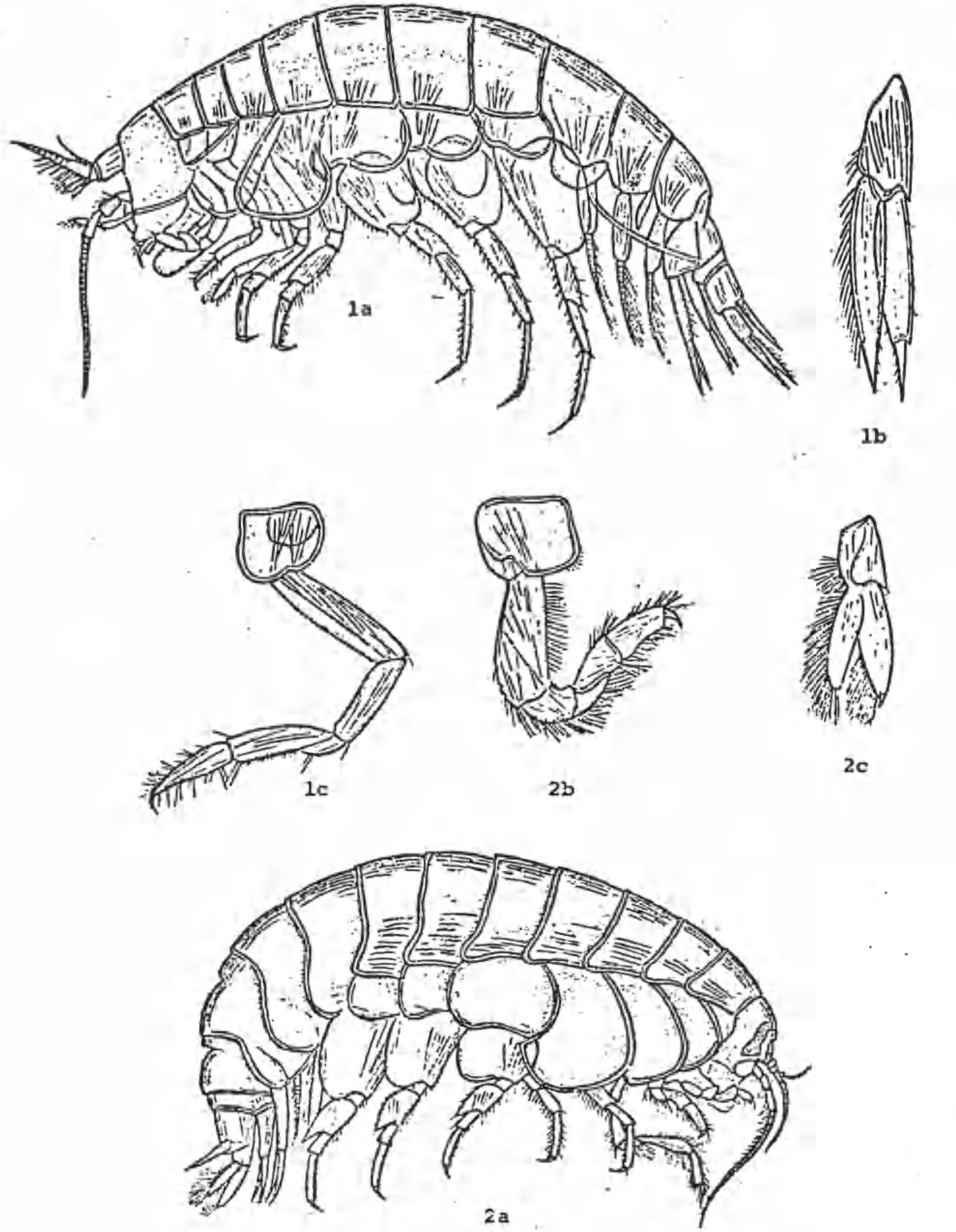


Plate 6

Fig. 1. <u>Cyclocaris guilelmi</u> Chevreux. a)♀, b) uropod 3, c) gnathopod 1.
Fig. 2. <u>Eurythenes gryllus</u> (Lichtenstein). a) ♀, b) gnathopod 1, c) uropod 3.

