REPORT NO. B2-15

A TAXONOMIC KEY TO THE BENTHIC AMPHIPODS (CRUSTACEA, AMPHIPODA) INHABITING TUKTOYAKTUK HARBOUR, NORTHWEST TERRITORIES

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NORTHERN OIL AND GAS ACTION PROGRAM

PROJECT B-2: CRITICAL ESTUARINE AND MARINE HABITATS OF THE CANADIAN ARCTIC COASTAL SHELF

SUBPROJECT B-2-3: NEARSHORE BENTHIC MONITORING, BEAUFORT SHELF

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A TAXONOMIC KEY TO THE BENTHIC AMPHIPODS (CRUSTACEA, AMPHIPODA) INHABITING TUKTOYAKTUK HARBOUR, NORTHWEST TERRITORIES

by

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This is a working draft report. Comments and suggestions regarding additions or deletions to this key are being solicited to ensure that the final publication is at once complete, accurate and useful. For this reason permission to cite or reproduce this manuscript in its present form must be obtained from M. Lawrence, Department of Fisheries and Oceans, 501 University Crescent, Winnipeg, Manitoba, R3T 2N6.

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ABSTRACT

The taxonomic key presented is to 11 species and 8 genera of benthic amphipods collected in Tuktoyaktuk Harbour, Northwest Territories. The key is subdivided into a series of dichotomous keys to suborder, family, and species. Pertinent illustrations, references, and species distribution are provided.

KEY WORDS: benthic, amphipods, Tuktoyaktuk Harbour, Northwest Territories, key, taxonomy, distribution

INTRODUCTION

Amphipods comprise a diverse assemblage of animals. The identification to species has proven difficult to many investigators due to the varying taxonomic characters within the order. The key presented is to the benthic amphipods of Tuktoyaktuk Harbour, Northwest Territories.

The intent of the key is to facilitate the ease with which species determinations can be made, thereby eliminating the use of out-of-area and obsolete keys resulting in the questionability of species identification. The key presented is subdivided into a series of dichotomous keys to suborder, family, and to species numbered one to ten. Attention should be focused on the species keys rather than the family key. In the amphipods, familial criteria do not aid in rapid identification since many cases of convergent evolution occur and much time can be spent deciding taxonomically the families to which certain species belong (Barnard 1975). Several taxonomic characteristics are provided in the dichotomous keys to facilitate the ease with which species identification can be made, especially in those instances where damaged specimens are available and crucial body parts may be lost. The keys are intended to provide a reliable means of identification to the adult stages and wherever possible the most conspicuous of reliable taxonomic characters are utilized. The family and species keys have been written to include both sexes.

The key presented is not intended to include an exhaustive species list for the study area, but is a preliminary examination reflecting those specimens obtained in collections from sampling programs conducted in Tuktoyaktuk Harbour by the Department of Fisheries and Oceans, Winnipeg. It also

incorporates those species, whose identification has been verified, reported in both unpublished (Thomas et al. 1981) and published (Wacasey 1975; Wacasey et al. 1977; Sutherland 1982) accounts from previous research conducted in the harbour. The species list presented does not reflect only those species that are strictly benthic. Some species typically defined as pelagic have also been included, reflecting the overlap between the pelagic and benthic environments and/or contamination of sampling techniques, and perhaps misidentification. Several pelagic species undergo diurnal vertical migration indicating that the time of day sampling is undertaken will contribute towards the observed benthic/pelagic overlap.

The key will be updated in future studies to include specimens from present and possible future sampling programs being conducted in the harbour, eventually providing an exhaustive and thorough examination of all benthic amphipod species inhabiting Tuktoyaktuk Harbour.

SITE DESCRIPTION: TUKTOYAKTUK HARBOUR, N.W.T.

Tuktoyaktuk Harbour (133°W, 69°N) is situated on the eastern edge of the Mackenzie River Delta. The harbour is approximately 6.5 km long and 1.8 km wide (Bond 1982). The maximum recorded depth is 26 m, but the common depth encountered in the harbour is 10 m (Barber 1968) prior to recent dredging operations; the bottom sediment is predominantly silt-clay (Thomas et al. 1981).

Two narrow channels, the eastern and western entrance, at the harbour mouth maintain a seaward connection. The surface waters of the harbour are influenced by the Mackenzie River outflow resulting in highly variable salinity fluctuations culminating in a sharp halocline separating upper and deeper waters. Surface waters are also influenced by runoff from the three major inlets, Freshwater Creek, Mayogiak Inlet, and Reindeer Creek. Barber (1968) suggests that introduced ground water may also influence the salinity of the harbour waters. The upper water salinity ranges from 1 $g.L^{-1}$ to 13.7 $g.L^{-1}$ in the summer months, while in deep waters it exceeds 30 $g.L^{-1}$ (Bond 1982). The surface water temperature ranges up to 15°C in summer and averages 0°C in winter while the bottom temperature ranges from 0°C in summer to -0.5°C in winter (Bond 1982). Tides in the harbour are semi-diurnal (Dohler 1964).

METHODOLOGY

COLLECTION, PRESERVATION, PREPARATION

A trawl or sledge is employed for qualitative sampling of epifaunal amphipods and a grab, dredge, or corer for quantitative sampling of infaunal amphipods. A combination of sampling methods insures that a representative sample is obtained. It is important to sample continuously throughout the year, when possible, to obtain specimens representing all life cycle stages.

Those samples obtained from a grab, dredge, or corer are washed through a series of sieves with great care to avoid damaging specimens and are then manually sorted. Specimens are preserved in a 5-10% formaldehyde solution or 70% ethanol. Alcohol, however, does have a tendency to bleach out body pigments which may be useful in species identification. The addition of a dye, such as Rose Bengal, to the preservative will enhance the clarity of those body parts required for species identification.

Reliable species identification requires systematic examination and dissection. The entire procedure for dissecting an amphipod is well described by Barnard (1969), Appendix I (p. 507-511) and a checklist of characters to be examined prior to using the key in Appendix II (p. 512-519). The body parts required for taxonomic identification are prepared for examination as temporary, semipermanent, or permanent mounts. Glycerin or 7% ethylene glycol is used as a temporary mounting medium and CMC-10, Euparol, or Canada balsam are good when preparing semipermanent and permanent slide mounts (Bousfield 1973). The dissection of mouth parts has been avoided in this key because of their diminutiveness. Their dissection requires experience to avoid damage, e.g. mandibles are brittle and easily shattered and the lower lip is easily destroyed by tearing when removing maxilla 1 (Barnard 1975).

TAXONOMIC CRITERIA

The basic gammaridean and hyperiid amphipod is illustrated in Fig. 1 and 2, respectively. In amphipods, due to the lack of a carapace, seven distinct pereonites are visible each bearing a pair of appendages, either gnathopods or pereiopods, which vary in structure and size among species. The shape and size of the coxal plates is a taxonomic criterion at certain familial levels, e.g. Pontogeneiidae. Paired pleopods located on each of the pleonites are biramous, the rami being multisegmented and setose. Variations in the size and structure of pleopods are slight among species and are used in the generic and familial characteristics for the Phliantidae, Talitroidae, and some Corophiidae (Barnard 1969). Uropods vary from 2-3 pairs depending on the species; the third pair may be reduced in size and structure and are absent in some sedentary species; the telson is of taxonomic importance depending on whether it is cleft, entire, emarginate, and/or ornate. The presence or absence of the accessory flagellum and when present the number of articulations is of importance at the familial level.

Major ornamentation of the body including the shape and size of the rostrum, differentiation of lateral cephalic lobes, peduncle processes, and cuspidation of the epimeral plates varies among species. Dorsal ornamentation, common among cold water gammarideans, occurs in the form of a sharp ridge or cusps on the pereonites and/or pleonites.

The absence of eyes is not important taxonomically since many bathyal species are known to be eyeless. Sessile compound eyes are typical in most amphipods, however in the Hyperiidea the eyes are large shielding most of the head.

Males are sexed by the presence of a pair of small penial structures, occasionally minutely setose, attached to the coxae of pereonite 7. Ovigerous females can be readily identified by the presence of a ventral brood pouch. When sexual dimorphism of body parts occurs within a species there will be structural differences in the male gnathopod 2, being larger and more spinose and/or setulose; antennae of males are longer, uropod 3 is more setulose, and the eyes are larger compared with the females (Barnard 1975).

SYSTEMATIC LIST

ORDER AMPHIPODA

SUBORDER GAMMARIDEA

Family Amphilochidae

Astyra sp.

Family Calliopidae

Apherusa glacialis (Hansen)

Family Gammaridae

Gammaracanthus loricatus gp. (Sabine)

Gammarus wilkitzkii (Birula)

Family Haustoriidae

Pontoporeia affinis gp. (Lindstrom)

Pontoporeia femorata gp. Krøyer

Family Lysianassidae

Anonyx sp.

Boeckosimus affinis (Hansen)

Onisimus glacialis Sars

Onisimus litoralis (Krøyer)

Onisimus nanseni Sars

Family Oedicerotidae

Aceroides latipes Sars

Arrhinopsis sp.

Monoculodes sp.

Oediceros sp.

Paroediceros lynceus (M. Sars)

Family Photidae

Protomedeia sp.

Family Stenothoidae

Metopa sp.

SUBORDER HYPERIIDEA

Family Hyperiidae

Hyperia sp.

KEY TO SUBORDERS OF AMPHIPODA

Eyes, large shielding >75% of head; coxae reduced ..... Hyperiidea
(Key 1, p. 8)

Eyes, medium or small shielding <50% of head; coxae usually large ..... Gammaridea
(Key 2, p. 9)

KEY 1: HYPERIIDEA

One genus of the family Hyperiidae has been reported thus far in Tuktoyaktuk Harbour.

Hyperia Latreille

Body smooth; antenna 2 longer than antenna 1 for both sexes, antennae of male longer than those of female; gnathopod 1, subchelate or barely chelate; gnathopod 2, chelate, carpal process spatulate; pereiopods 3-5 shorter than pereiopods 1-2; coxal plates not fused to pereonites; uropod 3, inner ramous broad.

References: Sars 1895; Stephensen 1942; Yashnov 1948; Tencati 1970; Gosner 1971; Bowman 1973; Bowman and Gruner 1973.

KEY 2: KEY TO SOME COMMON FAMILIES OF GAMMARIDEAN AMPHIPODS

1a. Coxa 4 largest 5

1b. Coxa 4 not largest 2

2a. Gnathopod 2, carpus and propodus bearing scales or minute coarse setulae; propodus of gnathopod 2 elongate ..... Lysianassidae (Key 3, p. 11)

2b. Gnathopod 2, carpus and propodus not bearing scales or minute coarse setulae; propodus of gnathopod 2 not elongate 3

3a. Antennae, posterior edge setose; uropod 3 usually shorter than uropods 1 or 2 ..... Photidae (Key 4, p. 15)

3b. Antennae, posterior edge not setose; uropod 3 highly variable 4

4a. Pereiopod 4 longest; pereiopods 1-5, broad, spinose and setose - fossorial ..... Haustoriidae (Key 5, p. 16)

4b. Pereiopod 4 not longest; pereiopods 3-5 successively increasing in length, not fossorial ..... Gammaridae

(Key 6, p. 18)

5a. Coxa 1 very small shielded by coxa 2 7

5b. Coxa 1 as large as coxa 2 6

6a. Uropod 3, uniramous; pereiopod 3, basis elongate ..... Stenothoidae

(Key 7, p. 21)

6b. Uropod 3, biramous; pereiopod 3, basis not elongate ..... Amphilochidae

(Key 8, p. 21)

7a. Uropod 3, peduncle elongate, rostrum conspicuous, strong ..... Oedicerotidae

(Key 9, p. 22)

7b. Uropod 3, peduncle not elongate, rostrum inconspicuous, weak ..... Calliopidae

(Key 10, p. 25)

KEY 3: LYSIANASSIDAE

1a. Telson deeply cleft; epimeral plate 3, posterior corner produces a reflexed spine ..... *Anonyx* sp.

1b. Telson entire, maybe slightly emarginate; epimeral plate 3, does not produce a reflexed spine 2

2a. Gnathopod 2, densely setose; gnathopod 1, palm bearing a row of small spines with several large spines interspersed ..... *Boeckosimus affinis* (Hansen) (Plates III, IV)

2b. Gnathopod 2, not densely setose; gnathopod 1, palm not bearing a row of large and small spines 3

3a. Urosome 1, saddle-like depression dorsally; pereiopods 3, 4, 5, basis coarsely serrated ..... *Onisimus nanseni* Sars (Plates V, VI)

3b. Urosome 1, slight depression dorsally; pereiopods 3, 4, 5, basis finely serrated 4

4a. Uropod 2, inner ramous elongate, slender, outer ramous proximal half coarsely serrated, distal half spiniform, a large spine located medially ..... Onisimus litoralis (Krøyer) (Plates VII, VIII)

4b. Uropod 2, inner and outer rami similar ..... Onisimus glacialis Sars (Plates IX, X)

Anonyx Krøyer

Head, interantennal lobe pronounced; eye large, spatulate; antenna 2 longer than antenna 1; gnathopods weakly subchelate; pereiopods 3-5 successively increasing in length; epimeral plate 3, posterior corner produces a reflexed spine; uropod 2, inner ramous proximal half bears a notch, telson deeply cleft.

References: Sars 1895; Stephensen 1942; Shoemaker 1955; Barnard 1969; Gosner 1971; Bousfield 1973.

Boeckosimus affinis (Hansen) Plates III, IV Fig. 3

Body smooth; head, lateral lobes rounded; eye, spatulate, pigment red; antenna 2 slightly longer than antenna 1, antennae 1, 2, 2 setae per fascicle posteriorly, 1 seta per fascicle anteriorly; antennae 1, 24-30 articulations for male, 19 articulations for female; accessory flagellum, 3 articulations; antenna 2, 30-38 articulations for male, 24 articulations for female; gnatho-

pod 1, propodus slightly convex anteriorly, concave posteriorly, palm bearing a row of small spines interspersed with several large spines, dactylus, inner edge bearing a spine located medially, finely serrated proximally; gnathopod 2, propodus and carpus densely setose; coxa 1, lower anterior corner produced, coxae 2-4, slightly expanded distally, coxae 5-7, reduced; pereiopods 1, 2, setose posteriorly, pereiopods 3, 4, 5, basis expanded, finely serrated posteriorly; epimeral plate 3, posterior corner rounded; telson, entire, slightly emarginate, apically bearing 4 spines; adult female length 10-12 mm.

Distribution: Tuktoyaktuk Harbour; Demarcation Pt. and Collinson Pt., Alaska; Kara Sea; Ungava Bay; Bering Strait; northeast Greenland; King William Island.

References: Shoemaker 1920, 1955; Dunbar 1954.

Onisimus nanseni Sars — Plates V, VI; Fig. 4

Body smooth; head with lateral lobes prominent; eyes medium, oval; antenna 2 longer than antenna 1, antenna 1, 17 articulations for female; antenna 2, 19 articulations for female; accessory flagellum, 3 articulations; gnathopod 1, propodus distally elongated, dactylus inner edge finely serrated proximally, gnathopod 2, carpus distally bearing long setae, propodus transversally truncated distally, densely setose, dactylus located medially; coxa 1, slightly expanded, coxae 5-7, reduced; pereiopods 3, 4, 5, basis expanded, coarsely serrated on posterior edge, pereiopod 5 slightly shorter in length than pereiopod 3 or 4; urosome 1, dorsally with a distinct saddle-like depression; uropod 3, shorter in length than uropods 1 or 2; telson, entire, slightly emarginate, distally bearing 2 spines; adult female length 10-14 mm.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Ungava Bay; Pt. Barrow, Alaska; east Greenland; Iceland; Kara Sea; Franz Josef Fjord.

