

40. A Revision of the Isopod Genus *Ligidium* (Brandt)*
—Crustacea. By HAROLD GORDON JACKSON, F.Z.S.,
Birkbeck College, University of London.

[Received July 13, 1923 : Read November 6, 1923.]

(Text-figures 1-10.)

CONTENTS.

	Page
(1) Introduction	823
(2) Generic and Specific Characters	824
(3) Key to the genus <i>Ligidium</i>	828
(4) The genus <i>Ligidium</i>	828
1. <i>Ligidium hypnorum</i>	829
2. <i>Ligidium fragile</i>	831
3. <i>Ligidium gracile</i>	832
4. <i>Ligidium latum</i>	834
5. <i>Ligidium germanicum</i>	835
6. <i>Ligidium japonicum</i>	836
7. <i>Ligidium bosniense</i>	837
8. <i>Ligidium nodulosum</i>	837
9. <i>Ligidium longicaudatum</i>	838
10. <i>Ligidium</i> (<i>Typhloligidium</i>) <i>cæcum</i>	838

(1) *Introduction.*

The genus *Ligidium* was separated from *Ligia* by Brandt in 1833 with this diagnosis: "Articulus appendicis caudalis apicalis exterior articuli basalis apici interius autem processui proprio ex articuli basalis apice prodeunti insertus." It is well defined in structure and habitat from *Ligia*, although nearer to that genus than to any other Terrestrial Isopod and linked to it by the newly-described genus *Ligidiodes* Wahrberg (1922); and there is but slight range of structure within it. Budde-Lund (1885) gives five species which he describes in Latin with the utmost brevity and without figures. The most important and indeed often the only character given is the form of the uropod, but as the appendage is brittle and often lost, it is sometimes impossible to make a certain identification from his description. I only retain two of these species, but several good species have been added since Budde-Lund's work, and his collection contains specimens, mostly unidentified by him, which have enabled me to describe all but four species. The revision of this genus has been greatly aided by a recent paper by Verhoeff (1918) dealing with the European species, in which much-needed new characters are proposed, and a new subgenus, *Typhloligidium*, is set up, on, to my mind, amply sufficient grounds, to contain Carl's cave-dwelling *Ligidium cæcum*.

* This paper is the second of a series.

(2) *Generic and Specific Characters.*

I have not found any marked sexual dimorphism to occur in *Ligidium*, the difference between the sexes being confined to the modified pleopods of the male. In some species of *Ligia* the sutures separating coxal plates from tergite are differently marked in the sexes. It is interesting to note that no such difference is to be found in this genus, and that the sutures are marked, if at all, in an entirely different manner by fine semi-circular grooves on the last four thoracic somites of both sexes (text-fig. 7, a).

The *proportions* of the body and the *size* vary remarkably little.

The *colour* of preserved specimens is of little value, but the distribution of the pigment is sometimes characteristic and always worth noting.

The general *surface* of the body is remarkably smooth and polished in all but two species, which have a roughened appearance owing to the presence of scales or knobs.

Cephalon. The line of the epistome is continuous. Above and between the insertion of the antennæ it forms a downwardly-directed V, which differs in length and sharpness in different species. When prolonged and sharp it commonly projects forward to form a slight triangular rostrum. This condition is termed "produced" in the following descriptions (text-fig. 7, b). The eyes are moderately large in all species of the subgenus *Ligidium*, and occupy the lateral corners of the head. In front of the hind margin of the cephalon is a more or less deep trench ("transverse groove"), opening to the cheek more or less behind the eye on each side. The two pear-shaped pits on the forehead of *Ligia* are represented in this genus by grooves ("frontal grooves") which originate behind the eyes in the transverse groove, run forwards on the inner side of the eyes, and turn inwards on the top of the head to run towards each other parallel to the transverse groove. They never meet in the mid-line, but end abruptly. The demarcation of these grooves has some systematic value. (Text-figs. 3, b; 7, b.)

The *thoracic somites* vary little in general form. The hind margins of the first three are more or less straight, the fourth is slightly concave, and the remainder more deeply so owing to the backward production of the lateral corners. These are never, however, much produced. The first somite usually differs from the remainder, as has been pointed out by Verhoeff (1901). In many species the tergite is dented on the postero-lateral corner of each side, and the dint may take the form of a wide shallow pit or of a shallow groove forming a "re-entrant" from the hind border of the tergite (text-fig. 3, c & d). In either case it superficially appears as if the tergite had been carelessly nipped by a fine pair of forceps. This structure is referred to hereafter as the "lateral depression." When the depression is extended to

the hind border of the tergite, there is often present on its hind edge a patch of stiff bristles arranged in about three transverse rows, forming, as it were, a thick fence of stakes at the entrance to the little valley. Verhoeff (1918) has suggested that this apparatus may be used as a comb for cleaning the antennæ, but confirmatory observations have yet to be made.