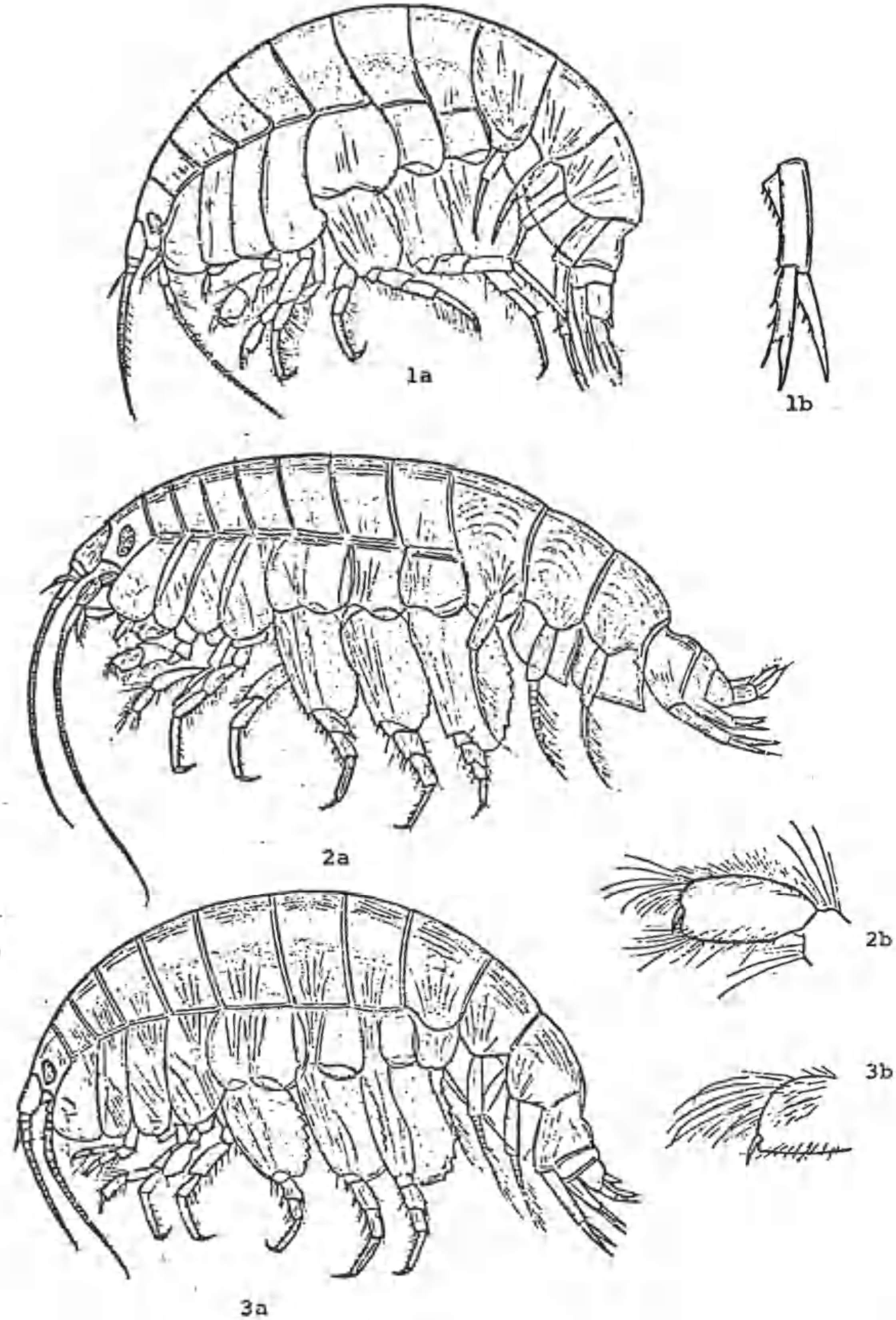
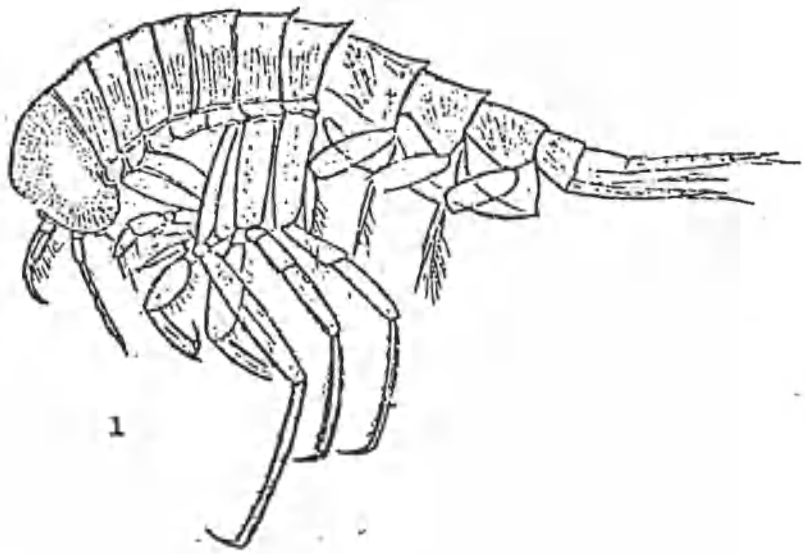