References: Sars 1900; Stephensen 1942, 1944; Shoemaker 1920; Dunbar 1954; Tencati and Geiger 1968; Tencati 1970.

Onisimus litoralis (Krøyer) Plates VII, VIII

Fig. 5

Body glabrous; head, lateral corner slightly produced; eyes, small, oval, pigment red; antenna 2 slightly longer than antenna 1; antenna 2, 16 articulations for female, antenna 1, 14 articulations for female, accessory flagellum 5 articulations; gnathopod 1, powerful, propodus quadrangular, longer than carpus, palm bears several spines, dactylus inner edge bears 1 large spine medially, finely serrated proximally; gnathopod 2 oblong, propodus length shorter than carpus; coxa 1 expanded distally, coxae 2-4 narrow, coxa 5 rounded quadrangular, coxae 6-7, reduced; urosome 1 dorsally, slightly depressed; pereiopods 1, 2, propodus, elongate, concave; pereiopods 3, 4, 5, slender; pereiopod 4 longest, propodus elongate, slender; uropod 2, outer ramous proximal half serrated bearing 3 spines, distal half spiniform, inner ramous elongate, slender; epimeral plate 3, posterior corner produced; telson, entire, oblong, slightly emarginate, distally bearing 2 spines; adult female length 11-13 mm.

Distribution: Tuktoyaktuk Harbour; Collinson Pt., Alaska; Bernard Harbour, N.W.T.; James Bay; Hudson Bay; Ungava Bay; Labrador; east Greenland; Kara Sea; Norway; Franz Josef Fjord; Novaja Zemlya.

References: Sars 1895; Shoemaker 1920, 1926, 1955; Stephensen 1942, 1944; Dunbar 1954; Barnard 1969; Tencati 1970.

Onisimus glacialis Sars Plates IX, X

Fig. 6

Body smooth; head with lateral lobes distinctly angular; eyes, medium oval; antennae 1, 2, equal, 14 articulations for female; accessory flagellum, 3 articulations; gnathopod 1, carpus reduced, propodus triangular; gnathopod 2, propodus obliquely truncated distally, dactylus located on lower anterior corner; coxa 1, broad, anterolateral corners rounded; coxa 5 twice as large as coxa 7; pereiopods 3, 4, 5, basis expanded, finely serrated on posterior edge; urosome 1 dorsally, slightly depressed; uropod 3, inner and outer rami lacking marginal setae; telson, entire, obovate, distally bearing 2 spines; adult female length 11-13 mm; arctic, circumpolar species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Lancaster Sound; Pond Inlet; western Baffin Bay; Ungava Bay; Pt. Barrow, Alaska; east Greenland; Iceland; Franz Josef Fjord.

References: Sars 1900; Shoemaker 1920; Stephensen 1942, 1944; Dunbar 1954; Tencati 1970; Bradstreet 1982; Bradstreet and Cross 1982; Cross 1982.

KEY 4: PHOTIDAE

One genus of the family Photidae has been reported thus far in Tuktoyaktuk Harbour.

Protomedeia Krøyer

Body slender; head, anterior lobe truncated; eyes small; antenna 1 longer than antenna 2; accessory flagellum present; gnathopods, slender and densely setose for female; gnathopod 2 larger than gnathopod 1, basis beset with long setae; coxal plates small; pereiopods 1,2, densely setose, pereiopods 3, 4, 5, successively increasing in length; uropod 3, rami spinose; telson entire.

References: Sars 1895; Shoemaker 1955; Bousfield 1973.

KEY 5: HAUSTORIIDAE

Urosome 1, bifid cusp dorsad; accessory flagellum biarticulate; coxa 5, anterior lobe narrowing distally; eye, reniform, red ..... Pontoporeia femorata gp.* Krøyer (Plates XI, XII)

Urosome 1, bifid cusp lacking; accessory flagellum triarticulate; coxa 5, anterior lobe rounded distally; eye, medium, black ..... Pontoporeia affinis gp.* (Lindstrom) (Plates XIII, XIV)

* Studies to date have indicated that two species of Pontoporeia, P. femorata and P. affinis, are composed of a complex of closely related species (pers. comm. Dr. E.L. Bousfield). Until they are properly separated, the species are provisionally labelled with gp. following the species name.

Pontoporeia femorata gp. Krøyer — Plates XI, XII

Fig. 7

Body glabrous, moderately compressed; eyes, reniform, bright red pigment; antennae bearing arborescent-type setae on posterior edge; antenna 1, 8 articulations for female, antenna 2, 19 articulations for female; accessory flagellum small, biarticulate; gnathopods feeble; gnathopod 2, carpus elongate; pereiopod 5, basis expanded, larger than remaining pereiopodal segments, bearing long setae on posterior edge; coxal plates, 1-4, oblong, 5th posteriorly excavated, anteriorly produced, 6-7th reduced; urosome 1, dorsally bearing a bifid cusp; telson, broad, cleft extending beyond mid-length, each lobe bearing 1 large spine; adult female length 6-8 mm; arctic, circumpolar species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Prudhoe Bay, Alaska; Jones Sound; Baffin Island; James Bay; Ungava Bay; Labrador; Baltic Sea; Kara Sea; Laptev Sea; Sea of Japan; White Sea; Spitsbergen; east Greenland; Norway.

References: Sars 1895; Shoemaker 1920, 1926, 1955; Stepehensen 1942, 1944; Dunbar 1954; Barnard 1969; Gosner 1971; Bousfield 1973; Busdosh et al. 1982.

Pontoporeia affinis gp. (Lindstrom) — Plates XIII, XIV

Fig. 8

Body compressed; head, lateral corners rounded; eyes medium, reniform, pigment black; antenna 1, 22 articulations for female, antenna 2, 27 articulations for female; antennae bearing arborescent-type setae on posterior edge; antennae for males divided into greater number of articulations with flagellum

more elongate than for females; accessory flagellum, 4 articulations; gnathopods feeble, gnathopod 1, propodus oval; gnathopod 2, carpus elongated; coxal plates, 1st pair distally expanded, 5th-7th pairs reduced; pereiopod 5, basis expanded, bearing long setae on posterior edge; urosome 1, bifid cusp lacking; uropods, rami bearing minute spines, 3 spines located on the apex; telson, small, broad, cleft extending to mid-length, each lobe bearing 4 spines; adult female length 10-12 mm.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Prudhoe Bay, Alaska; Ungava Bay; Baltic Sea; Kara Sea; many freshwater lakes in Canada and United States; Sweden; Finland; Russia.

References: Sars 1895; Shoemaker 1920; Stephensen 1942; Dunbar 1954; Bousfield 1958, 1973; Segerstrale 1962, 1977; Barnard 1969; Dadswell 1974; Busdosh et al. 1982.

KEY 6: GAMMARIDAE

Dorsal keel present; head, lateral corner with tuberculate projection; gnathopods equal ..... Gammaracanthus loricatus gp.* (Sabine) (Plates XV, XVI)

Dorsal keel absent; head, excavated above antenna 2 base, less acute at antenna 1 base; gnathopods subequal ..... Gammarus wilkitzkii (Birula) (Plates XVII, XVIII)

* Studies to date have indicated that Gammaracanthus loricatus is composed of a complex of at least 4 closely related species (pers. comm. Dr. E.L. Bousfield). Until it is properly separated, the species is provisionally labelled with gp. following the species name.

Gammaracanthus loricatus gp. (Sabine) Plates XV, XVI

Fig. 9

Body slender; dorsal keel pronounced posteriorly from 5th pereonite; head, lateral corner with a tuberculate projection; rostrum, strong, slightly curved; eyes small, round, pigment black; antenna 1, 42 articulations for male; peduncle segments distally reduced, accessory flagellum 4 articulations; antenna 2, 15 articulations for male; gnathopods 1, 2, equal, carpus, small produced as a narrow setiferous lobe more pronounced in gnathopod 2, propodus large narrowed distally, palm setose, dactylus longer in gnathopod 1 than in gnathopod 2; anterior coxal plates oblong quadrangular, 5th and 6th coxal plates, lateral corner excavated, 7th plate reduced; pereiopods 1, 2, slightly longer than gnathopods; pereiopods 3, 4, 5, slender and elongate; pereiopod 4 longest; uropod 3, large, rami obovate, setose; telson, small, widely cleft, bearing 3 spines per lobe; male length 35-40 mm; shallow water arctic and subarctic circumpolar species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Collinson Pt., Alaska; some freshwater lakes in North America; Frobisher Bay; Hudson Bay; Jones Sound; Prince Regent Inlet; Baffin Bay; Davis Strait; Barnard Harbour; east and west Greenland; west Baffin Bay; Lancaster Sound; White Sea; Barents Sea; Franz Josef Fjord; Novaja Zemlya; Labrador.

References: Sars 1895; Shoemaker 1920, 1926, 1955; Stephensen 1942, 1944; Dunbar 1954; Barnard 1969; Tencati 1970; Dadswell 1974; Bradstreet 1982.

Gammarus wilkitzkii (Birula) Plates XVII, XVIII

Fig. 10

Body slender; head, excavated above base of antenna 2, less acute at antenna 1 base; eyes, reniform, pigment black; antennae 1, 2, densely setose on posterior edge; antenna 1, 35 articulations for male; accessory flagellum 5 articulations, antenna 2, 16 articulations for male, peduncle 3 elongate; gnathopod 1, propodus triangularly oval; gnathopod 2, broader and larger than gnathopod 1; gnathopods 1, 2 for male, palm bears single spine located medially; urosomes, dorsally bearing fascicles containing spines and long straight setae; uropod 3, rami equal, beset with long feathery setae; telson deeply cleft, each lobe bears 1 basal, 1 subapical, and 3 apical spines; male length 17-24 mm; circumpolar, arctic species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Lancaster Sound; west Baffin Bay; Pond Inlet; central arctic basin; Alert Bay; northern Ellesmere Island; Jones Sound; east Greenland; northern Iceland; northern Norway; Spitsbergen; Kara Sea; Novaja Zemlya; Laptev Sea.

References: Stephensen 1942, 1944; Dunbar 1954; Tencati and Geiger 1968; Tencati 1970; Steele and Steele 1975; Kulikov 1980; Bradstreet 1982; Bradstreet and Cross 1982; Cross 1982.

KEY 7: STENOTHOIDAE

One genus of the family Stenothoidae has been reported thus far in Tuktoyaktuk Harbour.

Metopa Boeck

Antennae elongate; accessory flagellum lacking; gnathopod 1 simple or weakly subchelate; gnathopod 2 usually subchelate; coxae 2, 3, large, coxa 4 largest; pereiopods 4, 5, basis expanded distally; pereiopod 4 longest; uropod 2, inner ramous longer than outer ramous; telson entire.

References: Sars 1895; Stephensen 1942; Shoemaker 1955; Gosner 1971; Bousfield 1973.

KEY 8: AMPHILOCHIDAE

One genus of the family Amphilochidae has been reported thus far in Tuktoyaktuk Harbour.

Astyra Boeck

Body stout, pellucid; eyes lacking; antennae subequal; accessory flagellum present; gnathopods feeble, subequal, slightly subchelate; coxa 1 larger than coxa 2 or 3, coxa 4 distally truncated; pereiopods 3, 4, 5, longer than pereiopods 1, 2; uropods, rami lanceolate, setose; telson deeply cleft.

References: Sars 1895; Stephensen 1942; Barnard 1969.

KEY 9: OEDICEROTIDAE

1a. Rostrum large, sharp, deflexed; eyes contiguous located distally on rostrum ..... *Monoculodes* sp.

1b. Rostrum lacking or rudimentary; eyes not located on rostrum 2

2a. Antenna 1 longer than antenna 2; pereiopods 1, 2, longer than pereiopods 3, 4 ..... *Aceroides latipes* Sars (Plates XIX, XX)

2b. Antenna 1 not longer than antenna 2; pereiopods 1, 2 not longer than pereiopods 3, 4 3

3a. Pleon, slight keel dorsally; pereiopod 5 longest, basis broad posterior edge setose; eyes present ..... *Paroediceros lynceus* (M. Sars) (Plates XXI, XXII)

3b. Pleon, keel absent; pereiopod 4 longest; eyes lacking ..... *Arrhinopsis* sp.

Monoculodes Stimpson

Body slender; rostrum sharp, deflexed; eyes contiguous located distally on rostrum; antenna 2 longer than antenna 1; gnathopods stout, unequal in structure; gnathopod 2 large; gnathopod 1, small, stout; coxal plates successively increasing in size to 4th pair; coxa 5, large, bilobed; pereiopod 5 longest; telson entire.

References: Sars 1895; Stephensen 1942; Gosner 1971; Bousfield 1973.

Aceroides latipes Sars Plates XIX, XX

Fig. 11

Body slightly inflated; anterior segments of pereon narrow; head length equals first three pereonites; rostrum very small, acute; eyes lacking; antenna 1, 12 articulations with 2 setae present on 12th article for female, antenna 2, 10 articulations for female; gnathopod 1, propodus obovate longer than carpus, gnathopods 1, 2, carpus distally produced; coxae 1-6, reduced, coxa 7 expanded; pereiopods 1, 2 large, strong, merus expanded distally edged with setae, carpus broad, short, heart-shaped edged with spiniform setae, propodus expands distally edged with bristles, dactylus large; pereiopods 3, 4 small, feeble, subequal in structure and size; pereiopod 5 longest, basis large, oval; uropod rami slender edged with few spinules; telson entire, quadrangular, 4 spines apically; total body up to 8-10 mm; arctic and subarctic, circumpolar species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Collinson Pt., Alaska; Ungava Bay; northern Norway; Spitsbergen; White Sea; Kara Sea; west Greenland.

References: Sars 1895; Shoemaker 1920; Stephensen 1942; Dunbar 1954; Barnard 1969; Bousfield 1973.

Paroediceros lynceus (M. Sars) Plates XXI, XXII

Fig. 12

Body with dark transverse bands of pigment; pleon dorsally bearing a slight keel; rostrum rudimentary; head, lateral corners produced acutely; eyes, large, contiguous, located distally on the rostrum; antenna 2 longer than antenna 1; antenna 1, 19 articulations for male, antenna 2, 88 articulations for male; gnathopods equal, powerful, gnathopod 1, propodus three times length of preceeding segments, gnathopod 2, propodus obovate, carpus distally produced; coxal plates, 1st pair expanded distally, 3 succeeding pairs quadrangular, 3 posterior pairs reduced; pereiopods slender; pereiopods 1, 2, shorter than pereiopods 3, 4, pereiopod 5 longest, basis broad with posterior edge setose; uropod 3, inner ramous bearing two spines; telson entire, quadrangular, bearing 2 spines apically; adult male length 21-23 mm.

Distribution: Tuktoyaktuk Harbour; Collinson Pt., Alaska; Jones Sound; Ungava Bay; Labrador; Iceland, Spitsbergen; Kara Sea; Laptev Sea; Siberian Sea; Norway; Franz Josef Fjord; Barents Sea; east and west Greenland; Baffin Island; Sea of Japan.

References: Sars 1895; Shoemaker 1920, 1930; Stephensen 1942, 1944; Dunbar 1954; Gosner 1971; Bousfield 1973.

Arrhinopsis Stappers

Rostrum lacking; eyeless; antenna 2 longer than antenna 1, peduncle segments reduced; gnathopods similar, subchelate, carpal process extending to palm; pereiopods 1, 2, basis expanded distally; pereiopods 3, 4, basis ovate; telson entire, slightly emarginate.

References: Stephensen 1942; Barnard 1969.

KEY 10: CALLIOPIDAE

One species of the family Calliopidae has been reported thus far in Tuktoyaktuk Harbour.