The edges of the tergites are beset with "Schuppenborsten" similar to those of *Ligia*, as described by Wahrberg—that is to say, the bristle usually projects slightly, but never conspicuously from the scale; it is sometimes not easy to detect.

The *abdomen* (metasome) is always abruptly contracted. The first two somites are covered by the last thoracic somite, and are without drawn-out pleural plates, but the remaining somites have these moderately drawn out. The terminal somite is very similar in form in all species. The hind border is arcuate or very bluntly angled in the median line; it is notched above the insertion of the uropods to a greater or less extent in different species, but no distinctive angles or spines are developed.

Appendages.

The *antennæ* (antennules) are of three segments, the distal of which is almost vestigial. They always project beyond the front of the head in this genus. Sensory bristles are found on each segment and a terminal bunch on the last of a few short stiff rods. (Text-fig. 2, a.)

2nd antennæ. Five segments and an obscurely segmented flagellum of not more than 15 or less than 9 segments, ending in a dense brush of setæ. In the subgenus *Typhloligidium* the flagellum has 19–23 segments. The number of segments on the flagellum appears to increase in number till fully adult. (Text-fig. 2, b.)

Right mandible. Three strong biting teeth; large lacinia mobilis beset with many strong bristles, but not chitinized; 3 hairy setæ between biting teeth and molar tubercle on base of lacinia mobilis. Molar tubercle not high-crowned, and bearing a dense row of setose bristles on its free posterior edge. A bunch of long non-setose bristles between lacinia mobilis and molar tubercle. (Text-fig. 1, a & c.)

Left mandible. Three or four strong biting teeth; lacinia mobilis with 3 chitinized teeth; 3 or 4 hairy bristles between biting teeth and molar tubercle on base of lacinia mobilis. Molar tubercle high-crowned; its surface strongly ridged. (Text-fig. 1, b & d.)

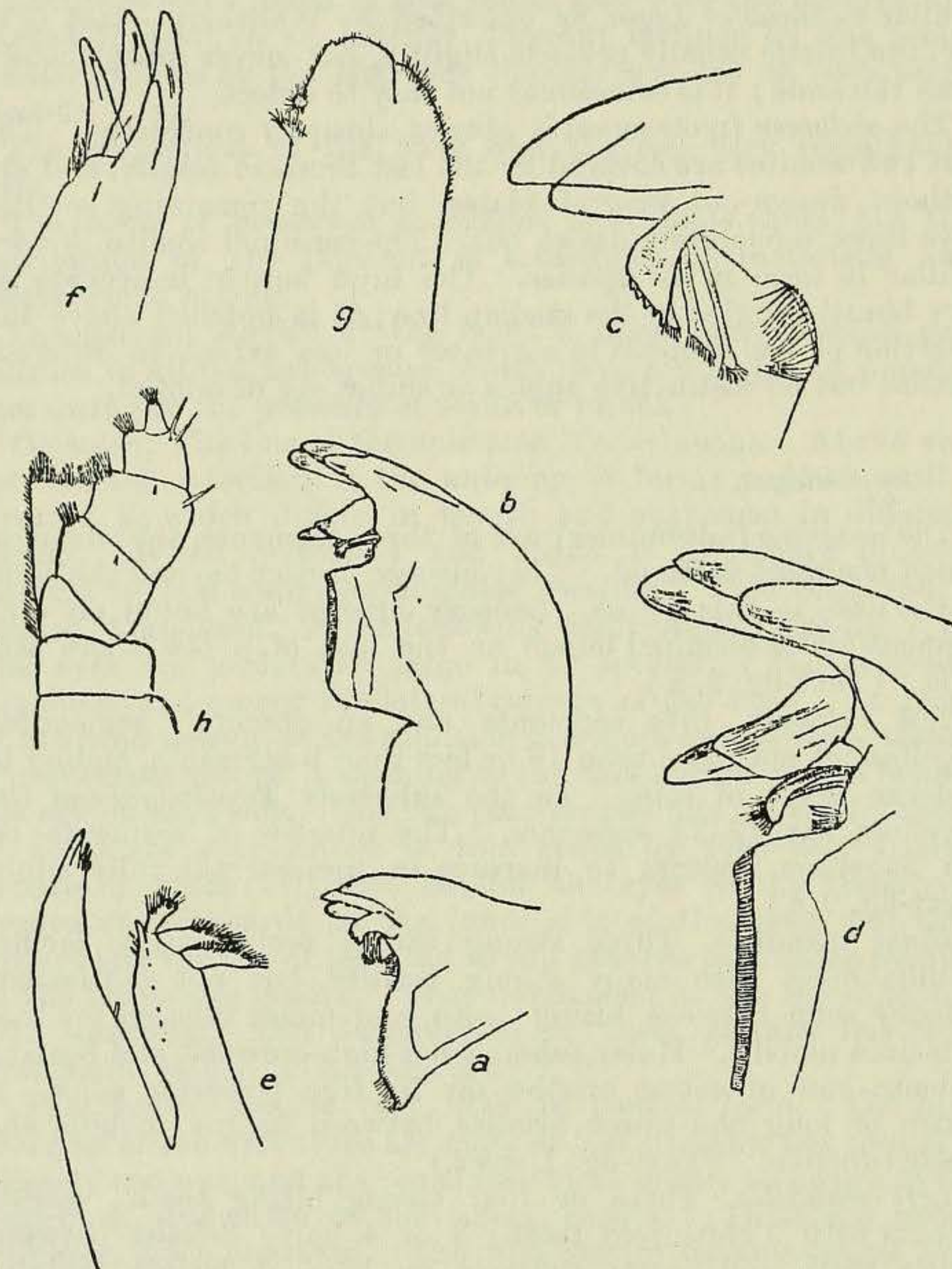
1st maxilla. Lacinia exterior with 4 large teeth and 3 or 4 small ones. Lacinia interior with three very stout hairy bristles, the two inferior of which are equal and larger than the uppermost one. (Text-fig. 1, e & f.)

