

Some Bathyal Pacific Amphipoda Collected by the U.S.S. Albatross

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SEVERAL BATHYAL Amphipoda from the U.S.S. "Albatross" expeditions of 1888 onward (Holmes, 1908; Shoemaker, 1925) remained to be determined in the collections of the U.S. National Museum, and the results of their study are presented here. Increasing interest is being shown in faunas on bottoms of 200–2000 m. Although these depths comprise only 8.5% of the world's sea-floor, they perhaps support the remnants of the ancient abyssal fauna occupying depths greater than 2000 m prior to the Tertiary cooling of the seas (Madsen, 1961; Barnard, 1961, 1962; and their bibliographies).

Bathyal benthic depths outside of the Norwegian polar basin have not been well explored for amphipods, so that any records are of great interest. These early *Albatross* collections, although small and widely scattered, contain very well-preserved and intact specimens of seven previously known and six new species.

Of especial interest is another record of *Mesopleustes abyssorum* Stebbing and the opportunity to discuss its relationship among three families that it intergrades. The question of speciation in the genus *Eusirella* is reopened. No depth is known for a new species of *Melita*, but its poorly pigmented eyes may indicate a deepwater origin.

Not all of the species recorded here are benthic, the members of the genera *Rhabdrotropis*, *Koroga*, *Eusirella*, *Cyclocaris*, and *Parandania* being bathypelagic or demersal.

FAMILY LYSIANASSIDAE

GENUS *Aristias* Boeck

Aristias adrogans, new species

Fig. 1

DIAGNOSIS: Eyes very pale, scarcely evident, no organized ommatidia apparent, composed

simply of dense tissue; antennal flagella 10-articulate; epistome and upper lip fused but bounded by a hollow incision, neither produced beyond the other; first coxa broader than long, fifth and sixth with long, broad posterior processes; palm of gnathopod 2 formed of a broad projecting thumb; all pereopods with a small conical distal process on article 6; article 4 of pereopod 3 overlapping article 5 halfway or less, article 5 half or less as long as article 4 and becoming shorter with each pereopod; second pleonal epimeron tending to project at lower corner; first urosomal segment lacking a dorsal process; uropods 1 and 2 multispinose; inner ramus of uropod 3 not quite reaching end of article 1 of outer ramus; lobes of telson relatively narrow, each armed apically with a single spine.

HOLOTYPE: USNM no. 108629, male, 15 mm.

TYPE LOCALITY: Albatross Station 4781, the Near Islands, Alaska, 52° 14' 30" N, 174° 13' E, 482 fms, June 7, 1906.

MATERIAL: Two specimens from the type locality.

RELATIONSHIP: Three species have been described lacking eyes according to Gurjanova's key (1962). These are *A. topsenti* Chevreux (1900), *A. microps* Sars (1895), and *A. falcatus* Stephensen (1923). The present species is so closely related to *A. falcatus* that one would consider them to be the same species, were not the trend in lysianassid systematics, especially as practiced by Gurjanova (1962), to seek extremely minute specific differences. Such has also been practiced in the genus *Orchomene* (= *Orchomenella* and *Orchomenopsis*). Because Stephensen makes a point of using the condition of the palm of gnathopod 2 as a character of distinction between *A. commensalis* and *A. falcatus*, it may also be used in the present species, which has a distinctly produced palm and so differs from *A. falcatus* but is similar to *A. topsenti*. *Aristias microps* has this palm very narrowly acute. In *A. falcatus* the inner ramus of the third uropod exceeds article 1 of the

¹ Beaudette Foundation, Santa Ynez, California. Manuscript received March 14, 1963.

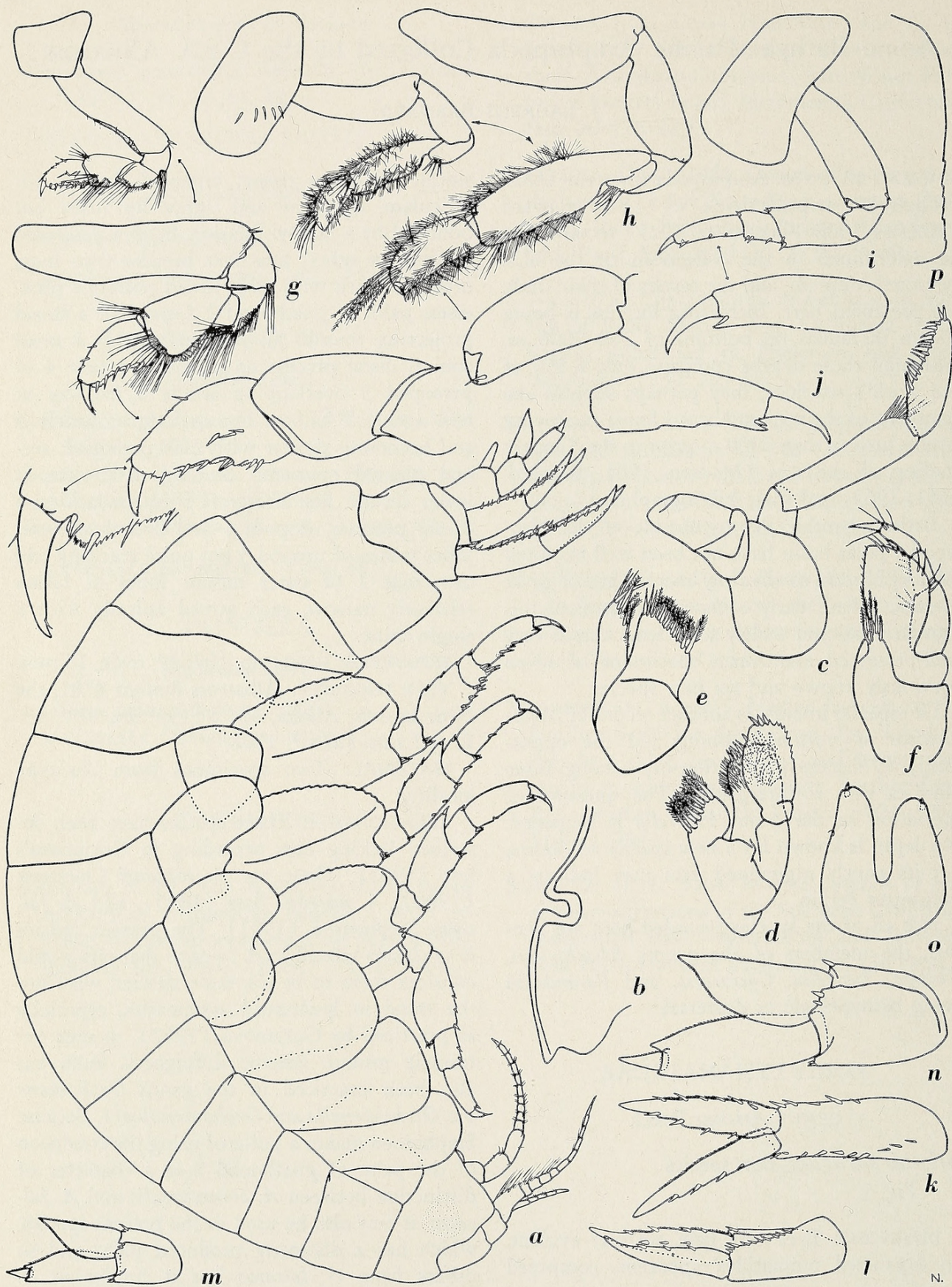


FIG. 1. *Aristias adrogans*, n. sp. Male, 13.0 mm, Albatross 4781: *a*, lateral view; *b*, epistome and upper lip complex; *c*, mandible; *d*, maxilla 1; *e*, maxilla 2; *f*, maxilliped; *g*, *h*, gnathopods 1, 2; *i*, pereopod 1; *j*, end of pereopod 5; *k*–*n*, uropods 1–3, 3 (enlarged); *o*, telson; *p*, posterior edge of third pleonal epimeron.

outer ramus, but in the present species it is slightly shorter. The fifth articles of pereopods 3–5 are noticeably shorter than in *A. falcatus*. *Aristias topsenti* is characterized by lateral wings on urosome segment 3. *Aristias microps* has a blunter head and poorly articulate antennal flagella and a broader telson than in the present species, and lacks the long posterior processes of coxae 5 and 6.

Because the loss of eyes may occur in different populations of the same species, I have inspected the literature on all other eyed species and find that the new species resembles *A. commensalis* Bonnier (1896), from which it differs by narrow telsonic lobes, bearing only one instead of two or three terminal spines. It differs from *A. antarcticus* Walker (1907; K. H. Barnard, 1932) by the unproduced upper lip, and from *A. collinus* K. H. Barnard (1932) by the unproduced dorsum of urosomal segment 1. *Artistias pacificus* Schellenberg (1936) was described from Vancouver Island and so bears inspection as a generic relative of close geographic placement. That species has eyes, has two apical spines on each telsonic lobe, and has the inner ramus of uropod 3 exceeding the first article of the outer ramus. The second and third pleonal epimera have small posterior corner teeth, a feature showing only a tendency in the present species. The longer rami of uropod 3, longer pereopods, and more strongly spinose uropods 1 and 2 distinguish this species from *A. curtipes* Gurjanova (1962). Both *A. japonicus* and *A. spinipes* Gurjanova (1962) have the inner ramus of uropod 3 exceeding article 1 of the outer ramus. A more careful rendering of the epistome and upper lip of species described in the last several decades would serve well in studying speciation in the group. Apparently the species are semi-parasites on ascidians and sponges, so that we may anticipate variability as seen in *Polycheria antarctica*, a dexamimid amphipod.