Apherusa glacialis (Hansen) Plates XXIII, XXIV

Fig. 13

Body slender; head, bearing a deep notch at antenna 2 base; rostrum short; eyes medium, round, pigment dark brown; antenna 2 longer in length than antenna 1; antenna 1, peduncle segment 3 shorter in length than segments 1 or 2; antenna 2, peduncle segments slightly longer than for antenna 1; antenna 1, 18 articulations for male, antenna 2, 28 articulations for male; coxal plates 1-4, rounded quadrangularly, 5-6 excavated distally, 7 rounded quadrangularly; gnathopods feeble, similar in size and structure, carpus elongate, densely setose on posterior edge; pereiopod 5 longest, propodus minutely serrated on anterior edge bearing 2 to 3 spines per fascicle; epimeral plates, posterior corner produced; epimeral plate 3, bearing few setae on posterior corner;

uropods, not elongated, setose; telson entire, obovate, distally bearing 2 spines; body length up to 10 mm; pelagic, arctic, circumpolar species.

Distribution: Beaufort Sea; Tuktoyaktuk Harbour; Pt. Barrow, Alaska; central Arctic basin; Pond Inlet; Jones Sound; Gulf of St. Lawrence; Lancaster Sound; west Baffin Bay; Greenland; Spitsbergen; Novaja Zemlya; Franz Josef Fjord.

References: Stephensen 1942, 1944; Dunbar 1954; Shoemaker 1955; Tencati and Geiger 1968; Barnard 1969; Tencati 1970; Bousfield 1973; Kalikov 1980; Bradstreet 1982; Bradstreet and Cross 1982; Cross 1982.

PLATES

ABBREVIATIONS USED IN PLATES

a	antenna
cp	coxal plate
ep	epimeral plate
g	gnathopod
h	head
p	pereiopod
t	telson
TL	total body length
us	urosome
ur	uropod
2	2nd segment of the pereiopod, termed the basis
5	5th segment of the gnathopod, termed the carpus
6	6th segment of the gnathopod, termed the propodus

PLATE I

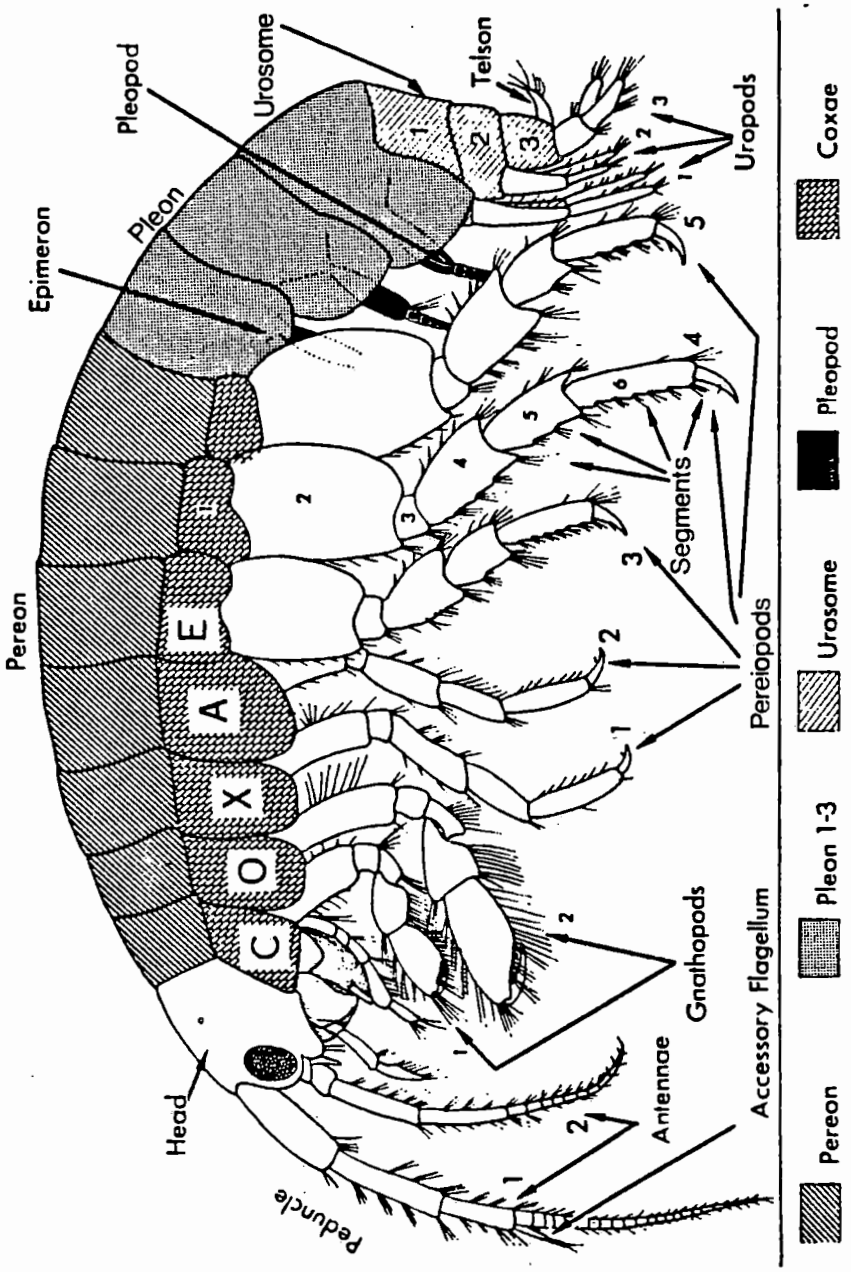


FIG. 1 The basic gammaridean
(modified from Barnard 1975)

PLATE II

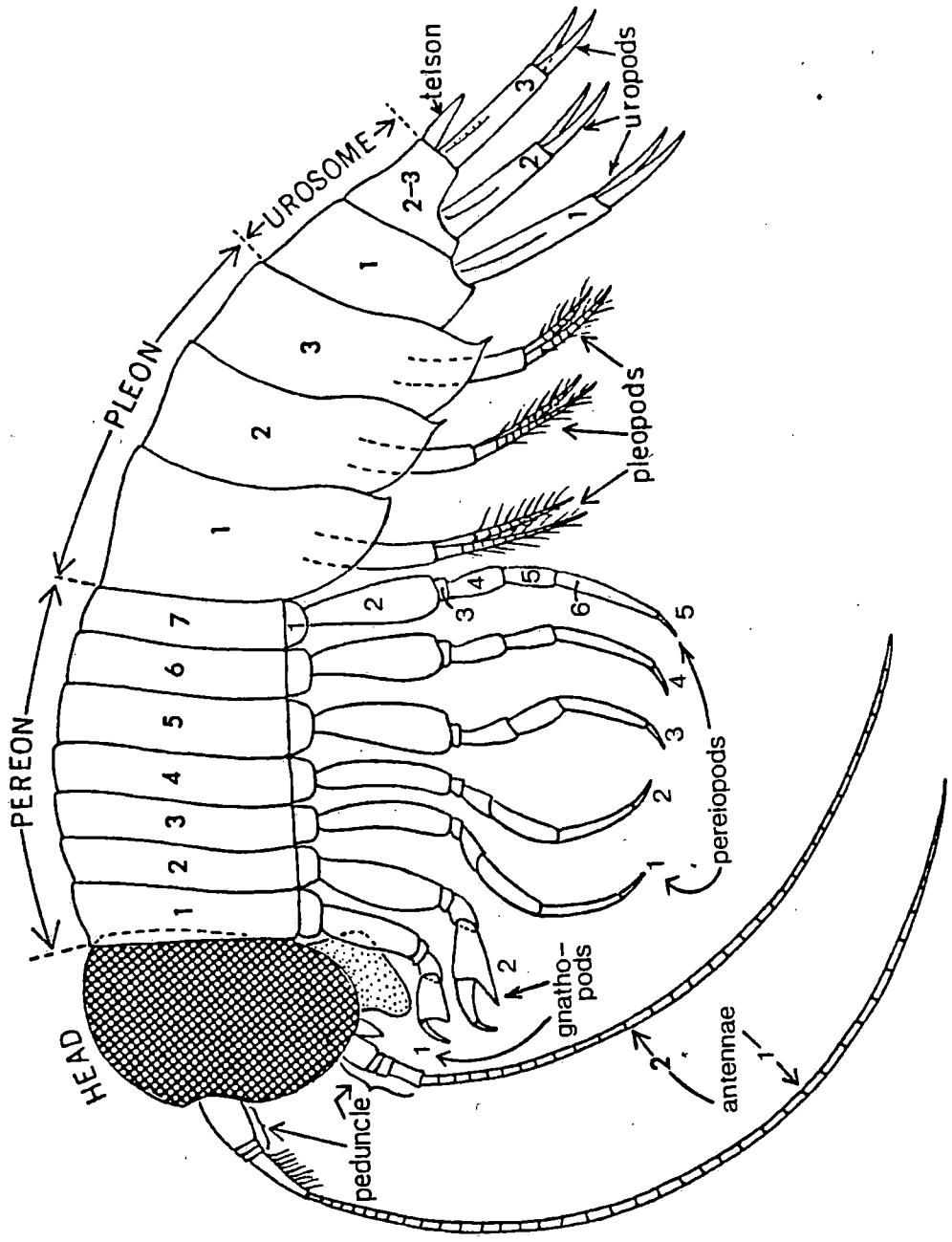


FIG. 2 The basic hyperiid
(modified from Bowman 1973)

PLATE III

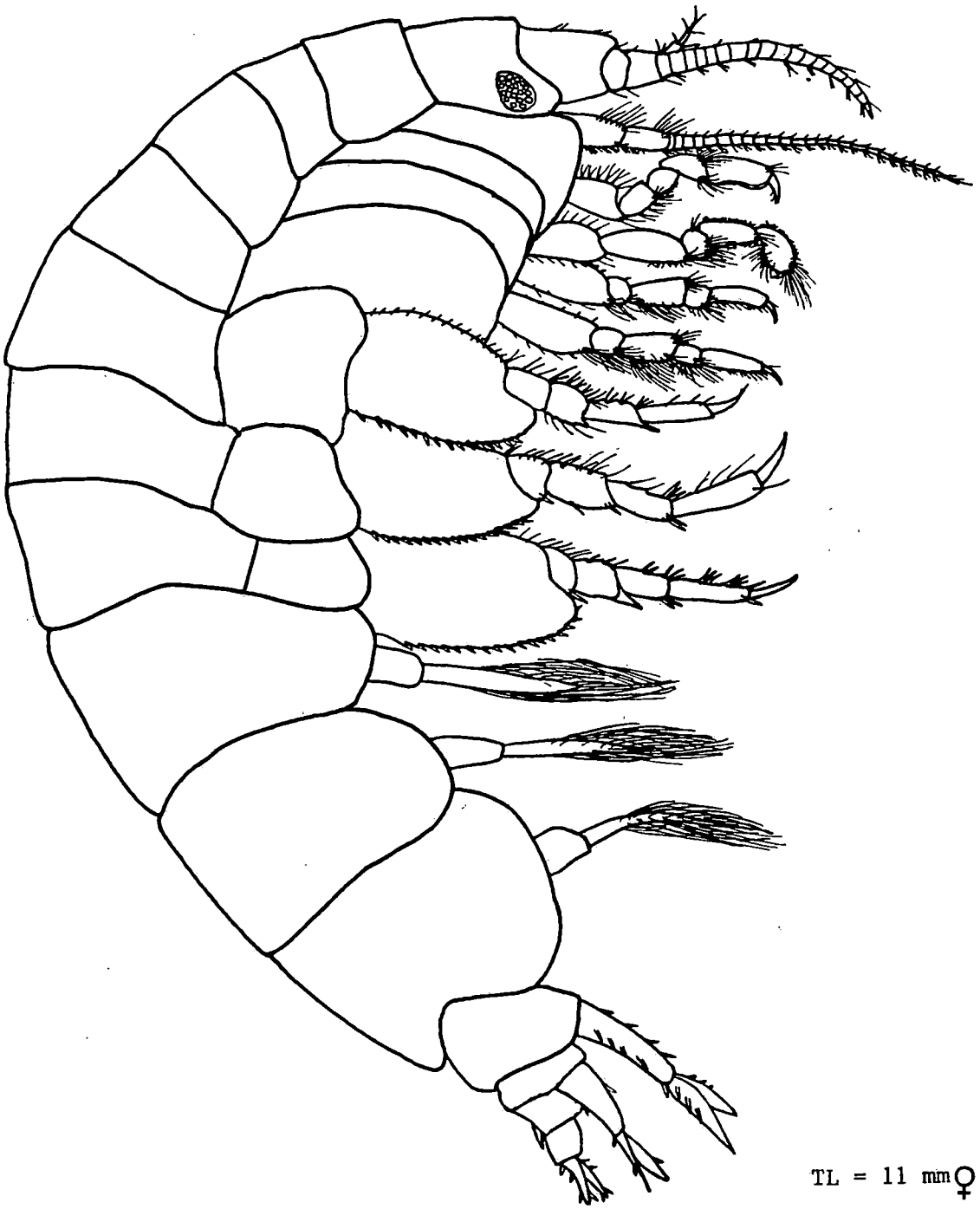


FIG. 3a Boeckosimus affinis (Hansen)