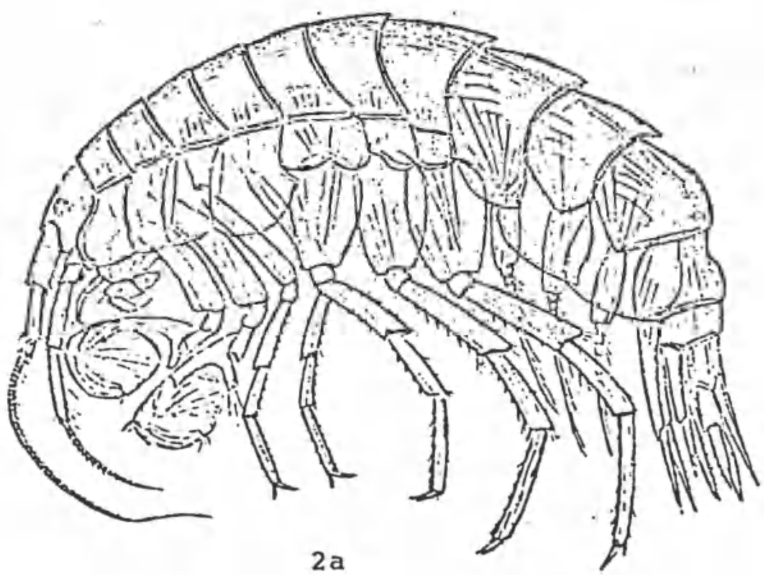
Plate 7

Fig. 1. Pseudalibrotus* litoralis (Kröyer). a) ♀, b) uropod 2; Fig. 2. Pseudalibrotus nanseni Sars. a) ♂, b) gnathopod 2; Fig. 3. Pseudalibrotus glacialis Sars. a) ♀, b) gnathopod 2.

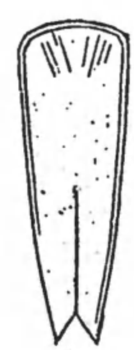
*see key



1



2a



2b

Plate 8

Fig. 1. *Parathemisto gaudichaudii* (Guérin). ♀; Fig. 2 a) *Eusirus cuspidatus* Kröyer. ♀, b) telson.