GENUS *Cyclocaris* Stebbing

Cyclocaris guilelmi Chevreux

Fig. 5K

Cyclocaris Guilelmi Chevreux 1899:148–152, figs. 1–5; Sars 1900:20–25, pls. 2–3; Stephensen 1913:107–108; Chevreux 1935:28–30, pl. 16, figs. 3, 8, 24, 26.

Cyclocaris guilelmi, Stebbing 1906:31; Bruggen 1907:215–216; Stephensen 1923:52–54; Schellenberg 1927:664–665, fig. 59; Stephensen 1933b:8–9, fig. 3; Stephensen 1935:43, figs. 2, 3; Gurjanova 1951:181–182, fig. 53; Birstein & Vinogradov 1955:222, fig. 8; Birstein & Vinogradov 1958:223–224; J. L. Barnard 1959:116–117, pls. 4, 5 (with references); Gurjanova 1962:88, fig. 18.

Cyclocaris faroensis Norman 1900:197–198, pl. 6, figs. 5–15.

MATERIAL: Albatross 4793, male, 6.3 mm.

REMARKS: The slight differences between coxa 1 of *C. guilelmi* and of *C. tabitensis* Stebbing (1888) probably are not worthy of specific value and perhaps are only figmental. Herein the first coxa is drawn; otherwise the material corresponds with that figured by J. L. Barnard (1959), except that the lower lip is like that figured by Sars (1900).

RECORD: East of Kamchatka, 54° 48' N, 164° 54' E, 2700 fms, June 16, 1906. An arctic pelagic species picked up in a deep benthic trawl.

GENUS *Koroga* Holmes

Koroga megalops Holmes

Fig. 2

Koroga megalops Holmes 1908:503–504, fig. 13; Stephensen 1923:60–61, fig. 5; K. H. Barnard 1937:145–146, fig. 3; Stephensen 1933:11; Thorsteinson 1941:56, pl. 2, figs. 18–20; Shoemaker 1945:186; Gurjanova 1951:192–193, fig. 62; Birstein & Vinogradov 1955:222–223; Birstein & Vinogradov 1958:224; Birstein & Vinogradov 1960:187; Gurjanova 1962:93, fig. 20.

MATERIAL: One specimen from Albatross Station 4785, east of Komandorskije Ostrova, 1850 fms, 53° 20' N, 170° 33' E, June 12, 1906; one specimen from Albatross Station 4758, off Queen Charlotte Islands, 52° 02' N, 132° 53' W, May 19, 1906, 300 fms.

DISTRIBUTION: A pelagic species, probably cosmopolitan, having been found in the north and tropical Pacific, the Arabian Sea, the high North Atlantic, and the middle Atlantic. In open-closing hauls Birstein and Vinogradov



FIG. 2. *Koroga megalops* Holmes. Female, 7.0 mm, Albatross 4758: *a*, lateral view; *b*, head and epistome-upper lip complex; *c*, *d*, antennae 1, 2; *e*, mandible; *f*, *g*, maxilla 1; *h*, maxilla 2; *i*, maxilliped; *j*, apex of inner plate of maxilliped; *k*, gnathopod 1; *l*, end of gnathopod 2; *m*, gnathopod 2; *n*, *o*, pereopods 1, 2; *p*, molar of left mandible; *q*-*t*, uropods 1, 2, 3, 3 (enlarged); *u*, telson.

showed its distribution to extend from a haul taken at a maximum depth of 500 m to one taken at a minimum depth of 2200 m. Other depth data are not reliable since the drags were open at all depths.

DISCUSSION OF *Paracallisoma* AND ALLIED GENERA

When Chevreux (1903) described *Paracallisoma*, only the genus *Scopelocheirus* Bate formed its closed relative, but since that time a number of other scopelocheirid genera have been described, as reviewed by Dahl (1959). Holmes (1908) described *Scopelocheirus coecus* which was relegated to *Paracallisoma alberti* Chevreux (1903) by Schellenberg (1926a), figured his specimen sufficiently to show it corresponded with Holmes' description more than with that of Chevreux. Indeed, no subsequent analysis of *P. alberti* has shown the distinctive second gnathopod as copied from the original description herein (Fig. 3n, o). Chevreux described his species as lacking a finger on gnathopod 1, but apparently subsequent reviewers have assumed Chevreux was in error. Even presuming Chevreux did not see the small finger among the distal setae as known for *S. coecus*, all subsequent authors have not given status to the condition of gnathopod 2 which, as drawn by Chevreux, shows a larger finger and longer palm than in *S. coecus*, with the finger failing to match the palm. Until Chevreux's type material can be examined again for these features there can be no assumption that Chevreux erred in both gnathopods.

Chevreux did not distinguish *Paracallisoma* from *Scopelocheirus*, although one might believe that the obvious statement "sans trace de dactyle" would suffice; but we can see that the shorter coxae and immense disproportion of coxa 5 to coxae 6 and 7 are also of value. *Scopelocheirus coecus* shares these features.

Dahl (1955) described *Bathycallisoma* to encompass *Paracallisoma* sp. Schellenberg (1955), which he thought was his *B. pacifica* n. sp., but in a footnote he wrote that it was *S. schellenbergi* Birstein and Vinogradov (1958) and should be transferred to *Bathycallisoma*. Birstein and Vinogradov (1960) transferred it back to *Scopelocheirus*. But *S. schellenbergi* appears to

be distinctly different from the only other two species in the genus *Scopelocheirus* and, as Dahl writes in his footnote, if *S. schellenbergi* belongs with *Scopelocheirus* then *Bathycallisoma* and other scopelocheirid genera should not exist.

Scopelocheirus schellenbergi differs from *S. hopei* and *S. crenatus* (see Sars, 1895: pl. 19) by the shorter coxae, especially noticeable in the poorly posteriorly excavate coxa 4, by the anterioposterior elongation of coxae 5 and 6, apparently by the lack of protrusion of the upper lip and epistome, by the very broadened plates of the maxillae and maxillipeds, and especially by the proximal inflation of the inner plate of maxilla 2, these characters all being shared by *Bathycallisoma pacifica*. Apparently also the lobes of the lower lip gape widely in *S. schellenbergi*, although Birstein and Vinogradov show only half of the lower lip and this is a criterion noted by Dahl as a generic feature of *Bathycallisoma*.

One character not mentioned by Dahl, but one I believe to be of significance, is the chelateness of the second gnathopod in both *S. hopei* and *S. crenatus*. This would make an excellent generic difference between *Bathycallisoma* and *Scopelocheirus*.

Until Chevreux's *Paracallisoma alberti* can be rechecked I must retain *P. coecus* as a distinct species that indeed is questionably assigned to *Paracallisoma*.

Paracallisoma coecus (Holmes)

Fig. 3

Scopelocheirus coecus Holmes 1908:500–502, figs. 10–12; Shoemaker 1945:186; J. L. Barnard 1954:54, pls. 4–5.

MATERIAL: One juvenile 6.0 mm, Albatross Station 4760, northeastern Pacific, 53° 53' N, 144° 53' W, 2200 fms, May 21, 1906.

REMARKS: The mouthparts and telson correspond to those figured by J. L. Barnard (1954), but they are less setose, the outer plate of the maxilliped having only 4 lateral setae instead of 14.