PLATE IV

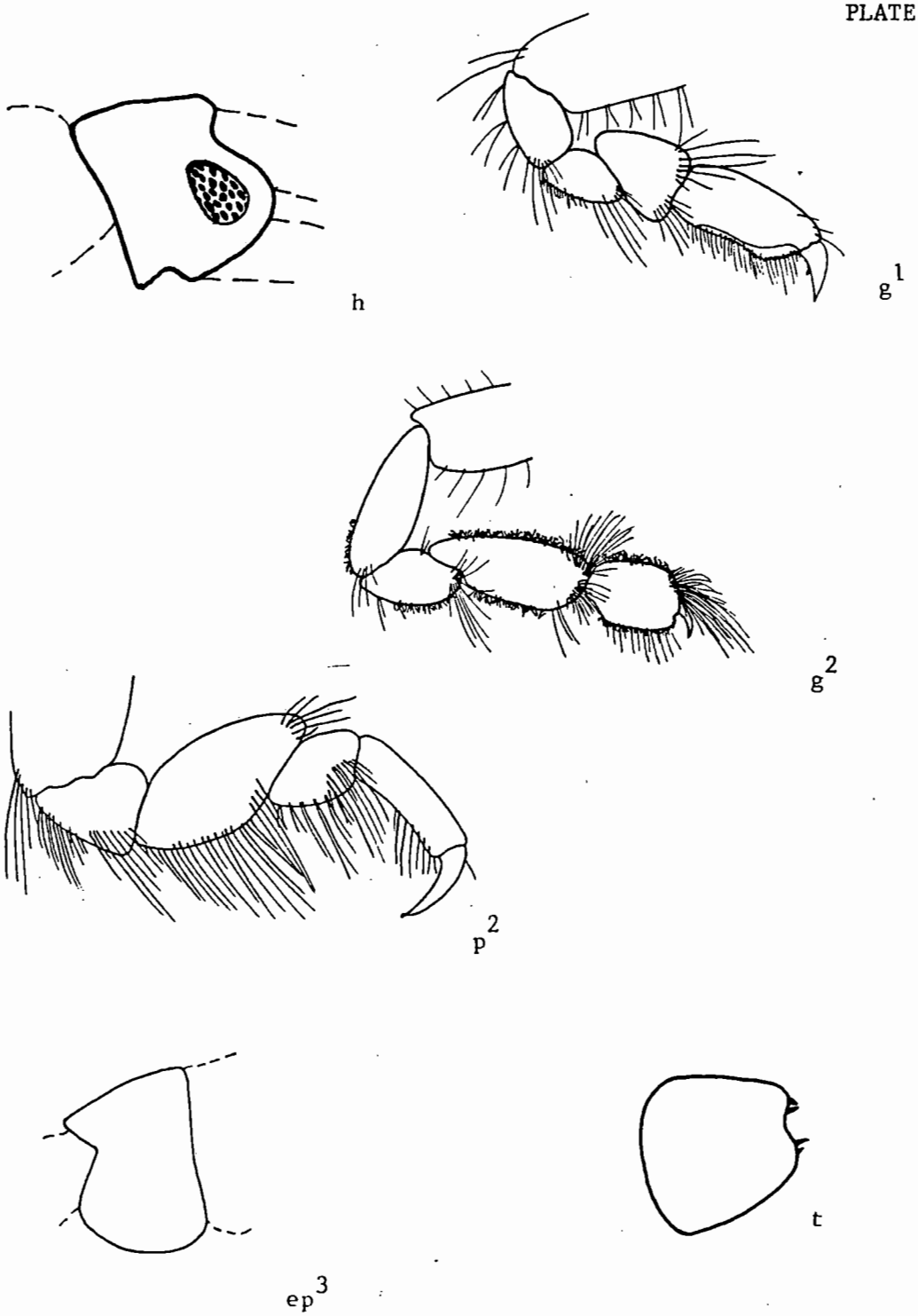
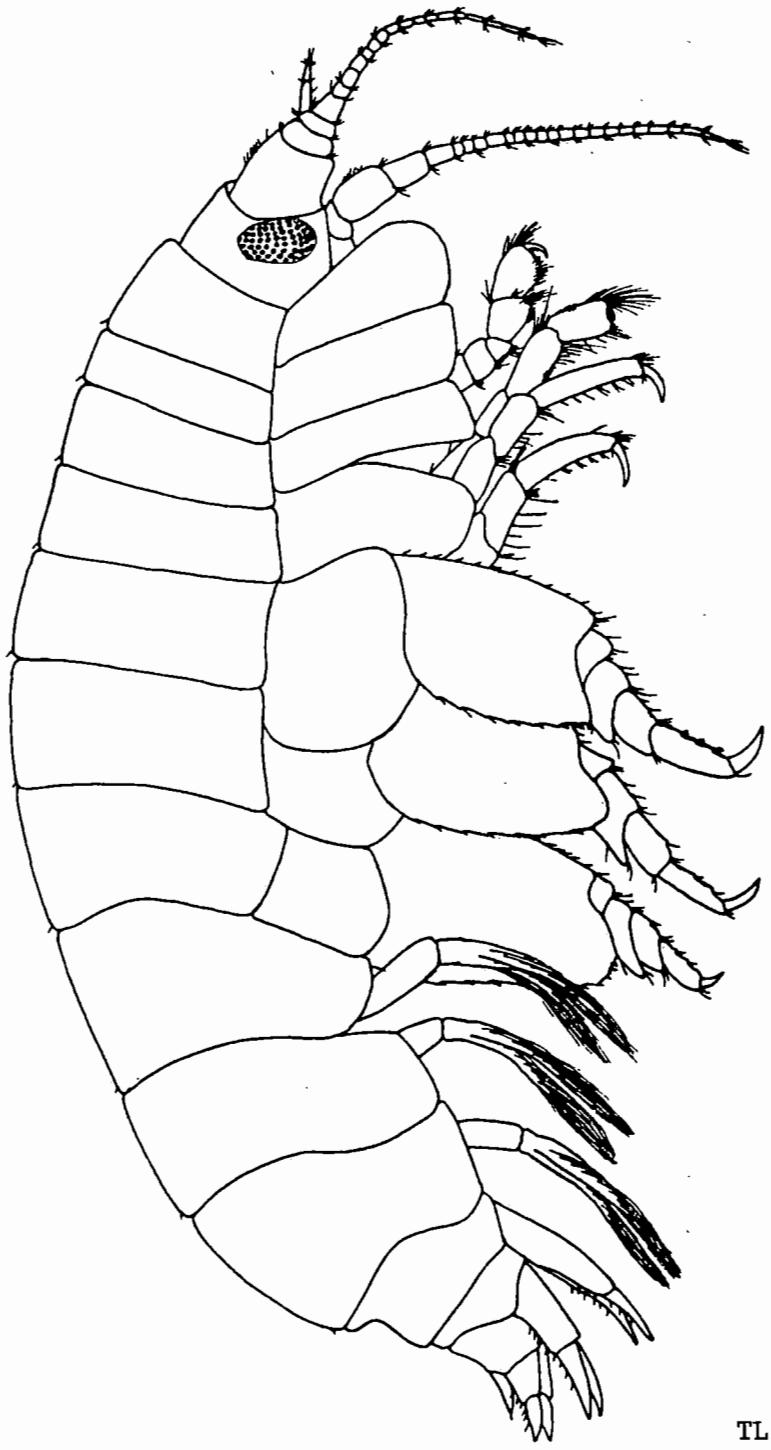


FIG. 3b Boeckosimus affinis (Hansen)

PLATE V



TL = 10 mm ♀

FIG. 4a Onisimus nanseni Sars

PLATE VI

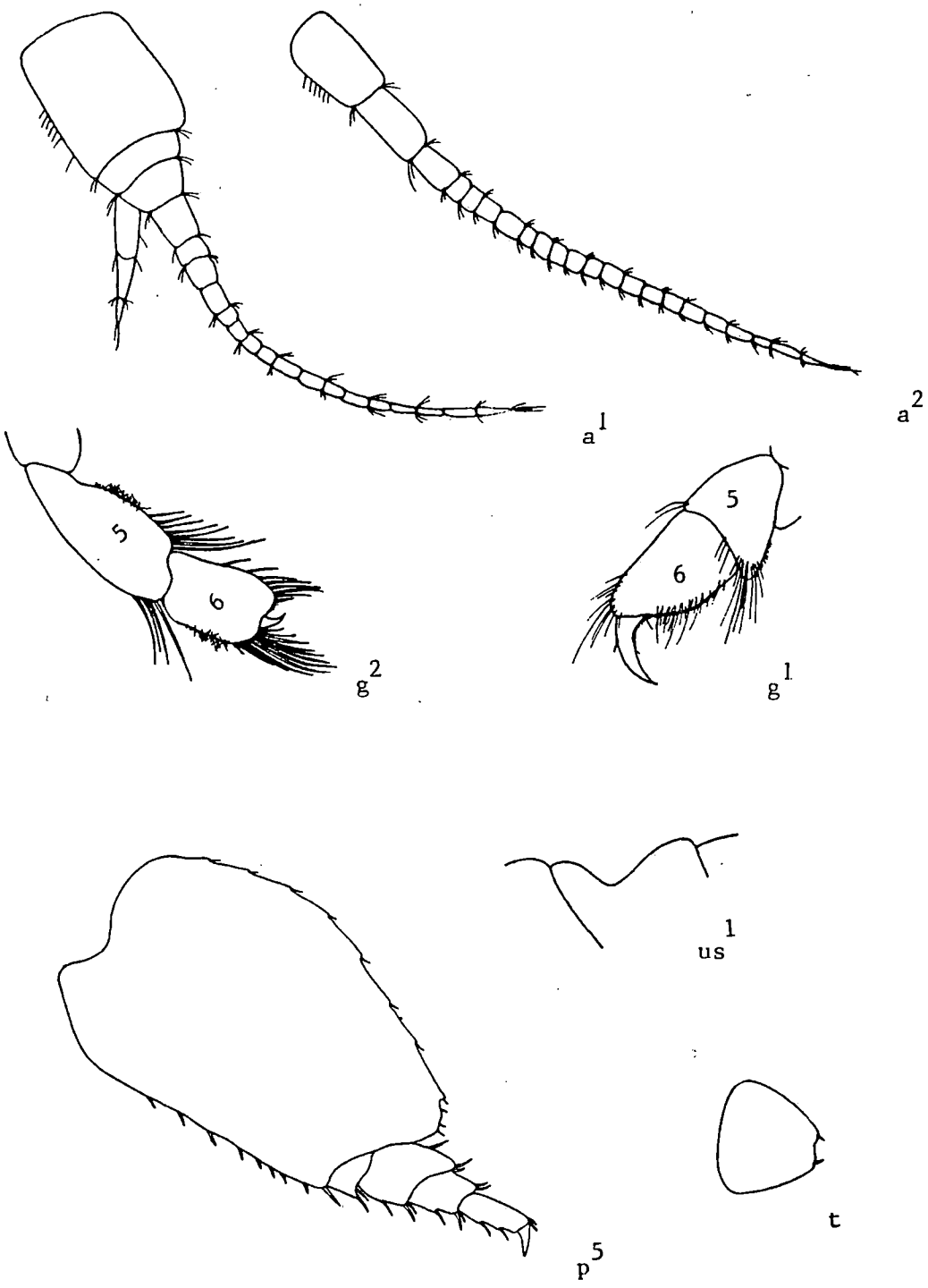
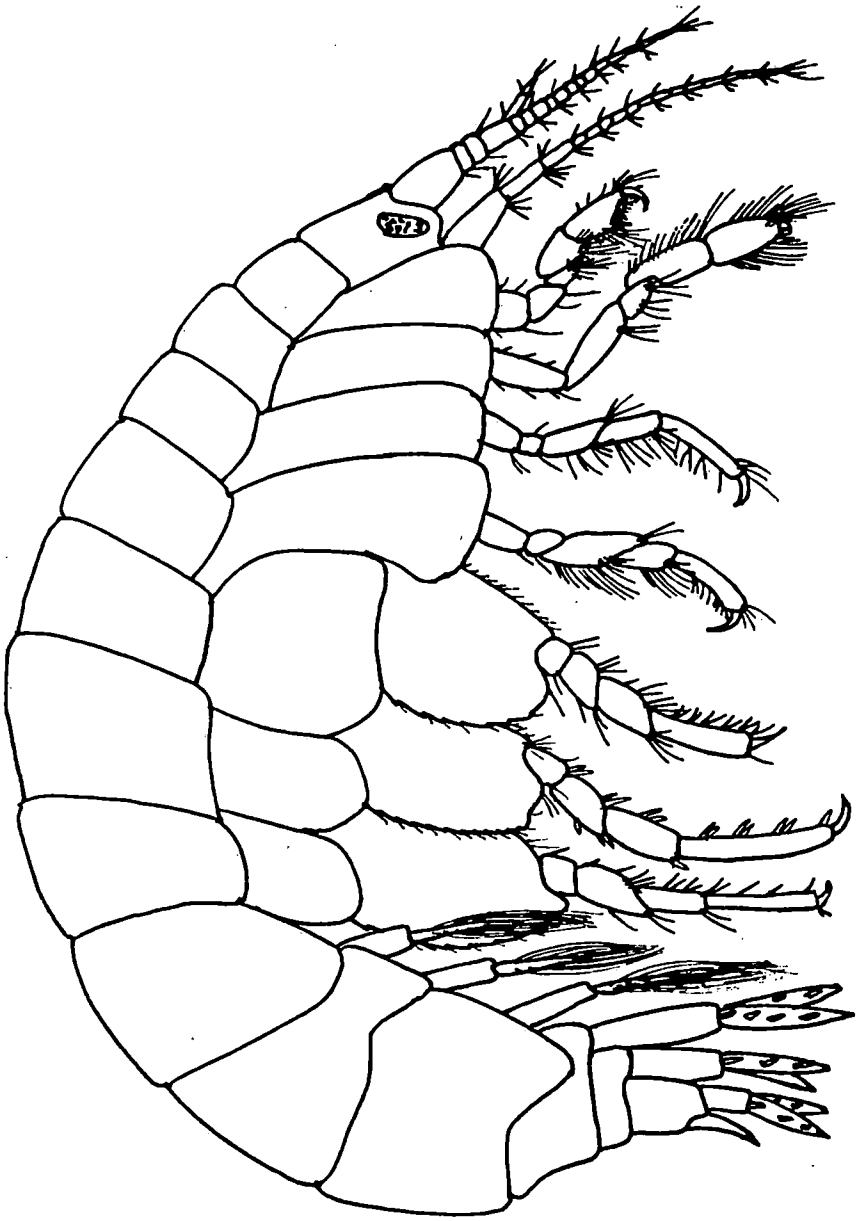


FIG. 4b Onisimus nanseni Sars

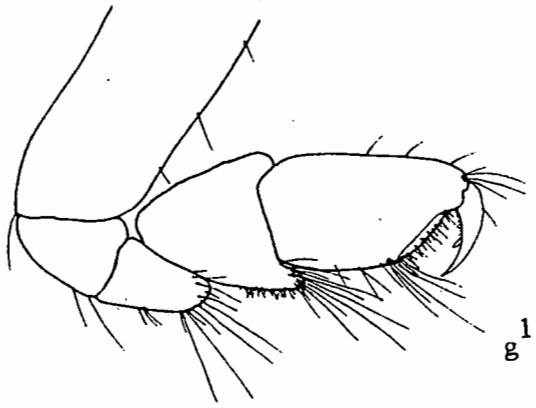
PLATE VII

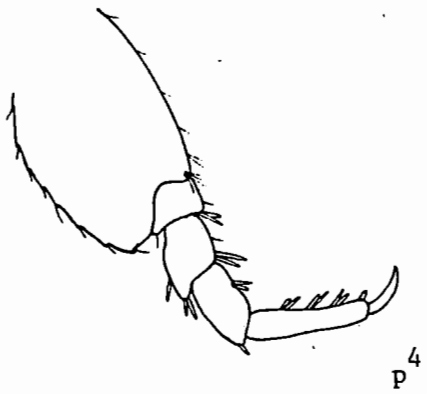


TL = 12 mm ♀

FIG. 5a Onisimus litoralis (Krøyer)

PLATE VIII





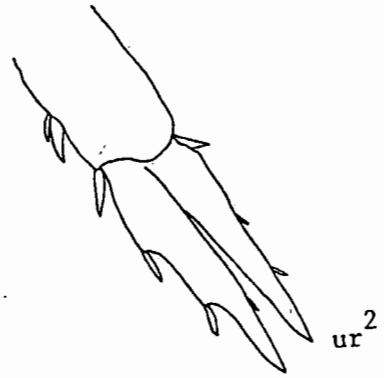
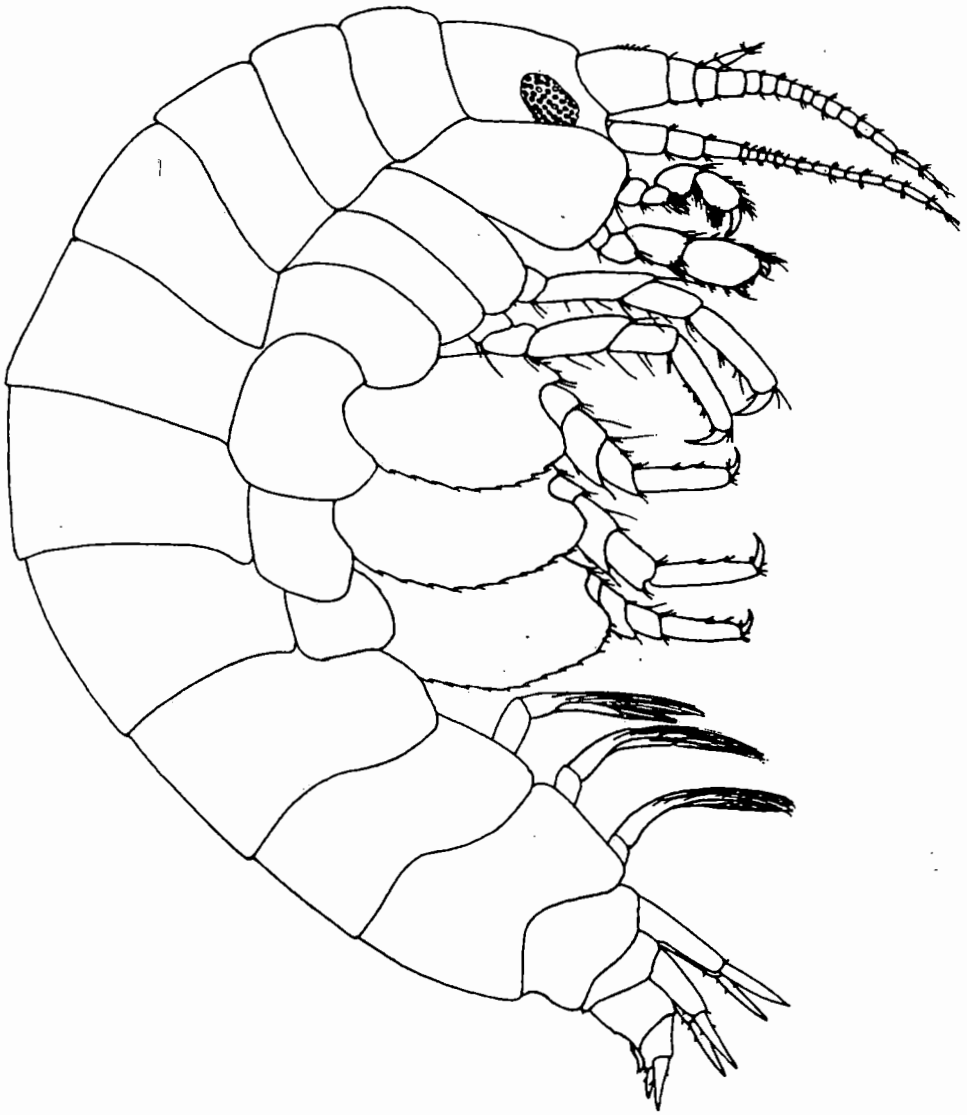