2nd maxilla. Obscurely divided into two lappets, the smaller on the outer side; on the inner side are seen two richly setose

bristles, the upper of which is small and rounded, the lower larger than the upper and blade-shaped. (Text-fig. 1, *g*.)

Maxillipedes. Endopodite distinctly divided into 5 segments, the distal one ending in a blunt cone; on inner side of all but proximal one a prominent bunch of about 7-9 bristles. The

Text-figure 1.



Ligidium hypnorum. *a* & *c*, right mandible; *b* & *d*, left mandible; *e* & *f*, 1st maxilla; *g*, 2nd maxilla; *h*, maxillipede.

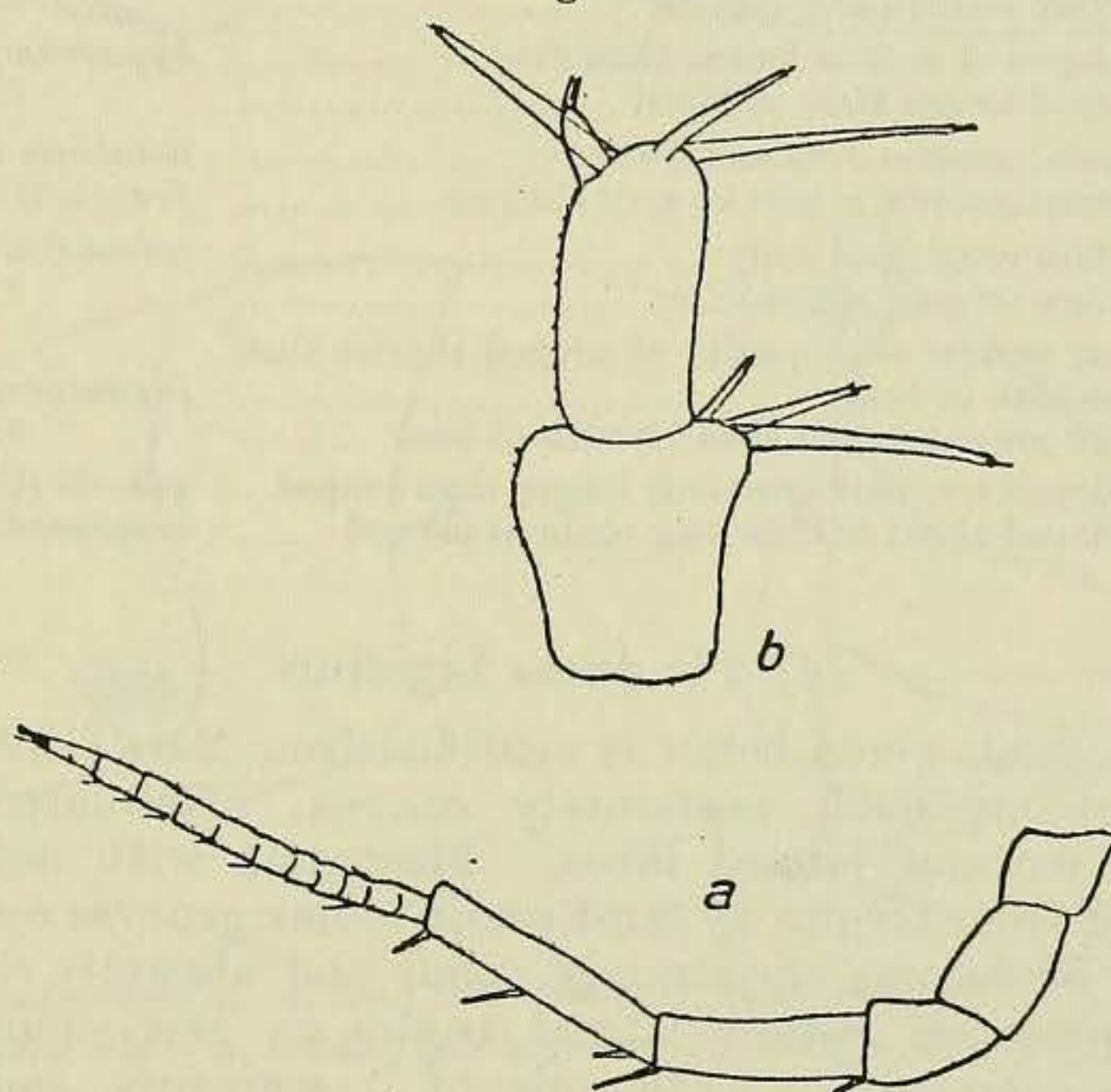
inner blade densely covered with plain and setose bristles on the apex. (Text-fig. 1, *h*.)