FAMILY STEGOCEPHALIDAE

GENUS *Parandania* Stebbing

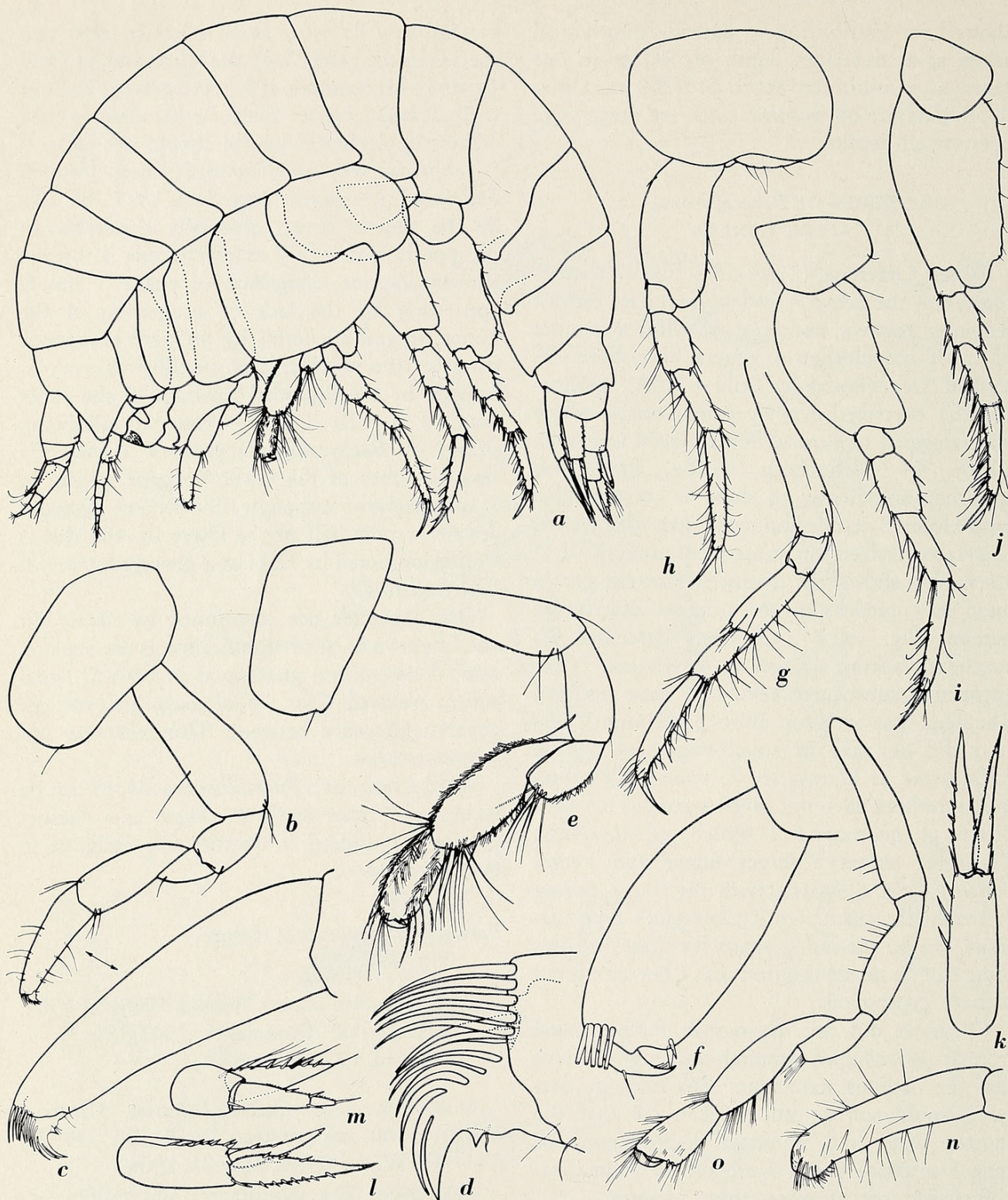


FIG. 3. *Paracallisoma coecus* (Holmes). Juvenile, 6.0 mm, Albatross 4760: *a*, lateral view; *b-d*, gnathopod 1; *e, f*, gnathopod 2; *g-j*, pereopods 1, 3, 4, 5; *k-m*, uropods 1-3. *Paracallisoma alberti* Chevreux 1903, copy of original figures, *n, o*, gnathopods 1, 2.

Parandania boeckii (Stebbing)

Andania boeckii Stebbing 1888:735, pl. 36

Parandania boeckii Stebbing, 1906:95-96; J. L.

Barnard 1961:57-58, fig. 27 (with references).

MATERIAL: One male, 5 mm from Albatross Station 4765 southeast, of Komandorskije Ostrova, 53° 12' N, 171° 37' W, 1217 fms (bottom depth), haul at 300 fms, May 29, 1906.

DISTRIBUTION: Cosmopolitan except for the

Arctic. Pelagic. Minimum recorded depth 300 m; minimum depth of closed haul 2200 m.

FAMILY PLEUSTIDAE

GENUS *Mesopleustes* Stebbing

This genus stands directly between the Pleustidae and the Paramphithoidae, forming almost the perfect intergrade, but in reality it is better assigned to the Calliopiidae. The two former families differ only by the lower lip and coxal structure. The lower lip of the type genus *Pleustes* is composed of gaping, tilted, oval outer lobes astride broad partially fused inner lobes, whereas the lower lip of the type genus *Paramphithoe* is composed of two upright, ungaping outer lobes with distinct mandibular processes and no inner lobes. The first four coxae of *Pleustes* are broadly rounded below, whereas those of *Paramphithoe* are sharply acute below. The lower lip of *Mesopleustes* is composed of distinct outer lobes, slightly tilted, slightly gaping, with poorly developed but distinct mandibular processes and indeterminate inner lobes. The coxae are attenuated but not sharply acute. The simple mandibular molar of *Pleustes* in contrast to the heavily ridged molar of *Paramphithoe* is of no consequence since other, undoubted pleustids have the paramphithoid molar. The slender gnathopods of *Paramphithoe* are imitated in other pleustid genera. Both families have species that are processiferous.

The fusion of Paramphithoidae and Pleustidae is not necessarily warranted by this intergrading genus, for if the importance of lower lips were discounted then the Calliopiidae should also have to be included in the complex. The Calliopiidae scarcely differ from Eusiridae (= Pontogeneiidae) and a case could then be made for their inclusion with pleustids and paramphithoids. I do not advocate such extensive recombination at this time in the Amphipoda, although the trend is obvious and, compared with other animal groups, the Amphipoda are certainly oversplit at the family level.

Mesopleustes abyssorum (Stebbing)

Figs. 4, 5

Pleustes abyssorum Stebbing 1888:872, pl. 67.

Mesopleustes abyssorum, Stebbing 1906:315; Chevreux 1927:92-93; Pirlot 1933:155-156; Schellenberg 1955:194.

MATERIAL: Four specimens 22 mm, 22 mm, 16 mm, and 15 mm, from Albatross Station 5082, south of Hamamatsu, Honshu, Japan, 34° 05' N, 137° 59' E, 662 fms, Oct. 20, 1906.

REMARKS: The lower lip of three of the specimens has been dissected. None shows the false inner lobes drawn by Stebbing, and I believe those may have originated from pressure on the organ while mounted under a cover slip, for by compression with a needle at the inflated median line false lobes can be inflated where shown by Stebbing. Hence the lower lip is even less like that of pleustids and more like that of paramphithoids.

Shallow pitlike thickenings of the chitin cover the body and the coxae and are drawn in enlarged figures.

DISTRIBUTION: Previously recorded from the southern Indian Ocean, near Marion Island, 3013 m; near Cape Noun, Morocco, 1180 m; NW Flores Sea, 694 m.

FAMILY EUSIRIDAE

GENUS *Eusirella* Chevreux

Eusirella multicalceola (Thorsteinson)

Figs. 6, 7

Gracilipes multicalceolus Thorsteinson 1941: 85-86, pl. 7, figs. 71-77.

Eusirella multicalceola, Birstein & Vinogradov 1955:271, fig. 30; Birstein & Vinogradov 1960:224.

MATERIAL: Figured female, 8.0 mm, and two other specimens, from Albatross Station 4758, off Queen Charlotte Islands, 52° 02' N, 132° 53' W, 1600 fms, May 19, 1906.

REMARKS: This species differs from *E. elegans* Chevreux (1908) by the much more slender gnathopods and the truncate first coxa, and from *E. longisetosa* Birstein and Vinogradov (1960) by the shorter third mandibular palp article, the much more deeply cleft telson, the shorter dactyli of the gnathopods, the shorter second article of the first maxillary palp, and by