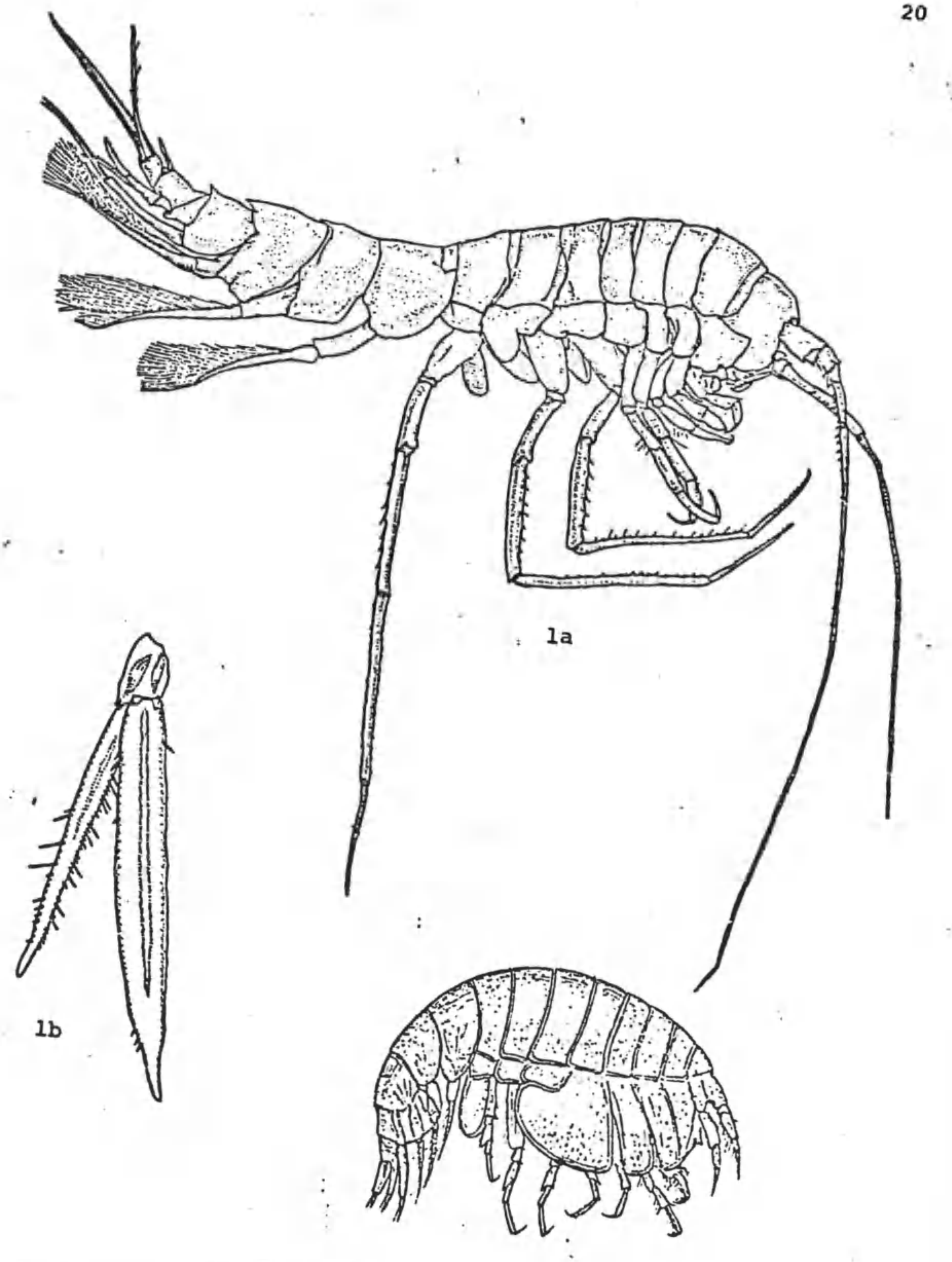


Plate 9

Fig. 1. Astyra longipes (Stephensen). a) ♀, b) uropod 3

Fig. 2. ?Andaniexis abyssi (Boeck) ♀.