Peræopods. Typical in form and without distinctive features. The bristles are of simple form, ending in two spikes with a median small "hair." A single bristle projects beyond the

unguis in all species but *L. japonicum*, in which, according to Verhoeff, the 7th foot has four ciliated bristles projecting beyond the unguis.

Pleopods. In the male the 1st and 2nd pairs are modified. The 1st endopod is drawn out on the inside into a process upon which is set a variable but small number of setæ. The 1st exopod has also setæ on the postero-median corner. The 2nd endopod is of two segments and greatly elongated. The inner edge is thickened, and the outer appears to be folded over in some forms. At the end of the distal segment this fold sometimes becomes a wide lappet, which shows considerable individual variation in size and shape. Verhoeff bases a key on the characteristics of the male pleopods, but although my material is not conclusive, I do not feel disposed to allow much importance

Text-figure 2.



Ligidium hypnorum. a, antenna; b, antennule.

to them. I suspect that they appear different in forms collected during and out of the breeding-season. (Text-figs. 3, e; 4, a & b; 6, d, e & f; 8, c & d; 10, c & d.)

Uropods. The striking inequality of the two rami and the characteristic inner process of the base make these appendages systematically valuable, a fact which causes their brittleness to be all the more regrettable. Budde-Lund divides the species dealt with by him into two groups—the first in which the exopod is longer than the endopod, and the second in which the reverse is the case. Further knowledge has shown that the first group contains but two species—the common *L. hypnorum* and *Typhloligidium cæcum*,—and that all the other known forms fall into the second group. The grouping does not seem to be of primary importance. (Text-figs. 4, c; 6, g; 8, e; 9, c; 10, e.)

(3) *Key to the genus Ligidium.*

The diagnoses of the genera *Typhloligidium* and *Ligidium* s.s. are taken from Verhoeff (1918) with one omission.