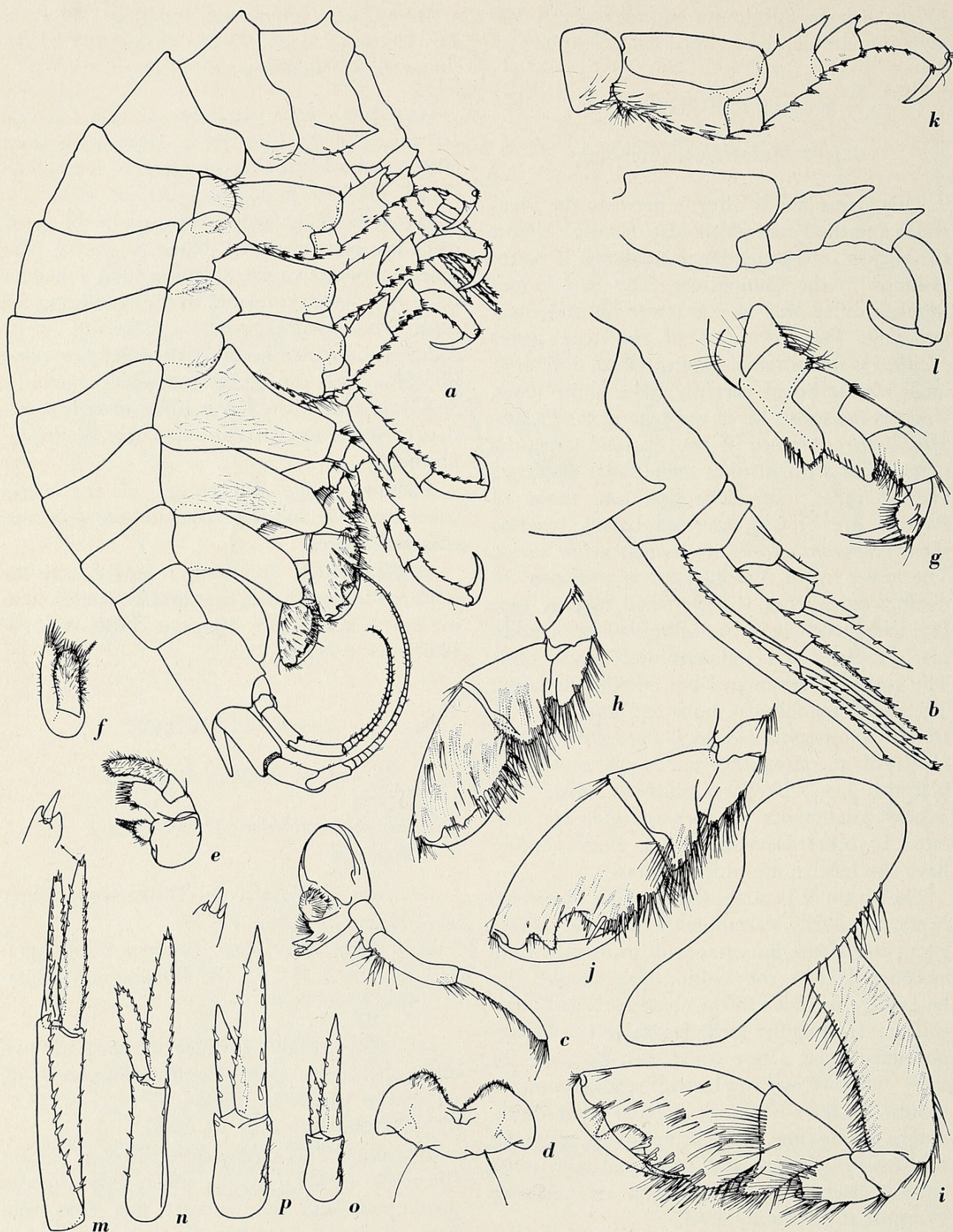


FIG. 4. *Mesopleustes abyssorum* (Stebbing). Female, 22.0 mm, Albatross 5082: *a*, lateral view; *b*, enlargement of urosome and third pleonal epimeron; *c*, mandible; *d*, lower lip; *e*, *f*, maxillae 1, 2; *g*, maxilliped; *h*, gnathopod 1; *i*, *j*, medial and lateral views of gnathopod 2; *k*, *l*, right and left pereopod 5, to show asymmetry in article 5; *m-o*, uropods 1-3; *p*, uropod 3, enlarged.

having article 5 of pereopod 1 much shorter than article 4.

The calceoli are present only on the medial faces of the articles of the antennae although in the figure of the animal drawn here they are shown rather strongly because they appear under low-powered microscopy to show through the very transparent appendages.

Birstein and Vinogradov (1960) removed Shoemaker's (1945) identification of *E. elegans* Chevreux to *E. multicalceola*, but I believe this move is premature, for Shoemaker's specimen has several good characters worthy of at least subspecific value if not more so. Especially important is coxa 1 projecting forward strongly in Shoemaker's specimen; the fifth articles of the gnathopods are of similar length in both pairs and relatively shorter than in *E. multicalceola*; the dactyli of the gnathopods extend nearly the full length of article 6, and hence the palm is longer and more distinctly defined by spines than in *E. multicalceola*; the accessory flagellum is of cylindrical, not bractiform shape as seen on my specimen. There may be differences in the mandibular palp not mentioned by Shoemaker. Shoemaker believed that *E. multicalceola*

as well as *E. valdiviae* Schellenberg (1926) were synonymous with *E. elegans* Chevreux. Since Thorsteinson had a male, and Birstein and Vinogradov and I figure females, we show that there are no sexual differences in *E. multicalceola*.

Eusirella valdiviae was not well figured and the gnathopods, although slender as in *E. multicalceola* and Shoemaker's specimen, may be turned and may not have been drawn flat; even so they have short dactyls as in *E. multicalceola*. The truncate first coxae also show that *E. valdiviae* is closely related and possibly the senior synonym of *E. multicalceola*.

Stephensen's (1944) figures of *E. elegans* show coxa 1 acutely pointed forward and show sexual differences only in antennae.

Because of zoogeographical considerations these species should not be fused until more material from the South Atlantic area can be examined in greater detail. *Eusirella multicalceola* is a North Pacific species, *E. valdiviae* is known from the South Atlantic, and *E. elegans* and Shoemaker's specimen are from the middle North Atlantic. Shoemaker's specimen is most closely related to *E. elegans* because of the first coxa. Hence *E. elegans* might be an endemic

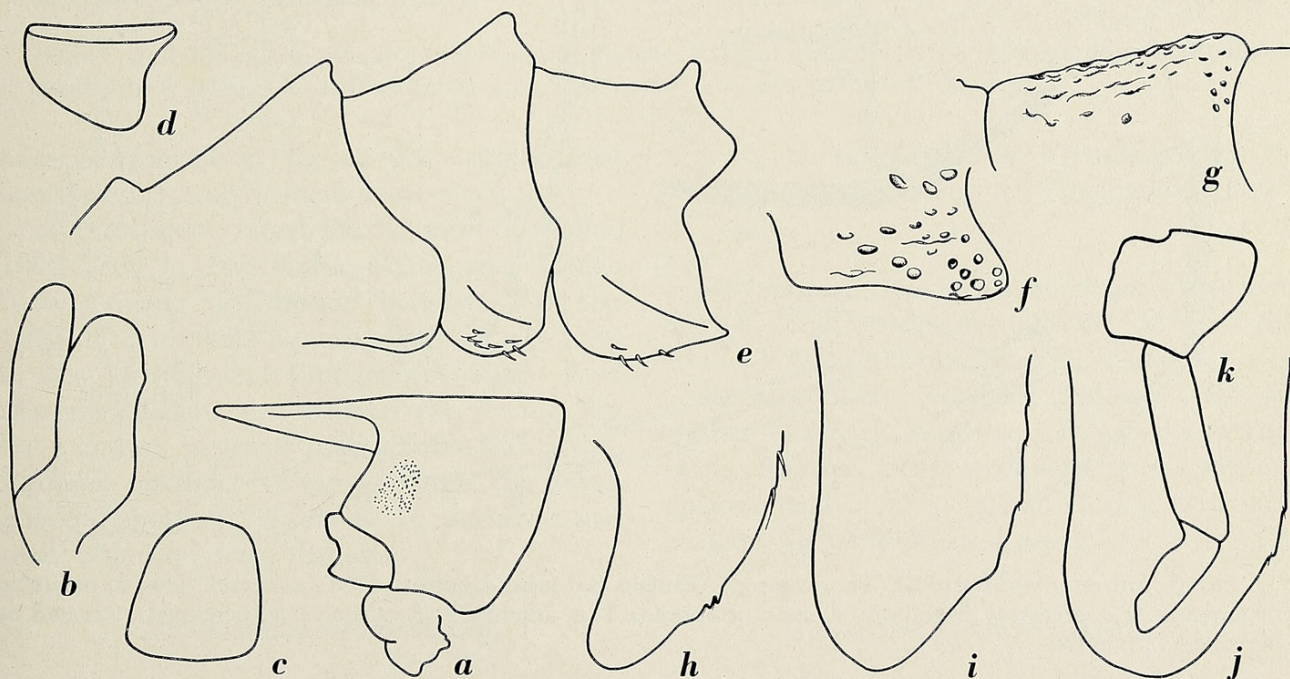


FIG. 5. *Mesoplenustes abyssorum* (Stebbing). Female, 22.0 mm, Albatross 5082: a, head; b, outline of maxilla 2; c, d, dorsal and lateral views of telson; e, pleonal segments 1-3, left to right; f, enlargement of a pereonal segment above the coxa to show sculpture; g, enlargement of dorsal edge of a pleonal segment to show sculpture; h-j, distal ends of coxae 1-3. *Cyclocaris guilelmi* Chevreux. Male, 6.3 mm: k, coxa and articles 2 and 3 of gnathopod 1.