FIG. 5b Onisimus litoralis (Krøyer)

PLATE IX



TL = 13 mm ♀

FIG. 6a Onisimus glacialis Sars

PLATE X

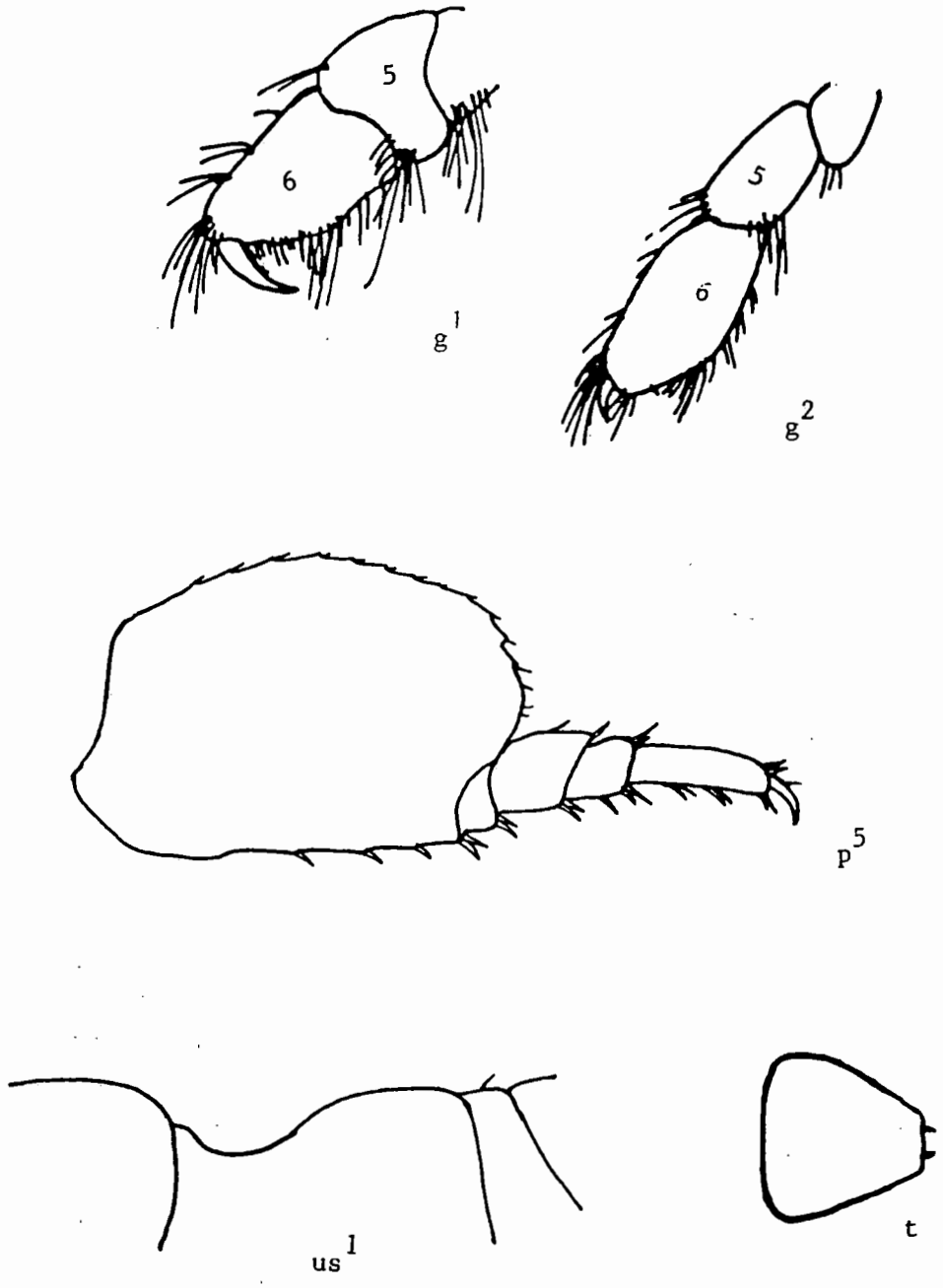
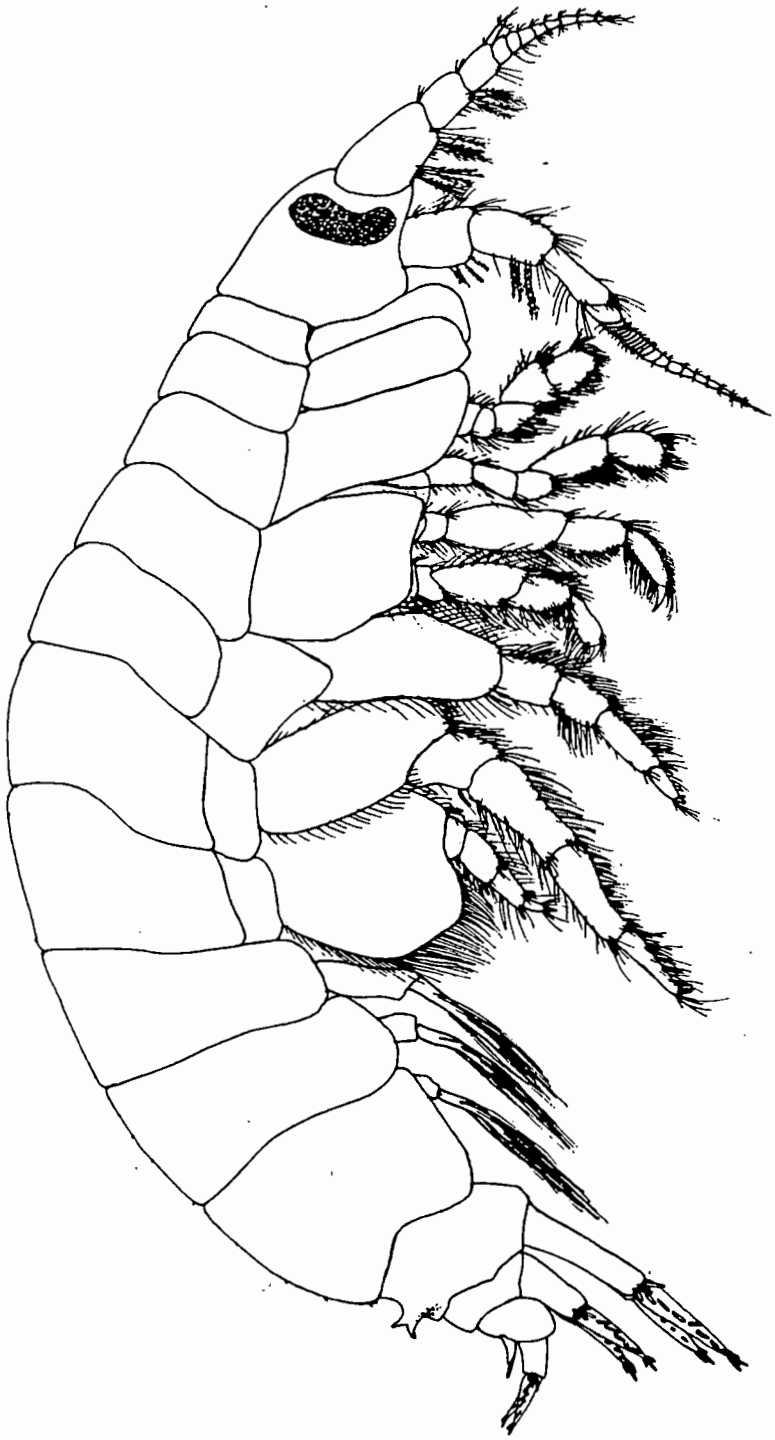


FIG. 6b Onisimus glacialis Sars

PLATE XI



TL = 6 mm ♀

FIG. 7a Pontoporeia femorata gp. Krøyer

PLATE XII

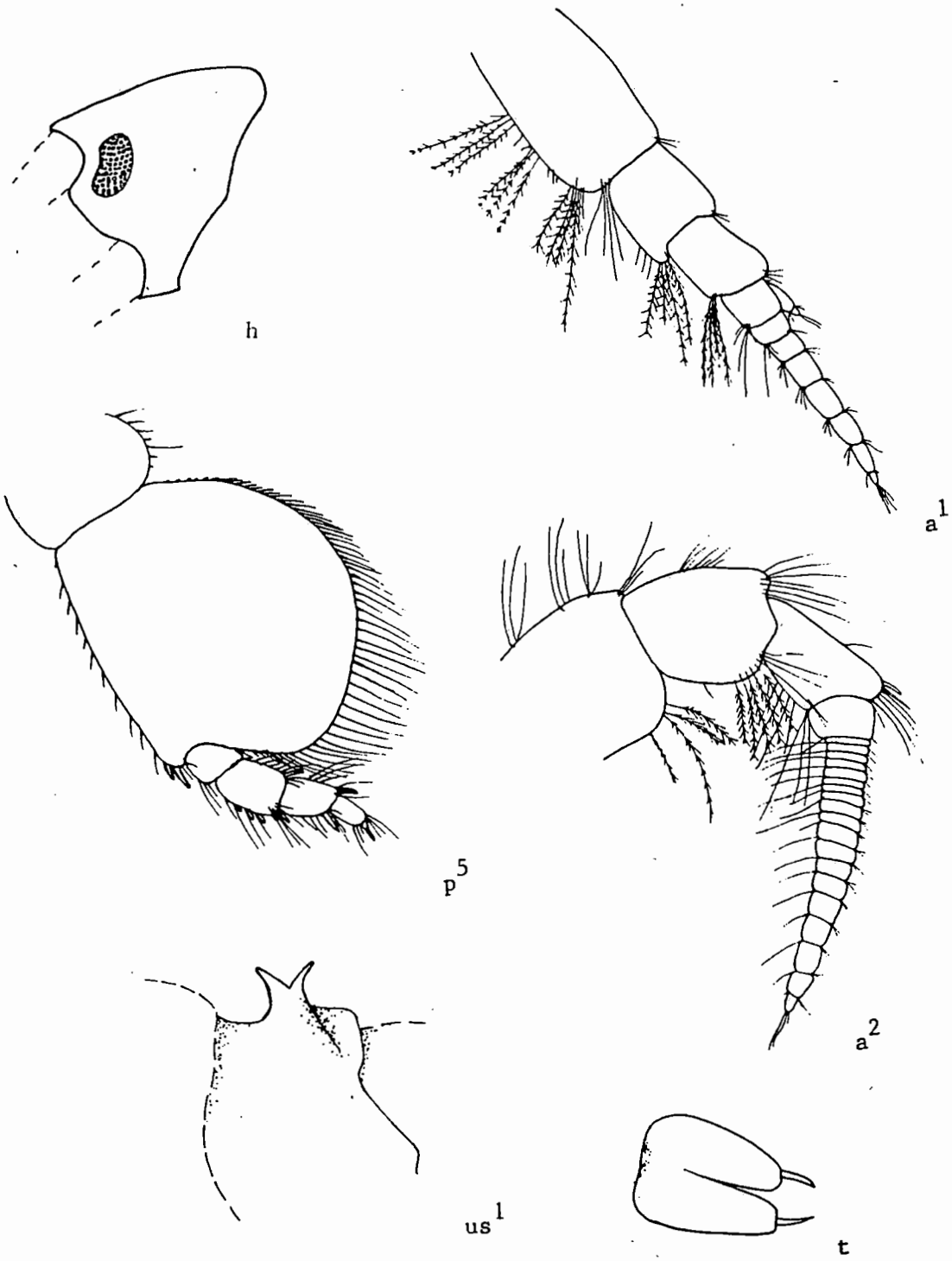
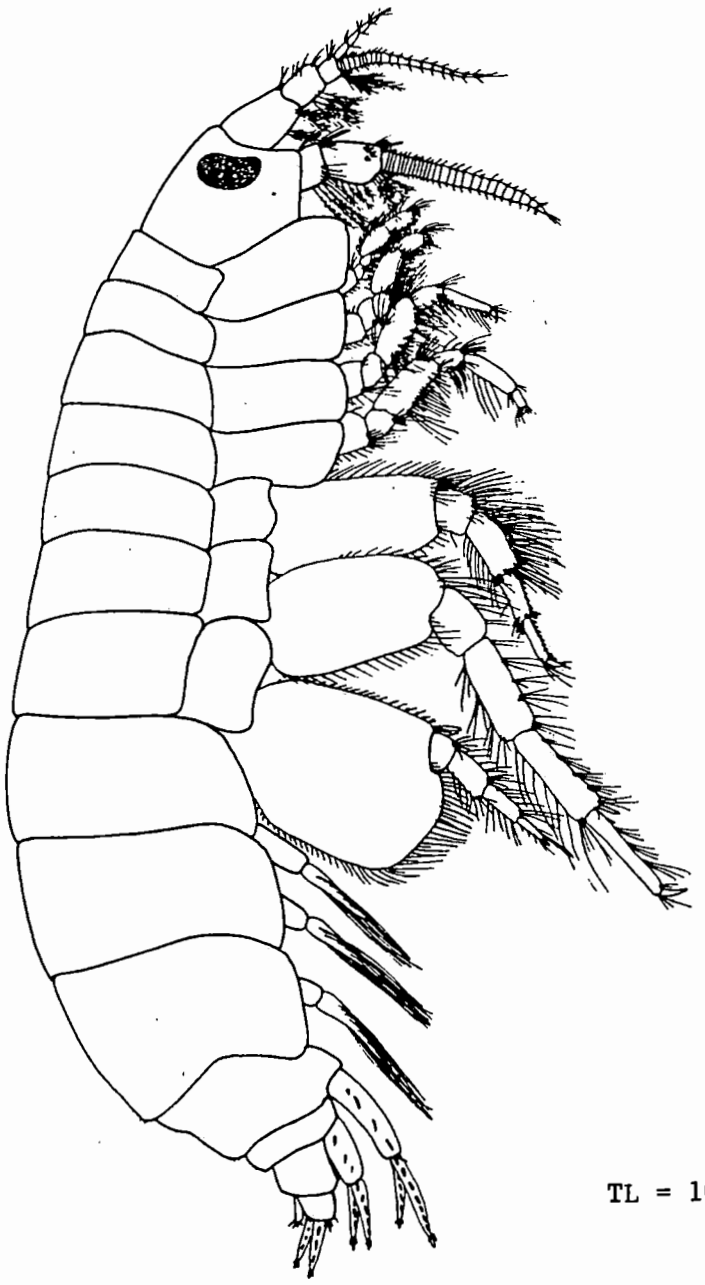