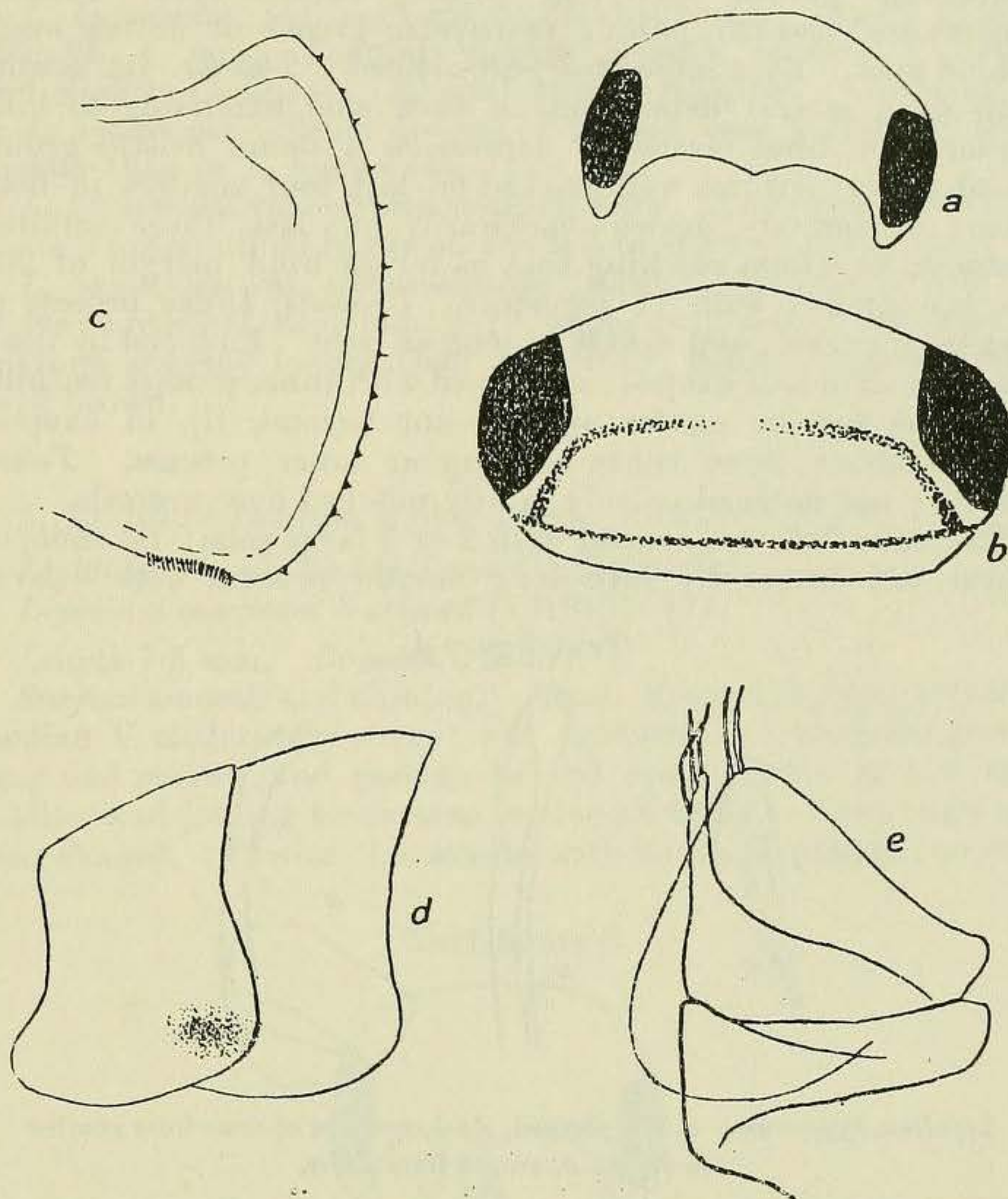
- A. Eyes and body-pigment absent. Antennal flagellum 19-23 segments. Mandibles with large interval between the biting teeth and triturating part; in intervening space 10-11 hairy bristles. Uropods widely separated.
Subgenus *Typhloligidium* Verh.
One species, *T. caecum* (Crimea—caves).
- B. Eyes large, body-pigment well developed. Antennal flagellum 10-15 segments. Mandibles with 3-5 hairy setæ, their biting teeth and triturating part not widely separated..... Subgenus *Ligidium* Verh.
- | | | | |
|----|---|---|----------------------------------|
| 1. | { | With bristle group on hind lateral border of 1st somite | 2. |
| | { | Without bristle group..... | 6. |
| 2. | { | With lateral depression on hind border of 1st somite | 3. Europe). |
| | { | Without lateral depression | <i>germanicum</i> (Central |
| 3. | { | Surface covered with little knobs | <i>nodulosum</i> (Caucasus). |
| | { | Surface smooth and shining | 4. |
| 4. | { | Endopod of uropod longer than exopod | <i>hypnorum</i> (Europe). |
| | { | Exopod longer than endopod | 5. |
| 5. | { | Frontal grooves deep and distinct | <i>bosniense</i> (S. Bosnia). |
| | { | Frontal grooves absent or very shallow..... | <i>fragile</i> (Caucasus). |
| 6. | { | Surface rough and scaly | <i>latum</i> (California). |
| | { | Surface smooth and shining | 7. |
| 7. | { | Inner process of propodite of uropod shorter than breadth of base | <i>japonicum</i> (Japan). |
| | { | Inner process longer than breadth of base | 8. |
| 8. | { | Endopod less than one-sixth longer than exopod... | <i>gracile</i> (California). |
| | { | Endopod about half as long again as exopod | <i>longicaudatum</i> (New York). |

(4) *The genus Ligidium.*

The diagnosis given below is modified from Sars (1899).