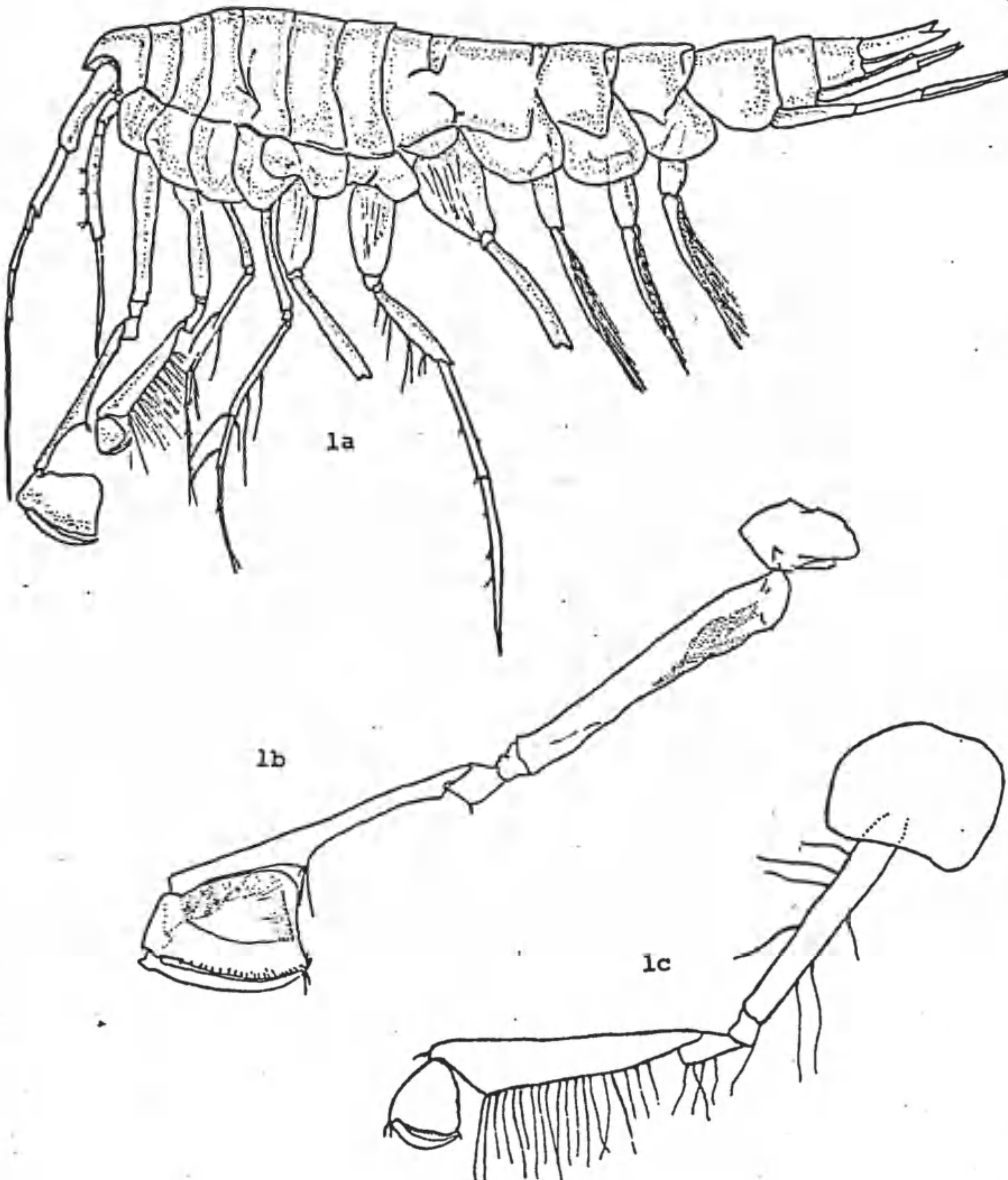


Plate 10

Fig. 1. Eusirogenes arctica Tencati. a) ♀ without uropod 3, b) gnathopod 1, c) gnathopod 2.

Illustrations

Notes:

1. Size and relative distributions:

	Size (mm)			Location in water column	
	maximum	average	specimen size*	under-ice	zooplankton
Scina borealis	---	---	9	---	X
Parathemisto abyssorum	18	10	---	---	upper 600 m
P. libellula	60	27	---	---	X
P. gaudichaudii	---	---	25	---	X
Hyperoche medusarum	---	---	6	---	X
Lanceola clausi	---	---	9	---	X
Hyperia galba	---	---	12	---	X
H. medusarum	---	---	12	---	X
Gammarus wilkitzkii	41	30	---	X (winter)	summer-~200 m winter- upper 20 m
Apherusa glacialis	15	8	---	X	upper 200 m
Gammaracanthus loricatus	---	---	35	X	X
Eusirus cuspidatus	---	---	24	---	X
E. holmii	45	20	---	---	X
Eusirogenes arctica	---	---	10	---	X
?Andaniexis abyssi	---	---	4	---	X
Pseudalibrotus litoralis	---	---	20	---	X
P. nanseni	20	13	---	X	1000 m & more
P. glacialis	---	---	10	---	X
Astyra longipes	---	---	26	---	X
Cyclocaris guilelmi	18	14	---	---	500-1500 m
Eurythenes gryllus	120	45	---	---	X

*relatively rare in the central Arctic

2. Distinction of amphipod sex:

Distinction of amphipod sex is often difficult except when the animal is a mature female possessing well-developed brood plates or is carrying eggs or young within the brood pouch. Determinations in other cases require close examination for brood plates in females and swollen testes or sexual papillae in males. In some species, there are secondary male and female characteristics, but differences of this sort do not always occur.

The presence of brood plates is often the only distinguishing characteristic of the female. They are found on the ventral side of the thorax immediately between the thorax surface and the gill of gnathopod 2 and pereiopods 1-4. Brood plates, also called oostegites or brood lamellae, vary in size from very slender and much smaller than the gill to several times the length and breadth of the gill (Plate 1c, fig. 2a, 2b). Developmental stages of females are frequently based on the relative sizes of brood plates. Small brood plates are often completely hidden from view by the gills and require much patience and practice to observe.