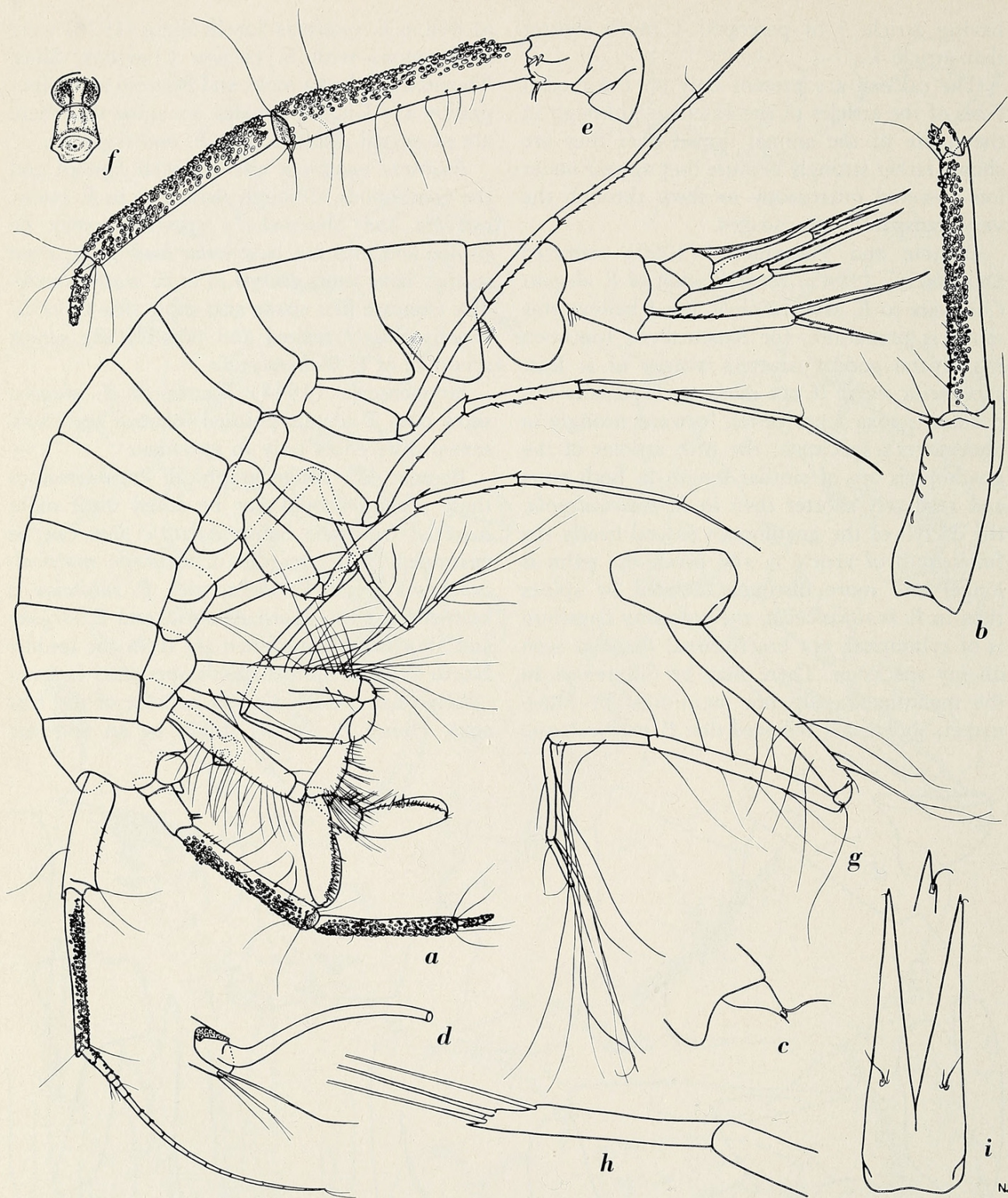


FIG. 6. *Eusirella multicalceola* (Thorsteinson). Female, 8.0 mm, Albatross 4758: *a*, lateral view; *b*, peduncle of antenna 1; *c*, accessory flagellum; *d*, apex of antenna 1; *e*, antenna 2; *f*, calceolus; *g*, pereopod 1; *h*, end of pereopod 1; *i*, telson.

Atlantic species, with *E. multicalceola* and *E. valdiviae* representing a North Pacific, circum-antarctic species penetrating into the South Atlantic. K. H. Barnard's (1932) identification of

E. elegans cannot be relegated either to *E. elegans* or *E. valdiviae* since the first coxa is not described and the gnathopods not figured. The very few locality collections of this species that

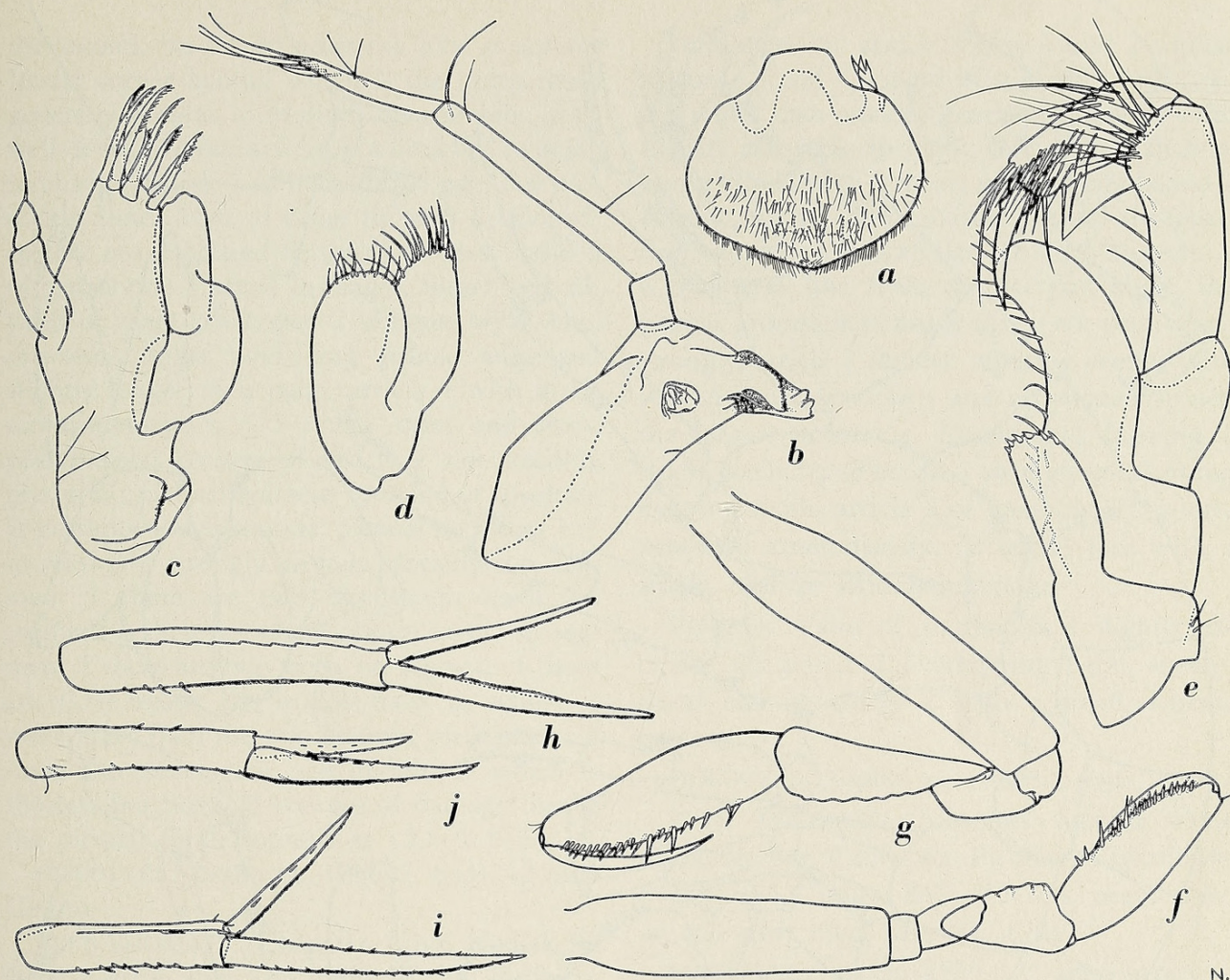


FIG. 7. *Eusirella multicaelceola* (Thorsteinson). Female, 8.0 mm, Albatross 4758: *a*, upper lip; *b*, mandible; *c*, maxilla 1; *d*, maxilla 2; *e*, maxilliped; *f*, *g*, gnathopods 1, 2; *h-j*, uropods 1-3.

have been made so far do not warrant final conclusions in any of these matters yet.

DISTRIBUTION: North Pacific: Gulf of Alaska, 1000-1200 m tow; Kurile-Kamchatka Trench tows showing distribution between 500 and 2000 m; east of the Ramapo Deep in a 0-5500 m tow; Birstein and Vinogradov (1960) state that the distribution includes the Bering Sea but I am not aware of such a published record. *Eusirella valdiviae* is known from the South Atlantic about 30° S and K. H. Barnard's material also came from that area.

GENUS *Rhachotropis* Smith

Rhachotropis natator (Holmes)

Gracilipes natator Holmes 1908:527-529, figs. 32-34; Thorsteinson 1941:85, pl. 6, figs. 67-70.

Rhachotropis natator, J. L. Barnard 1954:54-

56, pl. 6; Birstein & Vinogradov 1955: 275-276; Birstein & Vinogradov 1960: 225.

MATERIAL: One specimen from Albatross Station 4760, northeastern Pacific, 53° 53' N, 144° 53' W, 2200 fms, May 21, 1906.

DISTRIBUTION: Northern Pacific: Gulf of Alaska, Hokkaido, southern California, and east of the Ramapo Deep, shallowest depth 930 m, greatest haul 5500 m but no closing hauls yet available defining greatest depth.