Body oblong oval, moderately convex, attenuated behind. Cephalon without lateral lobes. Mesosome with coxal plates marked off from tergite by faint semicircular grooves on last four somites. Metasome moderately small and abruptly contracted, without produced postero-lateral angles on last somite. Eyes large and compound. Antennula of 3 segments, small, distal segment rudimentary, but distinctly projecting in front of head. Antenna with multi-articulate flagellum of 10-15 (*Ligidium*) or 19-23 (*Typhloligidium*) segments. Mandible with lacinia mobilis and 3-5 (*Ligidium*) or 10-11 (*Typhloligidium*) setose bristles between it and the molar tubercle. 1st maxilla with 3 stout setose bristles on interior lacinia. 2nd maxilla membranous, with 2 stout setose bristles on inner side. Maxillipede with endopod of 5 distinct segments; inner blade linguiform and setose. Legs very slender and greatly increasing in length posteriorly. Opercular plates of pleopoda very thin, without any obvious branchial structure. Uropoda moderately large, base produced on inner side into a process upon which the endopod is set; endopod usually longer and more slender than exopod and provided with 2 long and slender apical bristles.

Text-figure 3.



Ligidium hypnorum. a, head from front; b, head from above; c, 1st tergite, lateral edge; d, 1st and 2nd tergites from side; e, 1st pleopod, ♂.

1. LIGIDIUM HYPNORUM (Cuvier). (Text-figs. 1, 2, 3, 4.)

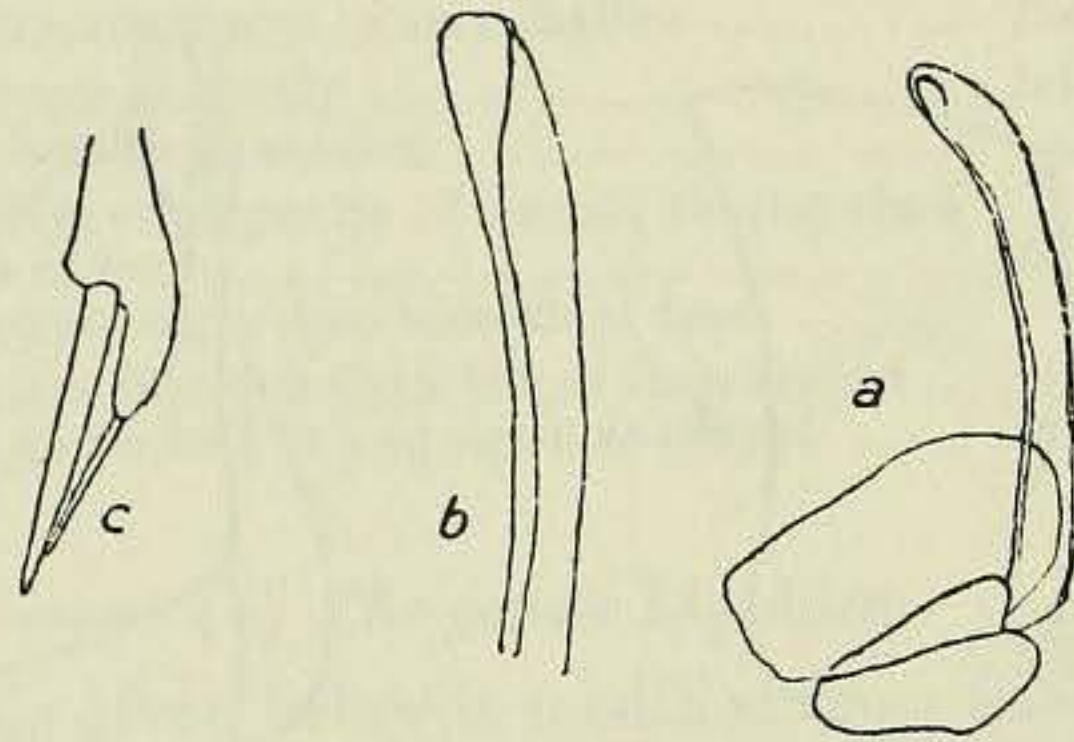
Oniscus hypnorum Cuvier, 1792, p. 19. *Ligidium personii* Brandt (1833), p. 173. *Ligia melanocephala* Koch (1847), H. 22 (162), 18. *Zia melanocephala* Koch (1847), Zusammenstellung, p. 212. *Z. paludicola* Koch (1847), H. 34 (180), 21. *Ligidium amethystium* Schöbl (1861), p. 311. *L. hypnorum* Stuxberg (1875); Budde-Lund (1885), p. 254 (*q. v.* for other references). *L. cursorium* Budde-Lund (1885), p. 256. *L. hypnorum* Michaelsen (1897), p. 132; Sars (1899), p. 157; Verhoeff (1901), p. 40. *L. melanocephala* Koch (1901), p. 69. *L. hypnorum* Koch (1901), p. 69; Richardson (1905), p. 686; Verhoeff (1918), p. 114; Dahl (1916 & 1917).