The identification of a male is largely dependent on its being sexually mature. Classification according to stages of development is nearly impossible, unless a secondary characteristic can be used. In most cases, males are identified by the presence of testes, located on the ventral side of the last segment of the thorax, which appear swollen and silvery as the breeding season approaches. One may also find sexual papillae protruding at the level of the swollen testes from the ventral surface of the seventh pereion segment.

In the arctic species included herein, the only known secondary sex characteristics of any use are changes in the antennae. Two types of antennae changes occur: a) changes in length, and b) changes in the number and size of the individual segments. Differences in the antennae lengths between males and females have been observed in Parathemisto abyssorum, P. libellula, Scina borealis, Hyperoche medusarum, Hyperia galba and Cyclocaris guilelmi. Changes in antennae lengths in other species in this key may also occur, but have not been observed by the author. In all cases mentioned above, the male antennae become elongated while those of the female do not. Typically, the male antennae may be as long as the body length and possess numerous small segments. In other species, no elongation takes place but the numbers of segments in the male and female differ, with the larger number sugements usually present in the male. This type of distinction takes place in species of Pseudalibrotus (as reviewed by Holmquist, 1965), but is very difficult to recognize and apply. Also, it has been observed that male antennae are frequently decorated with numerous calceoli, small flat projections at the terminal end of the flagellae segments (Plate 1c, fig. 1a, 1b), while females have few or, in more species, none.

In many cases where differentiation by secondary characteristics is impossible, one must rely solely upon primary characteristics. If sex cannot be distinguished by these characteristics, the specimen must be regarded as juvenile or immature. Many specimens, however, grow to sizes at which maturity is normally expected without any outward signs of maturity. Whether this group is the product of out-of-cycle breeding for a portion of the population or represents mature individuals which have re-absorbed their primary sex characteristics is a question as yet unanswered, although the former has been demonstrated by Dunbar (1957) for P. libellula.

Detailed examinations by dissection or histological sectioning can prove useful in determining development prior to the appearance of external characteristics.

3. Specific information on the more common species:

Parathemisto abyssorum (Boeck)

Syn. Themisto abyssorum

Distribution: This widely distributed species is common in subarctic areas at the periphery of the Arctic (Dunbar, 1964), but it also occurs in the high Arctic (Barnard, 1954) and in the North Atlantic. Areas of greatest abundance and breeding occur over the continental slopes in the subarctic. However, according to data given by Bousfield (1951), the Gulf of the St. Lawrence also has a large thriving population. P. abyssorum is usually found in the upper 600 m of water in the Arctic (Barnard, 1959) and between 600 m and 1000 m in the Norwegian Sea (Østvedt, 1955). It rarely occurs in locations where the bottom depth does not exceed 400m. Juveniles are typically found near the surface at depths of 100 m or less. Bousfield (1951) found that this species exhibits a negative phototropic response, being significantly more numerous at the surface at night than in the day. Bogorov (1940) also noted that this negative phototropic response caused seasonal vertical migrations in all except juvenile P. abyssorum.

Breeding: Breeding of P. abyssorum is widespread. It occurs most successfully in the subarctic over the continental slope (Tencati and Geiger, 1968) where the warmer temperatures (+2 to +3°C optimum) are believed to be an important factor (Bogorov, 1940).

Breeding has been observed to occur in the waters of NE Greenland, NW Norway, the Barents Sea, the Beaufort Sea and the Gulf of the St. Lawrence. Breeding in the high arctic also occurs, but on a smaller scale than breeding in subarctic regions. Most studies indicate that the breeding season, as indicated by the appearance of mature males and females or new juveniles, extends from about February to June. This corresponds well with a study of female developmental stages of high arctic specimens undertaken by the author (unpublished). However, Bousfield (1951) concluded, on the basis of the abundance of juveniles that breeding of *P. abyssorum* in the Belle Island Strait Region took place during August and September. It may be that the breeding season varies with location or occurs partly out-of-phase, with a limited number of specimens breeding following the summer. This has been shown to be the case for *P. libellula* (Dunbar, 1957) and data from the Barents Sea (Bogorov, 1940) and the high arctic (unpublished) could be used to support such a conclusion for *P. abyssorum*. These same studies indicate a life-cycle of two years with each *P. abyssorum* breeding only once before dying.