FIG. 7b Pontoporeia femorata gp. Krøyer

PLATE XIII



TL = 10 mm ♀

FIG. 8a Pontoporeia affinis gp. (Linstrom)

PLATE XIV

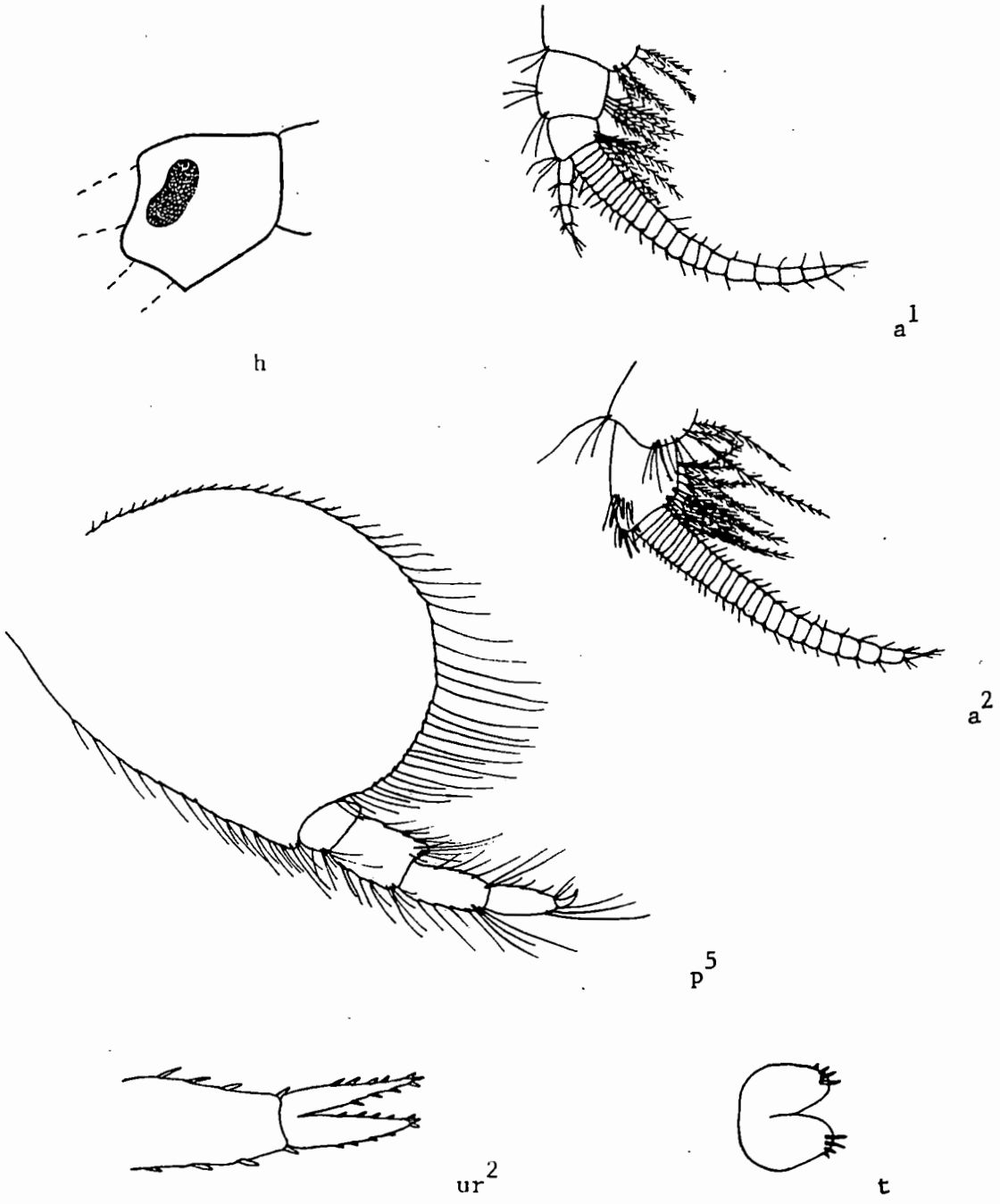


FIG. 8b Pontoporeia affinis gp. (Linstrom)

PLATE XV

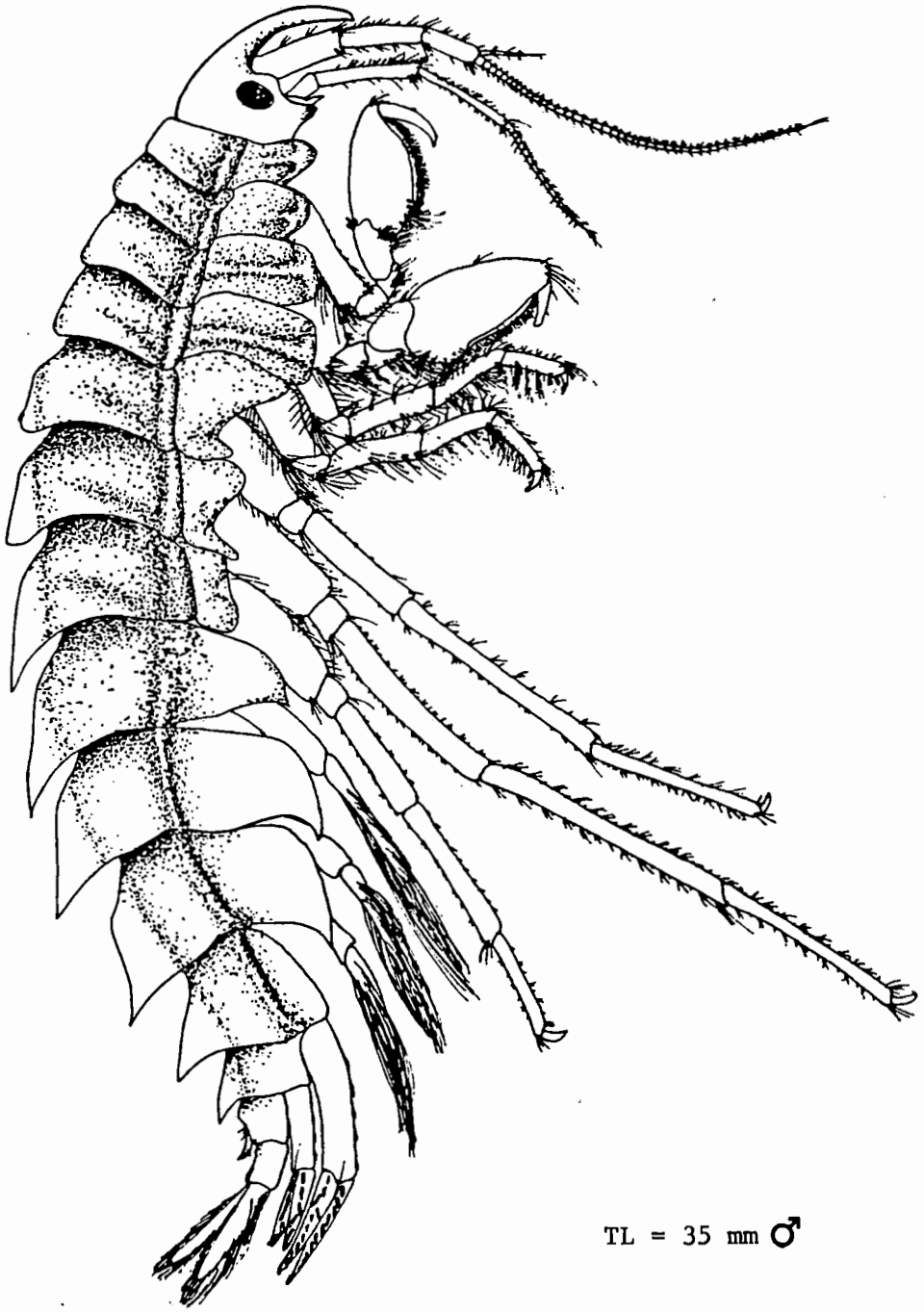


FIG. 9a Gammaracanthus loricatus gp. (Sabine)

PLATE XVI

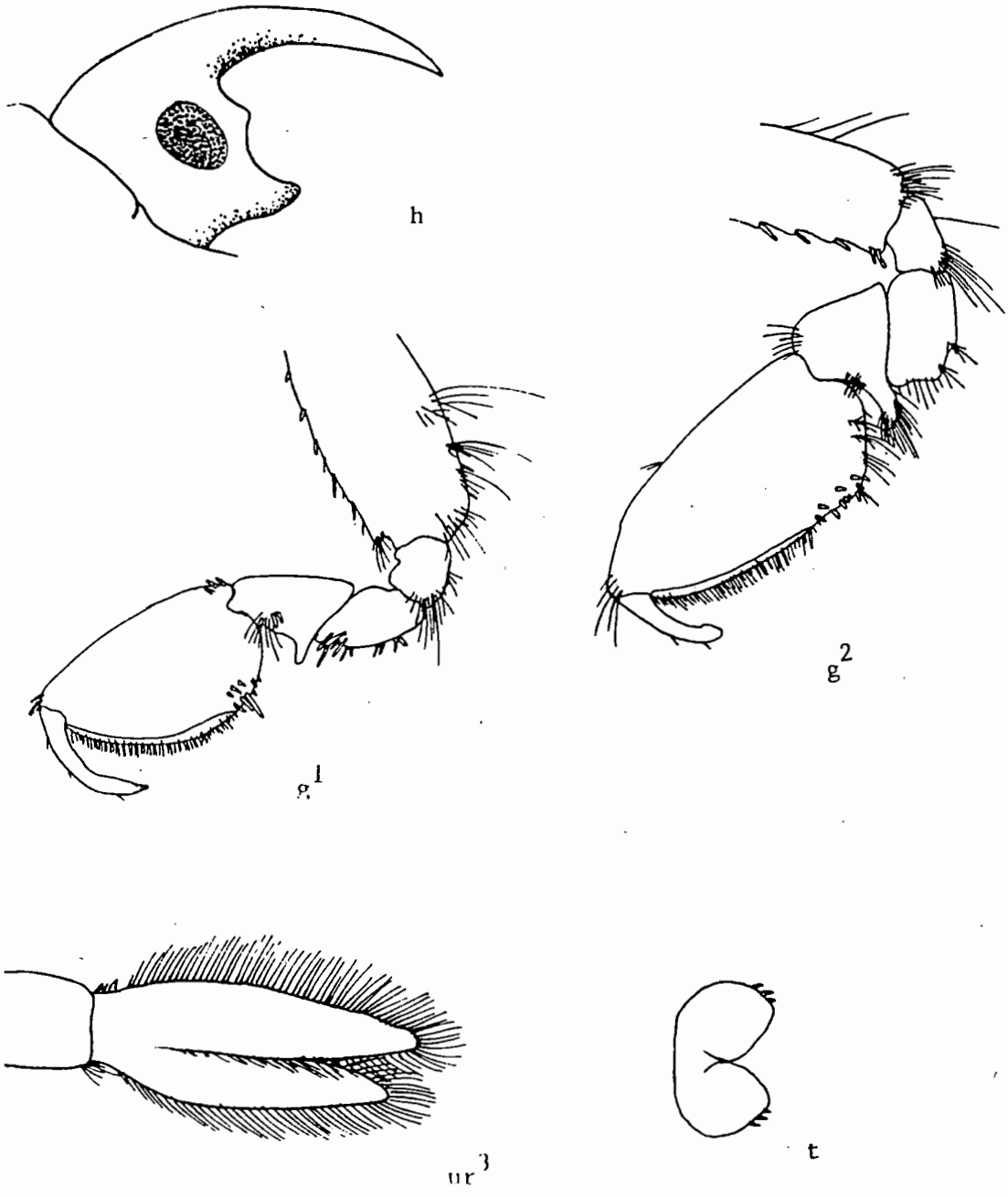


FIG. 9b Gammaracanthus loricatus gp. (Sabine)

PLATE XVII

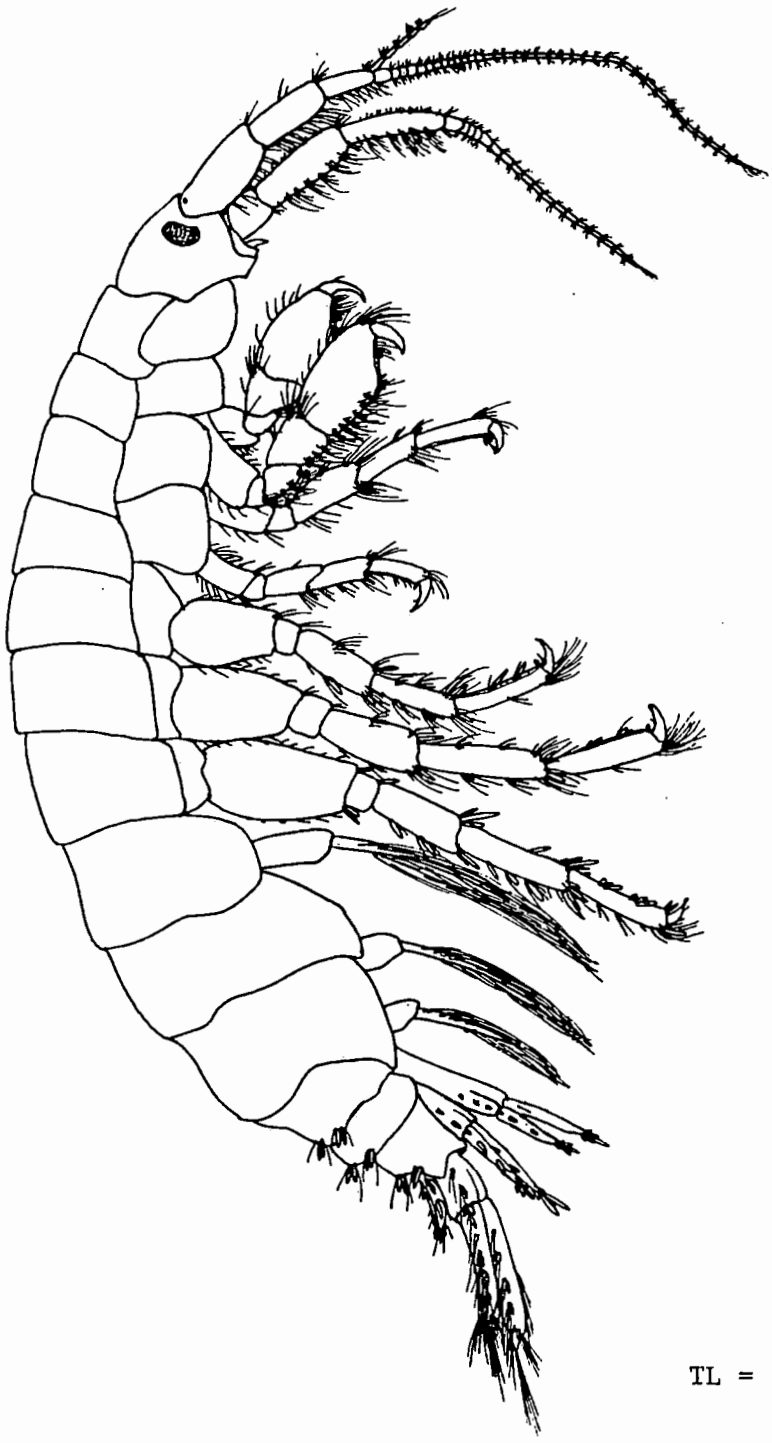


FIG. 10a Gammarus wilkitzkii (Birula)