FAMILY GAMMARIDAE

GENUS *Melita* Leach

Melita kodiakensis, new species

Fig. 8

DIAGNOSIS: Antenna 1 scarcely longer than

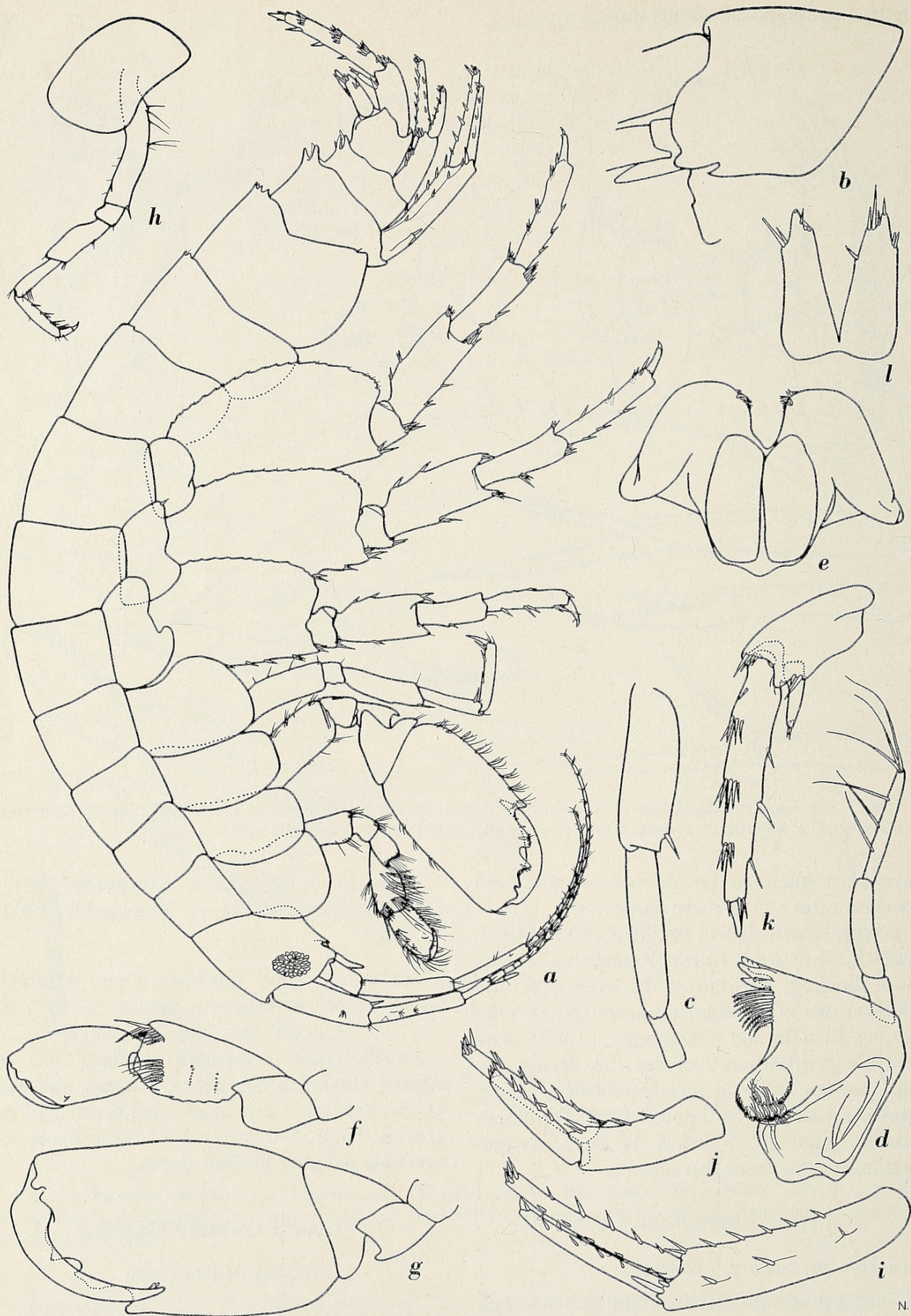


FIG. 8. *Melita kodiakensis*, n. sp. Holotype, male, 12.0 mm: *a*, lateral view; *b*, head; *c*, peduncle of antenna 1; *d*, mandible; *e*, lower lip; *f*, *g*, ends of gnathopods 1, 2; *h*, pereopod 1; *i-k*, uropods 1-3; *l*, telson.

the second; head with accessory lobe at antero-lateral corner behind which is the sharp tooth generally present in *Melitas*; eyes present, with well-developed ommatidea but bleached to ochre in alcohol; article 1 of mandibular palp not produced; inner lobes of lower lip well developed; coxa 1 not produced forward; articles 5 and 6 of gnathopod 1 equal in length, finger normal; palm of male gnathopod 2 oblique, with three processes, finger overriding palmar edge and slightly longer than palm, article 4 with distal tooth; pereopods 3–5 rather short and stout, posterodistal corners of article 2 not strongly produced; pleonal epimera rounded or quadrate at posterior lower corners; pleonal segments 1–5 increasingly strongly dentate dorsally, on segment 1 there are two obsolescent teeth, on segment 2 there are three obtuse teeth, on segment 3 there are five teeth, on segment 4 there are three teeth, the middle-most of which is more erect than the two laterals, on segment 5 there are three teeth, the middle of which is shortest but possibly because of damage; hence the pleonal tooth formula is (2)–3–5–3–3–0.

HOLOTYPE: USNM no. 108631, male, 12 mm. Unique.

TYPE LOCALITY: Chogafka Cove, Kodiak Island, Alaska, July 10, 1880, W. H. Dall, no. 3371 (1948).

RELATIONSHIP: This species is related to *M. valida* Shoemaker (1955) but differs by the quadrate third pleonal epimeron, the smaller forward extension of the first coxa, and the larger teeth of the urosome. It differs from *M. dentata* (Kroyer) (see Sars, 1895: pl. 181) by the quadrate third pleonal epimeron, the unproduced first mandibular palp article, and the accessory lobe at the lower anterior corner of the head. From *M. gladiosa* Bate (Chevreux and Fage, 1925:233) it differs by the unproduced first to third pleonal epimera and the male second gnathopodal palmar armature. From *M. pallida* Sars (1886: pl. 15) the new species differs by the unproduced second and third pleonal epimera and the shape of the head.

FAMILY PHOTIDAE

GENUS *Photis* Kroyer

Photis chiconola, new species

Fig. 9

DIAGNOSIS OF MALE: Coxae 1 and 2 similar to coxae 3 and 4, longer than broad; third coxa not wider than second; gnathopod 1 with palm slightly excavate, distinctly defined by a shallow bump armed with a spine; palm of gnathopod 2 oblique, with a deep, narrow conical invagination, the defining tooth slender but not reaching a transverse line from the dactylar hinge, the palmar process near finger hinge not protruding strongly, article 7 slender, tapering evenly, with several inner serrations and articulated spines, the largest occurring distally and forming a slight notch, tip of article 7 strongly overlapping defining tooth; article 2 of gnathopod 2 poorly produced anterodistally, its lateral face with a single, obscure stridulating ridge.

FEMALE: Palm of gnathopod 2 slightly excavate, its article 7 overlapping palm, anterodistal end of article 2 with a small, narrow process.

HOLOTYPE: USNM no. 108632, male, 5 mm.

TYPE LOCALITY: Albatross Station 4530, Monterey Bay, California, Pt. Pinos Lighthouse, S 78° E, 6.8 miles, 847–755 fms, beam trawl on soft gray mud, May 27, 1904.

MATERIAL: Station 4530 (25 specimens).

RELATIONSHIP: This species is most closely related to *Photis conchicola* Alderman (see J. L. Barnard, 1962a) and the differences herein noted may be those of only racial value. *Photis chiconola* differs from *P. conchicola* especially by the slender dactyl of the female gnathopod 2, which strongly overlaps the palm, in contrast to the short, stout dactyl fitting the palm in *P. conchicola*. Articles 3–6 of pereopods 3–5 are more slender in *P. chiconola*, the dactyl of male gnathopod 1 is longer, and the male coxa 2 is longer than broad but this probably is a feature of its juvenility. The distal lobe of article 2 on the female second gnathopod is small and slender in contrast to that of female *P. conchicola*.

The new species is related to *P. reinhardi* Kroyer (see Sars, 1895: pl. 202), differing from it by the narrower palmar excavation of male gnathopod 2, which may be a feature of juvenility, but the dactyl strongly overlaps the palm, indicating sufficient difference.



FIG. 9. *Photis chiconola*, n. sp. Female, 4.5 mm, Albatross 4530: *a, b*, head; *c, d*, gnathopod 1; *e, f*, gnathopod 2; *g*, pereopod 1; *h*, end of pereopod 3; *i*, pereopod 5; *j*, coxa 5; *k*, coxa 6; *l-n*, uropods 1, 2, 3 (enlarged); *o*, telson; *p*, pleonal segments 1-3, left to right. Holotype, male, 5.0 mm: *q-s*, gnathopods 1, 2, 2 (enlarged); *t*, pereopod 2; *u-w*, pereopods 3-5; *x*, coxa 3.

GENUS *Podoceropsis* Boeck

Podoceropsis nitida (Stimpson)

Selected references:

Podoceropsis excavata, Sars 1895:576-577, pl. 205.