Length: ♂ 6 mm., ♀ 7.5 mm. *Breadth*: ♂ 2.5 mm., ♀ 3.5 mm. *Surface* smooth and shining. *Head*. Frontal margin slightly

sinuate; median V very obtuse and almost linear, not produced. Transverse groove deep and passing behind eyes. Frontal grooves well marked, joining transverse groove at obtuse angle behind eyes. Eyes large and pear-shaped. *Thorax*. 1st somite with deep lateral depression on each side, extending to hind border. On hind border of depression a dense bristle group. Coxal plates: sutures well marked on last four somites in both sexes; moderately drawn backwards on last three somites. *Antennal* flagellum reaching back as far as hind margin of 2nd thoracic somite; with 11 segments. *Uropods*. Inner process of base long, curved, and nearly as long as base. Endopod by itself not more than half exopod; combined with inner process reaching nearly as far, or as far as, but not beyond, tip of exopod. Exopod about three times as long as inner process. *Telson* arcuate; not notched or only faintly notched over uropods.

Pleopods of ♂. 1st exopod with 2 or 3 large setae; 1st endopod drawn out internally into long narrow process with 3 large

Text-figure 4.



Ligidium hypnorum. *a*, 2nd pleopod, ♂; *b*, endopod of same from another specimen; *c*, uropod from above.

bristles; terminal segment of 2nd endopod with rounded or almost triangular lappet.

Colour. Brown and yellow mottled. Dark more or less continuous band over junction of coxal plates and tergites.

Distribution. Europe; California; Niagara (Canada). This species has not been recorded from N. America since Stuxberg (1875), on which Budde-Lund (1885) comments, "quid mihi minus verisimile videtur."

Figured in full by Sars (1899).

I have included *L. cursorium* Budde-Land and *L. melanocephala* Koch as synonyms of this species after a minute examination of the original specimens. Verhoeff rightly conjectures that *L. cursorium* is a large variety of *L. hypnorum*, and as such I have distinguished it. *L. melanocephala* is a colour variety, with slight structural features to separate it from *L. hypnorum*. I agree with Verhoeff that *L. amethystium* is almost certainly a synonym.

Varieties.

L. hypnorum, var. *cursorium* (Budde-Lund). *Length* 9 mm. *Breadth* 4 mm. Frontal margin sinuate, median V blunt and slightly produced. Frontal grooves shallow. Colouring as in *L. hypnorum*. Inner process of uropod base perhaps a little shorter than in *L. hypnorum*.

L. hypnorum var. *atromaculatum* Verb. The dark markings make 2 longitudinal bands on the tail in front of the telson.

L. hypnorum var. *melanocephala* (Koch). Body very convex above; antennal flagellum 9-12 segments; fourth segment of antenna scarcely longer than the third; colour predominantly dark brown.