PLATE XVIII

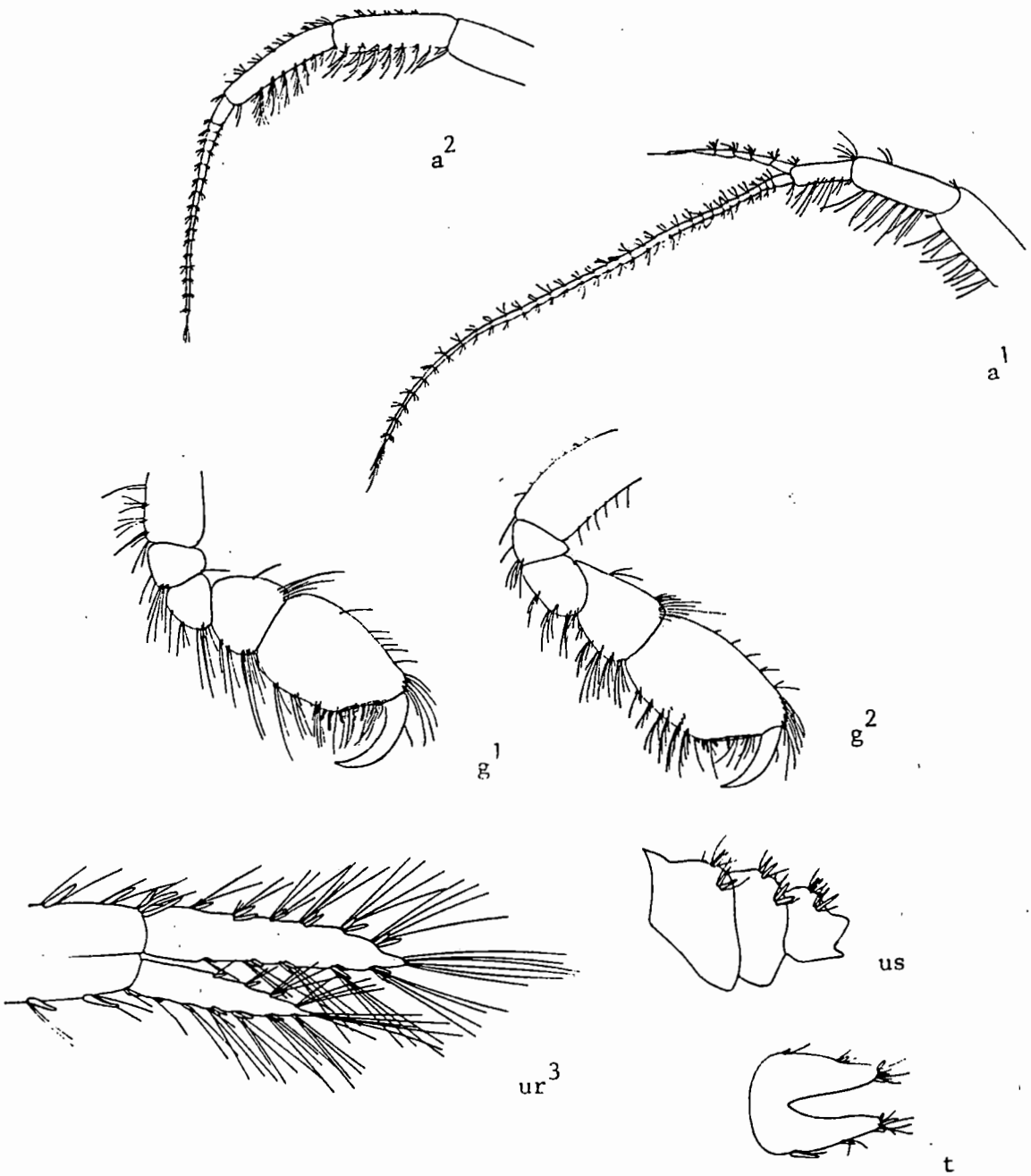
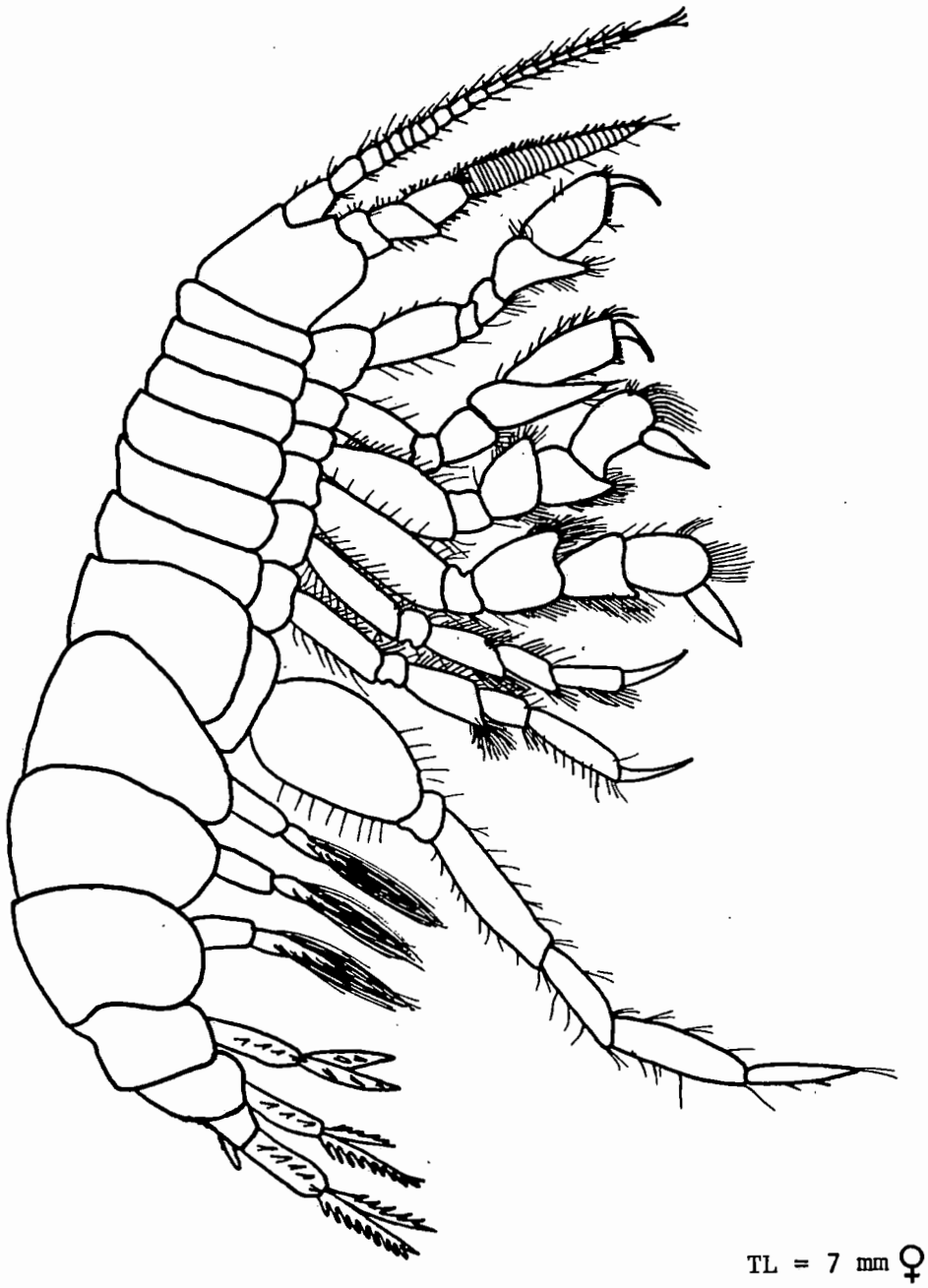


FIG. 10b Gammarus wilkitzkii (Birula)

PLATE XIX



TL = 7 mm ♀

FIG. 11a Aceroides latipes Sars

PLATE XX

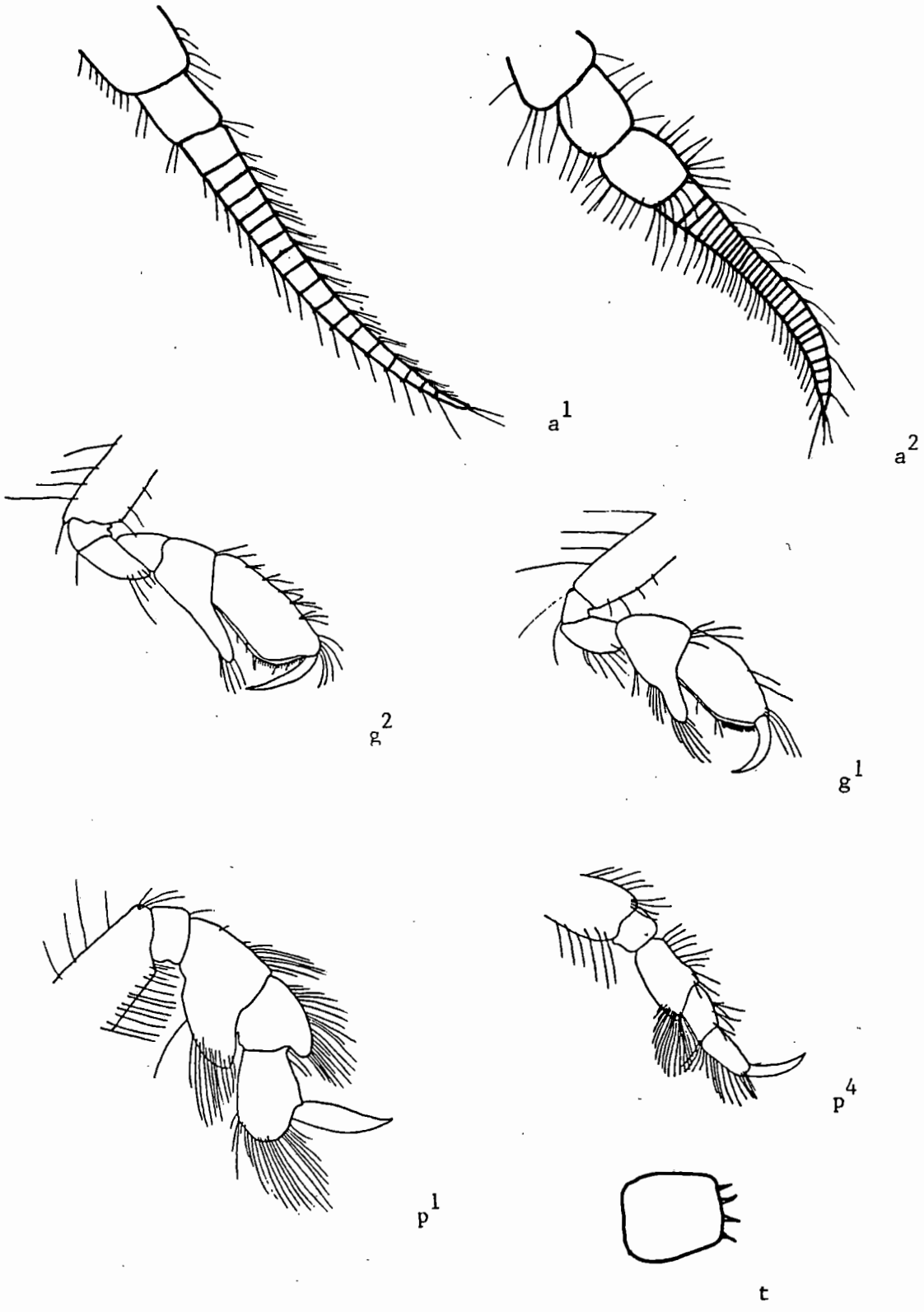


FIG. 11b Aceroides latipes Sars

PLATE XXI

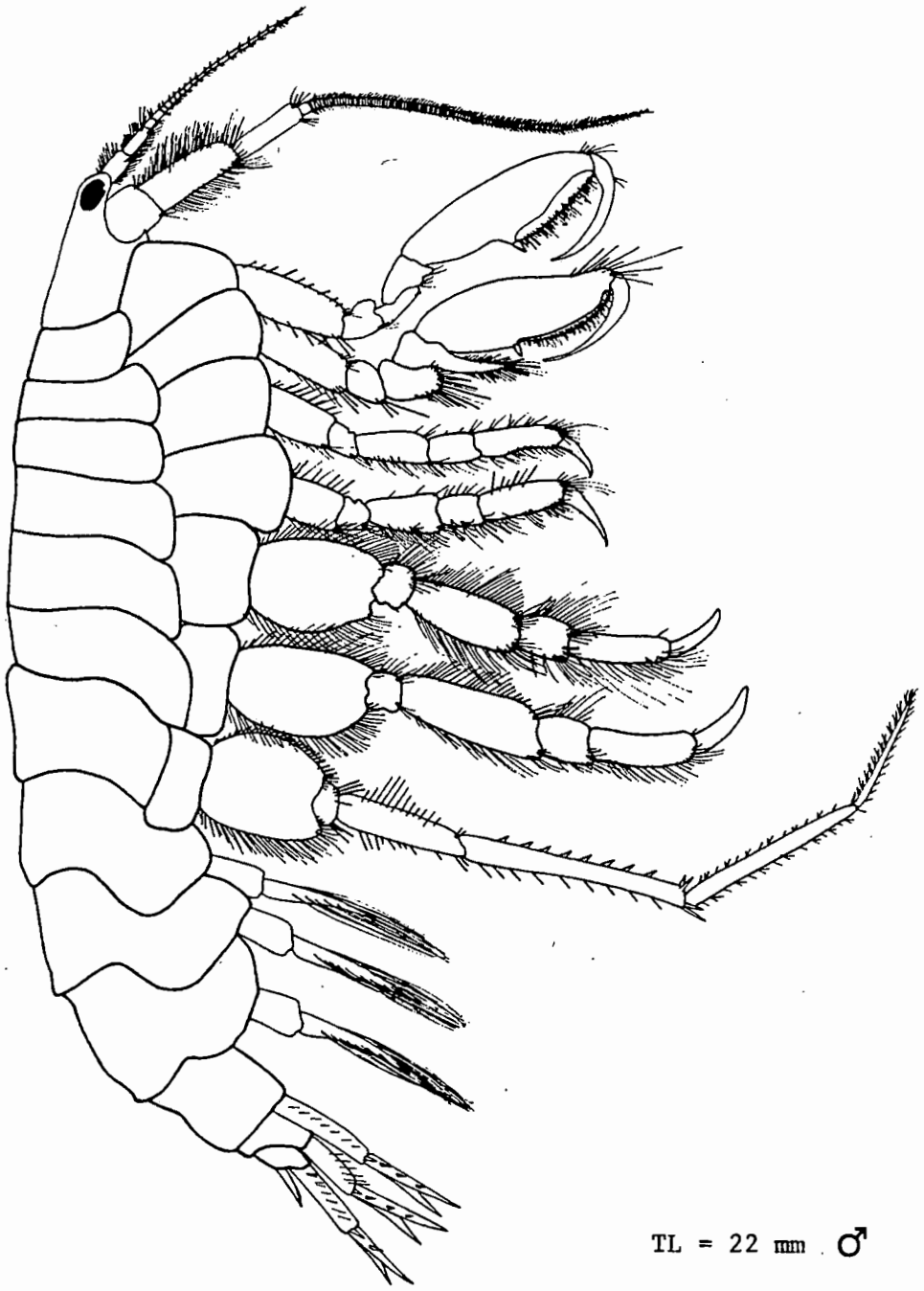


FIG. 12a Paroedicerus lynceus (M. Sars)