Podoceropsis nitida, Holmes 1905:524-525, unnumbered fig.; Holmes 1908: 543; Kun-

kel 1918:142-143, fig. 41; Chevreux & Fage 1925:317-318, fig. 326; Shoemaker 1930:124; Stephensen 1940:62; Stephensen 1942:373; Gurjanova 1951:855-856, fig. 600.

MATERIAL: One female from Chiniak Bay, Kodiak Island, Alaska, July 12, 1880, W. H. Dall coll. no. 3413 (1527).

DISTRIBUTION: Boreal species: North Atlantic at Norway, Kattegat, Holland, France as far south as Boulogne, British Isles, New England as far south as Connecticut; Arctic at Bering, Chukchi, and East Siberian seas; North Pacific at Kodiak Island, Alaska. Depth range 40–150 m.

FAMILY ISCHYROCERIDAE

GENUS *Ischyrocerus* Kroyer

Ischyrocerus hortator, new species

Fig. 10

DIAGNOSIS: Eyes obsolete, forming a barely perceptible white mass composed of finely particulate tissue; antenna 1 shorter than antenna 2; flagellum of antenna 2 not longer than article 5 of peduncle; coxa 5 half as long as coxa 4; pereopods 4 and 5 with lower posterior corners of second articles subconically produced, pereopod 3 less produced; uropod 3 very slender, elongated, rami about 37% as long as peduncle, apex of outer ramus ornamented (see figures), inner ramus with a single apical spinule; telson linguiform, apically rounded, armed with two lateral spines; gnathopod 2 with long palm, scarcely distinct from but longer than hind margin of article 6, near finger hinge bearing a poorly bifurcate process.

HOLOTYPE: USNM no. 108634, female, 13.8 mm, ovigerous.

TYPE LOCALITY: Albatross Station 2789, off Isla de Chiloe, Chile, 42° 36' 00" S, 75° 28' 00" W, 1342 fms, Feb. 12, 1888.

MATERIAL: Albatross 2788 (specimen 9.0 mm); Albatross 2789 (holotype, and a 9.5-mm specimen).

RELATIONSHIP: In the obsolescent eyes and the short rami of uropod 3 this species resembles *I. tenuicornis* (Sars 1885) and *I. brevicornis* (Sars 1885), but differs by the produced posteroventrol corners of the second articles of pereopods 4 and 5 and the distal palmar process of gnathopod 2. It has different proportions of the antennae than *I. tenuicornis*, and different proportions of the peduncle and rami of uropod 3 than does *I. brevicornis*.

The new species differs from *I. commensalis* Chevreux (1900) by the shorter fifth coxa, the

obsolescent eyes, and shorter rami of uropod 3, but in other respects the two species are similar.

This species is related to *I. chamissoi* Gurjanova (1951), but differs by the produced lower corners of the second articles on pereopods 3–5. The shorter rami of uropod 3 distinguish the species from *I. krascheninnikovi* Gurjanova (1951), according to her key and description. The new species lacks the distal peduncular seta on uropod 3 shown for *I. rhodomelae* by Gurjanova (1951).

The epistome is similar to that drawn herein for *I. malacus*, n. sp.

DISTRIBUTION: The type locality and off Archipielego de los Chonos, Chile, 45° 35' 00" S, 75° 55' 00" W, 1050 fms, Feb. 11, 1888.

Ischyrocerus malacus, new species

Fig. 11

DIAGNOSIS: Eyes obsolete, pigmentless in alcohol but bearing tiny distinct ommatidia moderately scattered; antennae about equal in length, flagellum of antenna 2 not longer than article 5 of peduncle; coxa 5 three-fourths as long as coxa 4; pereopod 5 with lower posterior corner of article 2 subacutely produced, the corners of pereopods 3 and 4 bluntly produced; uropod 3 slender, elongated, rami half as long as peduncle, apex of outer ramus ornamented (see figures), inner ramus with a single apical spinule; telson linguiform, apically rounded, armed with two spines; gnathopod 2 with long palm, scarcely distinct from but longer than hind margin of article 6, near finger hinge bearing a poorly bifurcate process.

HOLOTYPE: USNM no. 108636, female, 9.0 mm. Unique.

TYPE LOCALITY: Albatross Station 4538, Monterey Bay, California, 6.5 miles S, 85° E of Pt. Pinos Lighthouse, 871 fms, May 31, 1904.

RELATIONSHIP: This species resembles *I. hortator*, n. sp., in its general appearance but from the diagnoses one may see innumerable small differences. The eyes of *I. malacus* are slightly better composed, coxa 5 is longer, the rami of uropod 3 are longer, and the antennae are equal in length.

The produced lower corner of article 2 on pereopod 5 removes this species from these relatives: *I. megacheir* (Boeck), *I. hanseni*

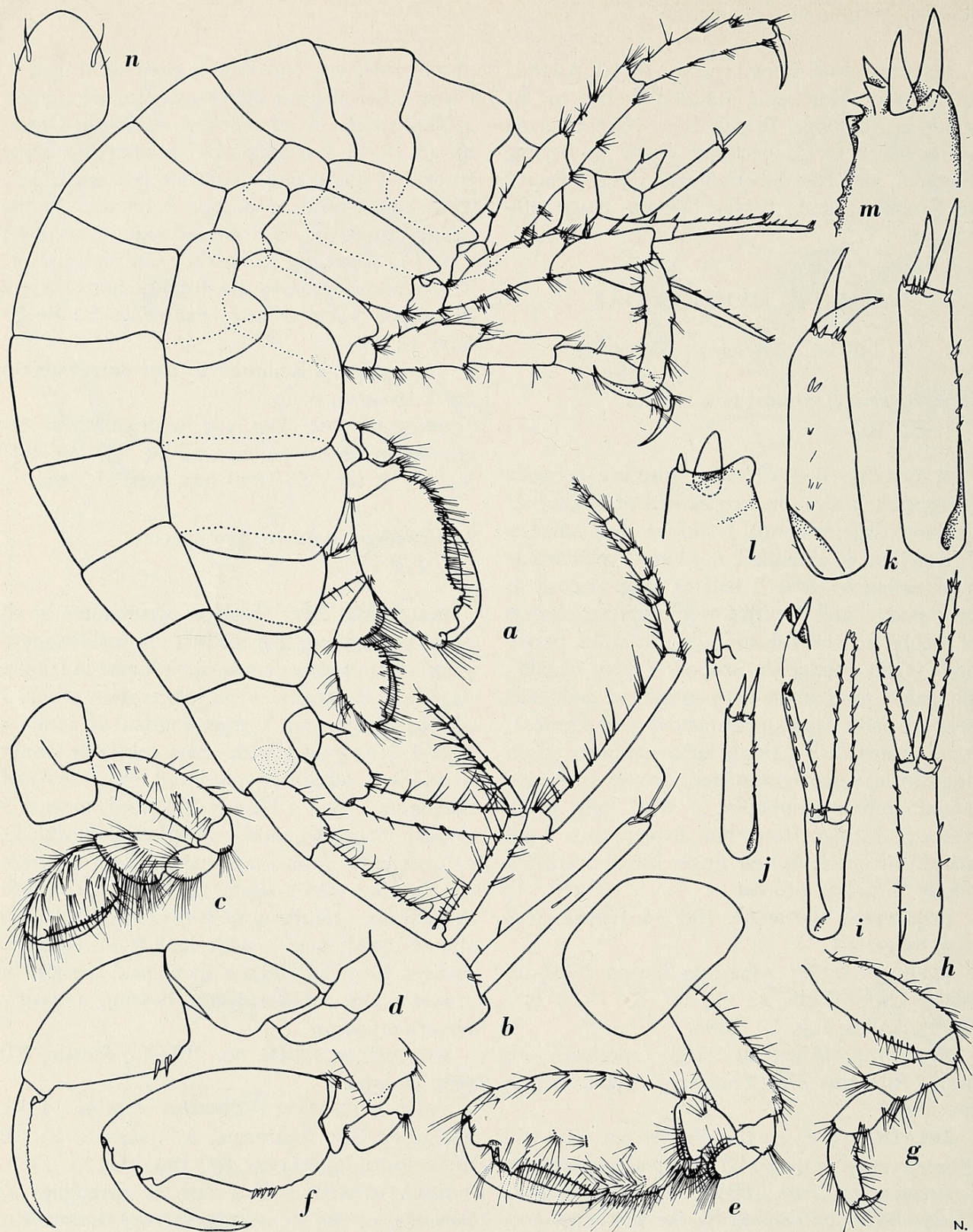
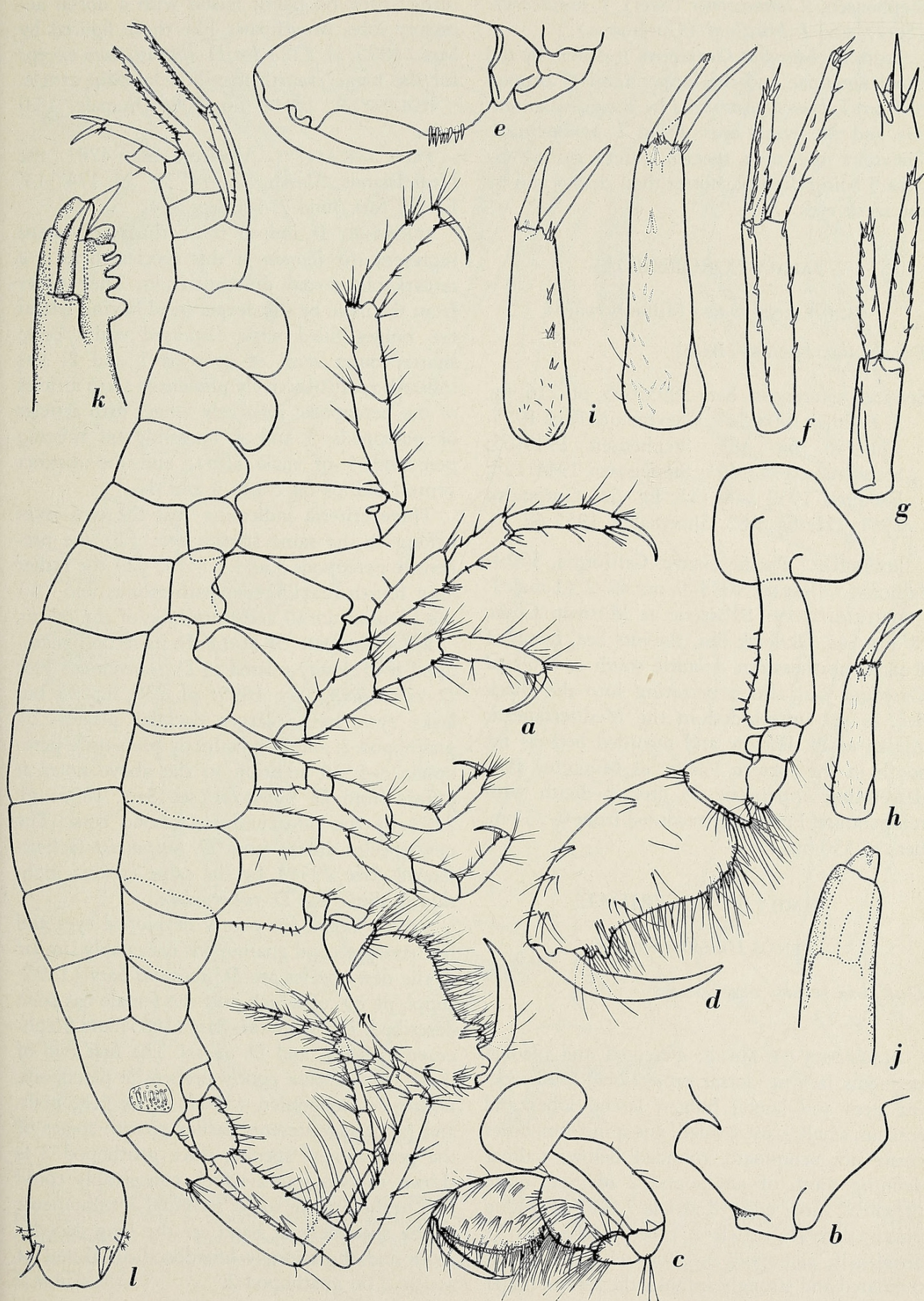