Care should be taken when observing females with eggs because the parasite *Thalassomyces marsupii* resembles a brood of eggs. This parasite is common in the slope waters of NE Greenland and occasionally is present on *P. abyssorum* found in the Amerasia Basin (Tencati and Geiger, 1968). Males and juveniles and arctic char (Grainger, 1953).

Breeding: A breeding study of *P. libellula* has been made by Dunbar (1957) using samples collected by the Calanus Expeditions of 1947-1955 in the Canadian subarctic. He showed that the breeding season, as indicated by mature males and females and the occurrence of new juveniles, extended from January until probably as late as June. However, some breeding was also shown to occur in the early fall, about August to October, and the possibility of continual breeding from August to June remained unconfirmed due to a lack of winter samples. A strong bimodal size distribution was evident in the samples examined. This indicated two reproductively isolated populations and suggested a two-year life cycle. However, Dunbar concluded that the smaller specimens of the breeding population are breeding out-of-phase and therefore have only 18 month life-cycles. Each specimen is believed to breed only once and then die. This species reproduces in the subarctic seas but probably not in the Arctic itself (Dunbar, 1964).

Color: Reddish purple with the center of the eye most heavily pigmented. Body color quickly fades in preservatives but eye color remains.

Apherusa glacialis

Distribution: *A. glacialis* is a very widely distributed circumcan also be infested with this parasite.

Color: Reddish brown or reddish purple, with the center of the eye darkly pigmented. Body color fades slowly in preservatives but eye color persists.

Parathemisto libellula (Lichtenstein)*

Syn: Themisto libellula (Lichtenstein)

Distribution: P. libellula is a circumpolar arctic species that extends into all peripheral seas of the arctic (Dunbar, 1957). It has been found as far south as the Strait of Belle Isle (Bousfield, 1951) and the southeast coast of Iceland (Stephensen, 1923). It is often used as an indicator of cold water masses (Dunbar, 1957 and 1964). Dunbar (1964) remarks that P. libellula is not common in the high arctic but is the predominant species in Hudson Strait, north and east of Baffin Island and in the Hudson Bay. P. libellula is also present in waters of NW Greenland (Dunbar, 1964), NE Greenland (Tencati and Geiger, 1968) and the Beaufort Sea on certain occasions (Shoemaker, 1955). The species is usually found near the surface or in deep waters but not at intermediate depths (Sars, 1895). This species was shown to exhibit a positive phototropic response, being closer to the surface in daylight hours (Bousfield, 1951). Adults of this species are rarely collected in net tows, but are often abundant in stomachs of ring seals (Dunbar, 1941)

*Bowman (1960) attributes the species to Lichtenstein instead of Mandt.

polar species which extends well into subarctic regions (Stephensen, 1931 and Dunbar, 1954). It is usually present in the upper 200 m of water, most frequently being associated with the underside of ice floes (MacGinitie, 1955 and others). Juveniles of this species are usually abundant in the upper 50 m in areas where the species breeds. No data has been compiled on vertical migrations. Barnard (1959) has indicated that polar cod (Boregadus saida Lepechin) appear to selectively feed on this species. It has also been found in the stomachs of seals (MacGinitie, 1955).*

Breeding: Breeding of A. glacialis occurs in the high arctic (Tencati, unpublished) and in the waters of NE Greenland (Tencati and Geiger, 1968). Dunbar (1954) found that in three years of sampling in Ungava Bay by the Calanus expeditions, seventy-three specimens of A. glacialis were collected but no ovigerous females were present. Consequently, breeding does not appear to occur in Ungava Bay. The breeding season, as indicated by ovigerous females in NE Greenland samples and samples from the Arctic basin, appears to be in January and February. Females as small as 6.5 mm are able to breed.

Color: Live and preserved specimens are both largely white with black eyes, however, live specimens may have the last three pereiopods tinted pink.

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*MacGinitie (1955) has noted that A. glacialis is common off Pt. Barrow.

Gammarus wilkitzkii Birula

Description: *Gammarus wilkitzkii* is a circumpolar arctic species which occurs only rarely in the subarctic. When found in the subarctic, it usually occurs at the mouth of rivers (Stephensen, 1940) or near drifting ice (Stephensen, 1944). Gurjanova (1930) considered it to be an arctic form characteristic of waters of low salinity. Dunbar (1964) attributes its success in the Arctic to the fact that it is a herbivore which feeds on algae and organic matter associated with the underside of ice floes. This species is often very abundant in the upper 20 m of water and large numbers can sometimes be collected in baited traps suspended just below the pack ice. In the summer, this species seems to disperse in the water column to depths of about 200 m, so baited traps near the surface are often useless. It seems, then, that the species exhibits a negative phototropic response.