PLATE XXII

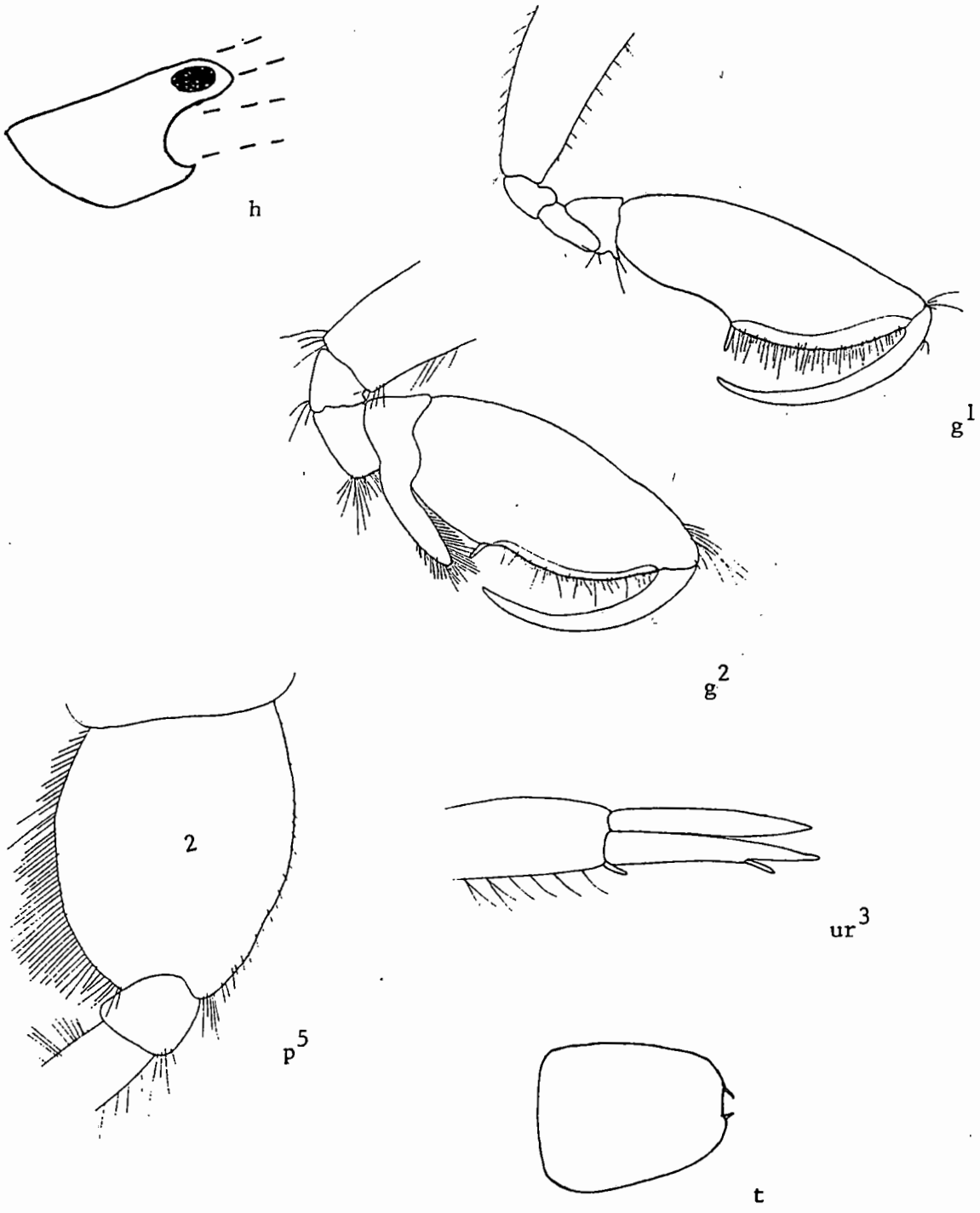
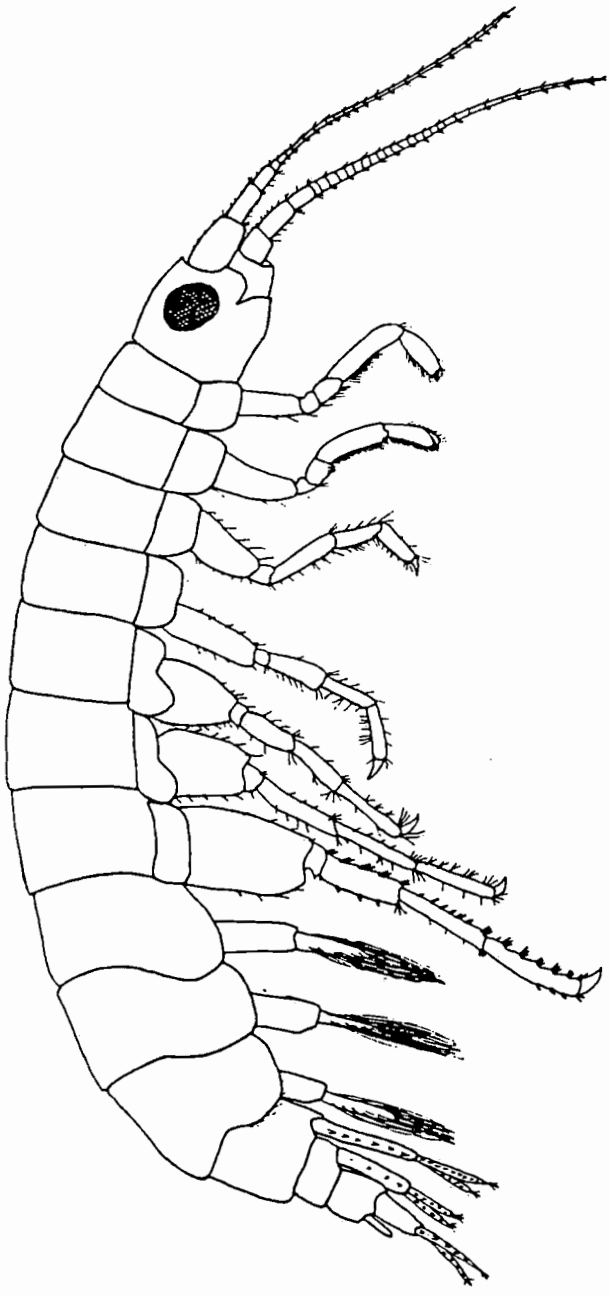


FIG. 12b Paroedicerus lynceus (M. Sars)

PLATE XXIII



TL = 4 mm ♀

FIG. 13a Apherusa glacialis (Hansen)

PLATE XXIV

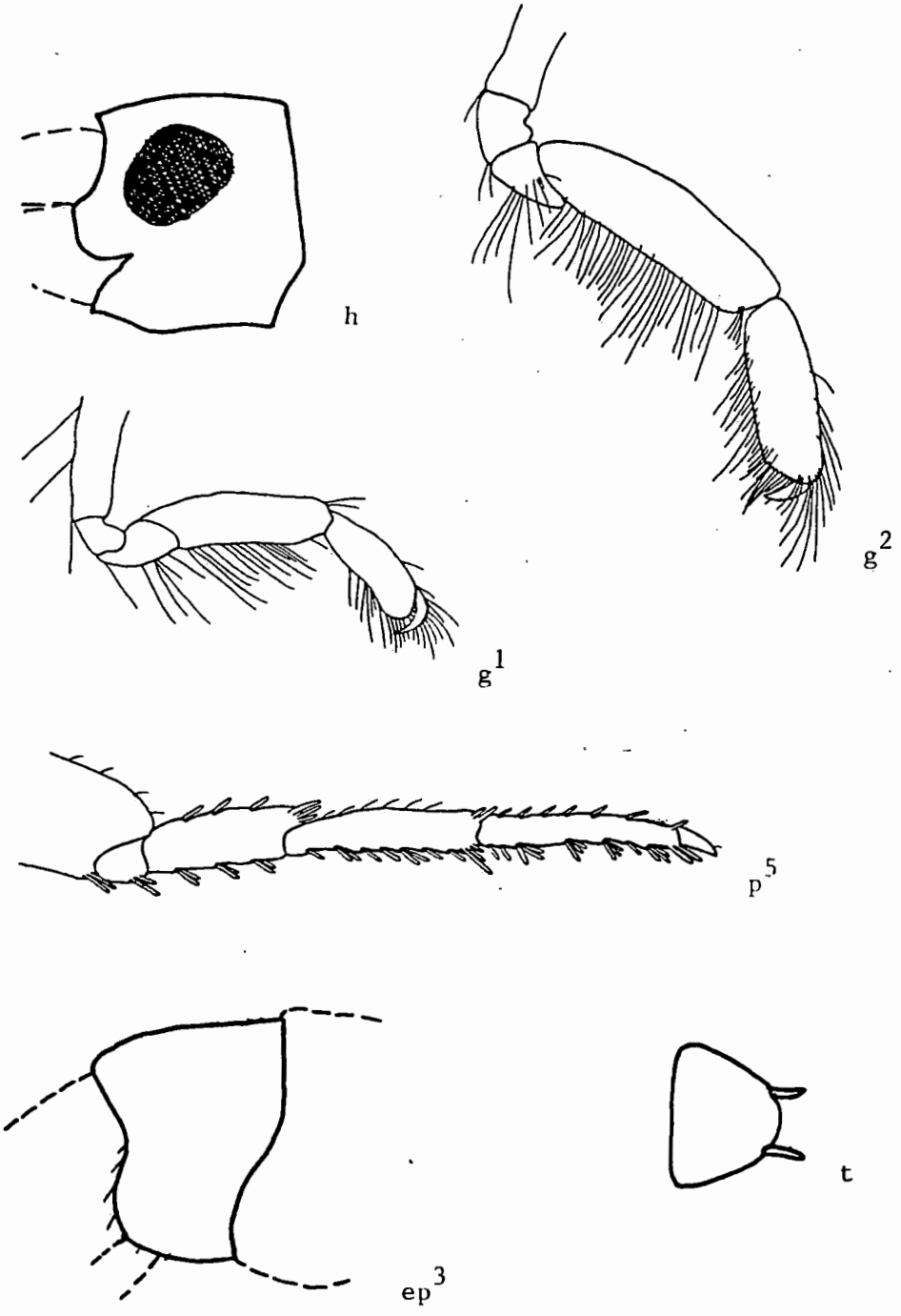


FIG. 13b Apherusa glacialis (Hansen)

GLOSSARY

ACCESSORY FLAGELLUM. The secondary ramous of antenna 1, may be lacking or vestigial, attached medially to peduncle segment 3.

ACUMINATE. Tapering to a point.

ARTICULATION. Separation, joint.

BASIS. The 2nd segment of a pereiopod and gnathopod.

BENTHIC. Of or pertaining to the benthos.

BENTHOS. The bottom of the sea, harbour, or lake.

BRISTLE. A stiff coarse hair or hair-like structure.

CARPUS. The 5th segment of a pereiopod and gnathopod.

CEPHALON. Anterior body region, consisting of head segments to which is fused the first thoracic segment.

CHELA. A terminal pincer formed by an immovable and movable finger.

CHELATE. Having the form of a chela.

CLEFT. A fissure, slit or opening, e.g. telson may be cleft resulting in a bilobed structure.

COXA, COXAL PLATE. Segment 1 of a pereonal appendage, expanded into a lateral lamella.

CRENATE. Having a notched or scalloped margin.

CRENULATE. Minutely or finely crenate.

CUSPIDATE. Terminating in a sharp, pointed tip.

DACTYLUS. Talon or claw-like terminus of segment 7 of a gnathopod and pereiopod.

DENTATE. With sharp spines directed outward from margin.

EMARGENT. Protruding from body surface or margin.

EMARGINATE. Shallowly concave, as in the apex of an uncleft telson.

ENTIRE. Not bilobed e.g. an uncleft telson.

EPIMERON, EPIMERAL PLATE. Ventrolateral expansion of pleonites 1-3.

EXCAVATE. Incised or emarginate, but more deeply.

FALCATE. Talonlike, curved or shaped like a sickle.

FASCICLE. A group, cluster, compact bundle.

FINGER. One of terminal elements of a chela; dactylus is the movable finger, the immovable or fixed finger is the terminal extension of the propodus.

FLAGELLUM. The multiarticulate sometimes whiplike terminus of antennae 1 and 2; that portion beyond the peduncle.

FOLIACEOUS. With marginal setae, usually plumose.

FOSSORIAL. Adapted for digging, burrowing, or tunneling; pereiopods are broad, and setose or spinose.

GLABROUS. Lacking hair or pubescence; smooth.

GNATHOPOD. One of the first 2 paired appendages of pereonites 1, 2, differing in structure and function from pereiopods.

INCISED. Cut into, having a deeply notched margin.

INTERANTENNAL HEAD LOBE. Lateral head process between the antennal sinuses.

ISCHIUM. The 3rd segment of a pereiopod and gnathopod.

KEEL. A sharp ridge.

LAPPET. A small fold or flap.

MERUS. The 4th segment of a pereiopod and gnathopod.

NOTCH. A v-shaped depression in an edge or surface.

OBLONG. Longer than broad, having the sides nearly parallel for most of the length.

OBOVATE. Broader proximally.

PALM. The posterior surface or margin of the propodus of a pereiopod on which the dactylus closes for prehension; may be marked by a change in the marginal slope or by presence of spine(s).

PEDUNCLE. The basal segments of paired, usually biramous, appendages, consisting of 3 segments in antenna 1, 5 segments in antenna 2, 1 or 2 segments in pleopods, and 1 segment in uropods.

PELAGIC. Of or pertaining to the open sea.

PELLUCID. Clear, transparent.

PEREON. The 7 thoracic segments bearing gnathopods or pereiopods.

PEREONITE. A single segment of the pereon.

PEREIOPOD, PERAEOPOD. A uniramous appendage of the pereon; composed of 7 segments differing in structure depending upon function; in amphipods pereonites 3-7 each bear one pair of pereiopods.

PLEON. The first 3 segments of the abdomen bearing the paired pleopods.

PLEONITE. A segment of the pleon.

PLEOPOD. A biramous swimming appendage on pleonite 1-3.

PREHENSILE. Adapted for grasping or seizing.

PROPODUS. The 6th segment of the pereiopod and gnathopod.

RENIFORM. Kidney-shaped.

ROSTRUM. The median process extending anteriorly from the head.

SERRATE. Regularly toothed, crenate.

SETA, pl. Setae. Tactile hair.

SETULA, pl. Setulae. A small short hair or bristle.

SETOSE. To bear small bristles or setulae.

SPATULATE. Spoon-shaped.

SPINOSE. Spinelike or possessing spines.

SPINULE. A small or minute spine.

SPINULOSE. Bearing small spines or spinules.

STOUT. Strong, robust, bulky.

SUBCHELATE. A prehensile condition of the pereiopod or gnathopod in which the palm is not produced to form a finger.

TELSON. A terminal flap of the urosome, attached to urosomite 3 dorsal to the anus, may be entire or cleft.

TRUNCATE. Blunt, appearance of sharply cut-off or broken-off either squarely or obliquely.

UROPOD. One of three pairs of terminal urosomal appendages, consisting of a peduncle and two rami.

UROSOME. The posterior three abdominal segments, which may or may not be fused, bearing the uropods and telson.

UROSOMITE. A segment of the urosome.

ACKNOWLEDGEMENTS

I would like to thank M. Lawrence and G. Lacho for the amphipod collections used in the preparation of this key. Thanks also to M. Curtis and N. Jarrett for their identification/verification of the amphipod specimens. The encouragement and constructive comments of S. Davies and S.R. Konrad are appreciated. Many thanks to M. Pidlubny and V. de Jong for their patience in preparing the illustrations, and to P. Flannagan for her assistance with the literature search.

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