FIG. 10. *Ischyrocerus hortator*, n. sp. Holotype, female, 13.8 mm, Albatross 2789: *a*, lateral view; *b*, accessory flagellum; *c*, *d*, gnathopod 1, medial and lateral; *e*, *f*, gnathopod 2, medial and lateral; *g*, pereopod 1; *h*–*j*, uropods 1–3; *k*, two views of uropod 3, enlarged; *l*, apex of inner ramus of uropod 3; *m*, apex of outer ramus of uropod 3; *n*, telson.

FIG. 11. *Ischyrocerus malacus*, n. sp. Holotype, female, 9.0 mm, Albatross 4538: *a*, lateral view; *b*, upper lip and epistome complex; *c*, gnathopod 1; *d*, *e*, gnathopod 2, medial and lateral views; *f*–*h*, uropods 1–3; *i*, two enlarged views of uropod 3; *j*, apex of inner ramus of uropod 3; *k*, apex of outer ramus of uropod 3; *l*, telson.



Stephensen, *I. tenuicornis* (Sars), *I. brevicornis* (Sars), and *I. brusilovi* (Gurjanova).

From *I. chamissoi* Gurjanova it differs by the equal antennae and the longer rami of uropod 3; from *I. krascheninnikovi* by the equal antennae and the weak eyes. From *I. commensalis* Chevreux the new species differs mainly by coxa 5 being slightly shorter than coxa 4 and by the weak eyes.

FAMILY COROPHIIDAE

GENUS *Erichthonius* Milne Edwards

Erichthonius hunteri (Bate)

Selected references: Sars 1895:605, pl. 216, fig. 2; Holmes 1908:543; Chevreux & Fage 1925:354-356, fig. 363; Stephensen 1940:65; Stephensen 1942:403; Stephensen 1944:128; Enequist 1950:344-345, fig. 62; Gurjanova 1951:951, fig. 662; Shoemaker 1955:68.

MATERIAL: Pacific Grove, California, 300+ fathoms, USNM no. 103349, no. 42, 2 (1 male).

DISTRIBUTION: Subarctic at Murman Coast, White Sea, Okhotsk Sea, Barents Sea, north of Russia; northeastern Atlantic south to Gulf of Gascogne but also penetrating into the Black Sea, as yet unrecorded in the Mediterranean; Alaska at Pt. Barrow and recorded here as far south in the eastern Pacific as Monterey Bay, descending apparently to greater depth with temperature. Previously recorded from 0-235 m, here to 550 m.

FAMILY PODOCERIDAE

GENUS *Dulichia* Kroyer

Dulichia remis, new species

Fig. 12

DIAGNOSIS OF MALE: Pereonal and pleonal segments lacking dorsal projections; head lacking eyes and lateral bulges, lateral lobes and rostrum small; coxa 1 small, not spiniform, other coxae not acuminate, rounded below; palmar defining tooth of gnathopod 2 oblique, quite proximal, inner edge of article 7 bearing a long proximal tooth, article 2 broadly lobed on its distal half; pereopods 3-5 subprehensile, article 6 inflated and strongly spinose, the serrate finger

turned back on palm; telson with a dorsal accessory lobe. Mouthparts like those figured by Sars (1895, pl. 228) for *D. spinosissima* except for the longer fourth maxillipedal palp article.

HOLOTYPE: USNM no. 108637, male, 13.0 mm.

TYPE LOCALITY: Albatross Sta. 4781, the Near Islands, Alaska, 52° 14' 30" N, 174° 13' E, 482 fms, June 7, 1906.

?FEMALE: If indeed these three specimens represent the female of this species there is a remarkable sexual differentiation. They differ from the male by the deeper head having lateral eye bulges filled with dispersed white cells; shorter outer rami of uropods 1 and 2; less inflated, yet distinctively prehensile sixth articles of the pereopods; relatively longer fifth articles of pereopods 3 and 4 (possibly on missing pereopod 5 of male also); and the distinct ventral bumps on coxae 3 and 4.

Three criteria indicating that the two sexes belong to the same species are: (1) the prehensile pereopods 3 and 4 (5?), (2) the rather long fourth maxillipedal palp article, and (3) the peculiar dorsal accessory lobe of the telson.

RELATIONSHIP OF MALE: In its second gnathopod it is closely related to *D. tuberculata* (see *D. curticauda*, Sars, 1895: pl. 230, fig. 2) but lacks eyes, has a larger dactylar process on gnathopod 2, and has distinctly prehensile pereopods 3-5. In addition to the above notes it differs from *D. porrecta* (see Sars, 1895: pl. 229) by the nonacuminate second coxa. The new species differs from *D. knipowitschi* Gurjanova (see 1951) by the same criteria mentioned above for *D. tuberculata*.

Species noted for poorly developed eyes and for having second gnathopods reasonably similar to the new species are *D. normani* Sars (1895: suppl. pl. 8), of which only the female has been described; *D. hirticornis* Sars (1885) and Stephensen (1944), and *D. abyssi*. The first two of these species have poorly prehensile pereopods. *D. abyssi* Stephensen (1944) lacks pereopods, and perhaps represents earlier growth stages of the present new species, since gnathopod 2 is shown in two stages which conceivably could lead to the present stage; terminal developments in the specimens at hand are the long dactylar tooth and the strongly broadened distal end of article 2 on gnathopod 2.



FIG. 12. *Dulichia remis*, n. sp. Holotype, male, 13.0 mm, Albatross 4781: a, lateral view, antennae and pereopod 5 broken; b, telson; c, end of maxillipedal palp; d, e, coxae 3, 4; f, end of gnathopod 1; g-i, details of gnathopod 2; j, k, end of pereopod 1; l, end of pereopod 3. Female, 16.0 mm, Albatross 4781: m, head and antennae; n, head, arrow indicating dorsum; o, p, gnathopods 1, 2; q-s, pereopods 3-5; t, end of pereopod 4; u, urosome.

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