Breeding: This species breeds very successfully in the arctic (Barnard, 1959). Only one brood is produced each year, with eggs being laid as early as December and some young still being found in female brood pouches as late as June. Barnard (1959) hypothesizes a life cycle of more than 6 years for *G. wilkitzkii*, with a total of 6 broods being produced per female. He also notes that this type of breeding and life cycle suggest that predation upon *G. wilkitzkii* in the arctic is minimal.

Cyclocaris guilelmi

Distribution: *Cyclocaris guilelmi* is a deep water Arctic form (Barnard, 1959) which is also found in the subarctic (Stephensen, 1935). Net tows in the high arctic indicate that this species is most abundant between the depths of 1500 m and 500 m, although it is also found outside that range. There is so far no evidence of vertical migrations in this species, and *C. guilelmi* specimens, including juveniles, are rarely if ever captured in the photic (visible light) zone. However, the following procedure, conducted by the author, shows that *C. guilelmi* exhibits a positive phototropic response. A light attached to the frame of a 1/2 M net was lowered to 500 or 1000 m with the net in a vertical position and the light shining toward the surface. After 5 minutes at the desired depth, the net was raised and closed before it had traveled too far. Each tow conducted in this manner resulted in the capture of 5-10 specimens of *C. guilelmi* and no other animals. Larger diameter net sizes would have doubtlessly increased the number collected.

Breeding: Breeding habits of this species are still undetermined. Females with visible brood plates are rare and data so far is too inconclusive to encourage speculation. Collections made by USC workers over the periods September 1965 through September 1966 and September 1967 through May 1968 contain only small numbers of sexually differentiable specimens. No females with large brood plates or carrying eggs or young are present in the USC or University of Washington collections.

Color: Body completely reddish-orange and eyes white in live specimens. The eye soon changes color and often becomes indistinguishable in preserved specimens. Body color is bleached out more slowly. Alcohol (70% ethanol) bleaches out body color much more rapidly than formalin (7-10% formaldehyde).

Pseudalibrotus nanseni

Distribution: This is a relatively common, circumpolar, arctic species. It is a member of the under-ice community, inhabiting the water immediately below the ice-water interface in the fall and winter seasons. During this time, it can be caught in large numbers by suspending baited traps at or just below the ice interface (Barnard, 1959; Mohr and Tibbs, 1963). About the end of January, most P. nanseni migrate downward to an undetermined depth. The relatively few specimens captured between February and October (?) indicate some migrate to depths of 1000 m and below while most appear to be still in the upper 200 m of water. Not quite all descend, however, a few P. nanseni can be caught in surface traps even in summer months. This species is very hardy and would probably be ideal for many laboratory studies, since it is also easily collected.

Breeding: Very little is known about the breeding habits of P. nanseni. Part of the problem is that sex is often undeterminable except in mature females and males. ǂ Barnard (1959) found reproducing females present in the arctic basin in the months of November, December, January, February and May. He also observed that the number of identifiable females and small juveniles (<4 mm) collected in baited traps was always very small, even when large numbers of P. nanseni were collected. It is also noteworthy that many of the specimens examined by the author from deep tows are females with well developed brood plates.

ǂ Breeding in this species seems to be limited to Arctic Basin, as no evidence of breeding was found in water off N. E. Greenland and few P. nanseni were collected by MacGinitie in the relatively shallow water near Barrow. (Shoemaker, 1955; MacGinitie, 1955).

Glossary

1. article: segment of an appendage.
2. dactyl, dactylus: terminal article of an appendage.
3. pereiopod: one of last 5 thoracic appendages.
4. gnathopod: one of first 2 thoracic appendages.
5. uropod: appendage from one of last 3 (4,5,6) abdominal segments.
6. truncate: with a blunt end.
7. ramus: terminal articles of uropods, see Pl. la.
8. serrate: toothed on edge, saw-like.
9. Hyperiidea: suborder of order Amphipoda.
10. Gammaridea: suborder of order Amphipoda.
11. mag.: magnification
12. peduncle: basal article on certain appendages, including antennae and uropods.
13. spinose: having many little spines.
14. telson: flap dorsal to the anus and attached to the last abdominal segment.

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