2. LIGIDIUM FRAGILE Budde-Land. (Text-fig. 5.)

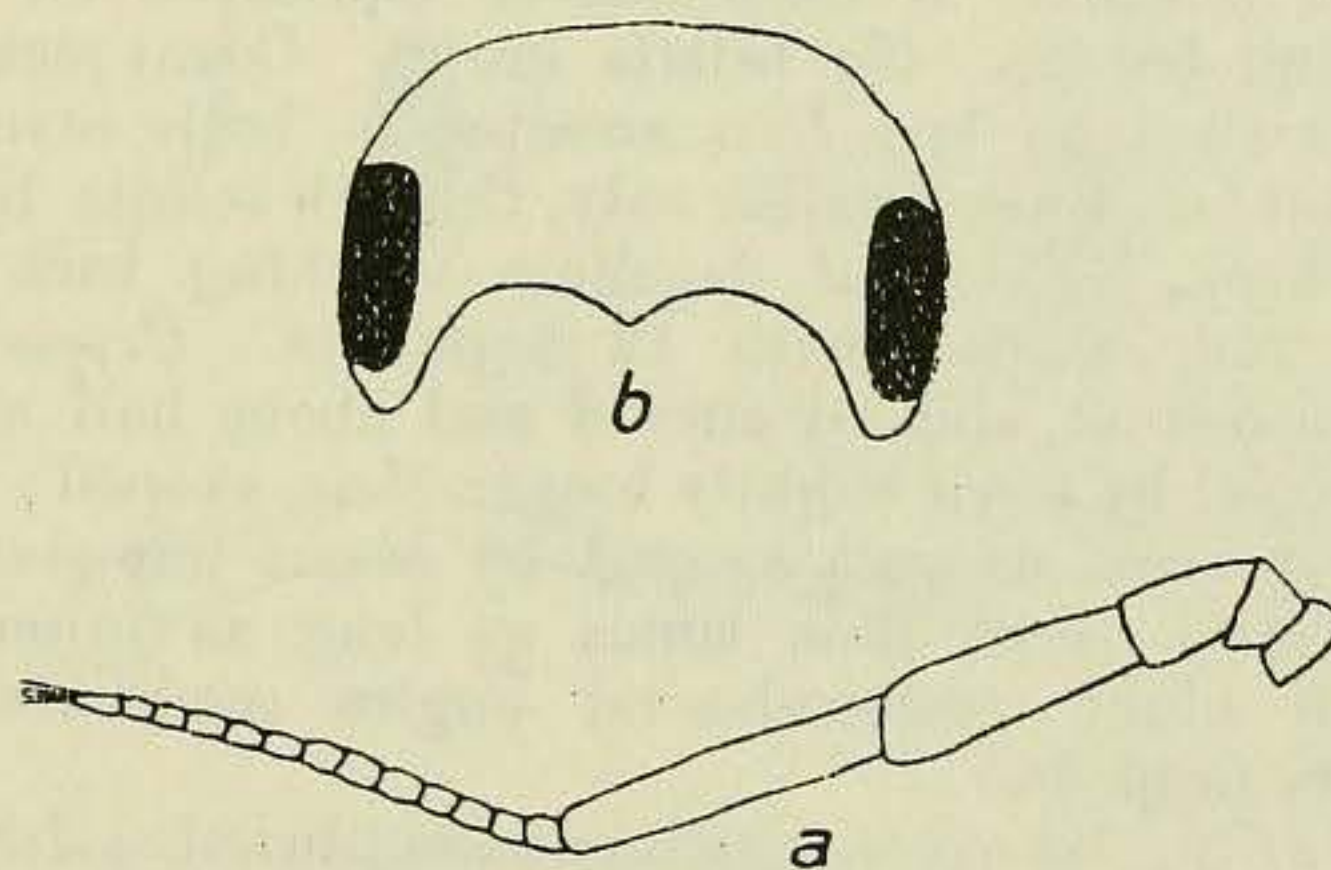
Ligidium fragile Budde-Land (1885), p. 257.

Ligidium euxinum Verhoeff (1918), p. 114.

Length 7.5 mm. *Breadth* 3.5 mm.

Surface smooth and shining. *Head*. Frontal margin sinuate; median V moderately sharp; not produced. Transverse groove deep and narrow, and passing behind eyes; frontal groove very shallow and joining transverse groove abruptly. Eyes large and pear-shaped. *Thorax*. 1st somite with lateral depression on each

Text-figure 5.



Ligidium fragile. a, antenna; b, head from front.

side extending to hind border. On hind border of depression a bristle group. Coxal plates: sutures faintly marked on last four somites; slightly drawn backwards on last three somites. *Antennal* flagellum reaching back as far as halfway across 3rd thoracic somite; with 12-15 segments. *Uropods*. Inner process of base nearly as long as base; endopods reaching further back than exopod; exopod about twice as long as inner process. (I have not seen a complete uropod.) *Telson*. Sides obtuse-angled and with slight notch over uropods.

Colour. Mottled brown and yellow; median yellow stripe from head to tail; legs yellow.

Distribution. Caucasia, Crimea.

Verhoeff's suspicion that his *L. euvinum* can be brought into relation with Budde-Lund's *L. fragile* proves to be well founded on further examination of Budde-Lund's material. I have no hesitation in placing it as a synonym of that species.

Variety.—*L. fragile caucasicum* Verhoeff (1918). Epimera of thorax predominantly coloured with irregular brown marks. Hind angle of tergite of 2nd somite with similar depressions to 1st tergite. Antennal flagellum with 11 segments.

3. LIGIDIUM GRACILE (Dana). (Text-fig. 6.)

Styloniscus gracilis Dana (1856), p. 176.

Ligidium tenue Budde-Lund (1885), p. 258.

Ligidium gracilis Holmes (1904), p. 318; Richardson (1905), p. 690 (*q.v.* for other references).

Ligidium gracile Verhoeff (1918), p. 114.

Length: ♂ 7 mm., ♀ 9 mm. *Breadth:* ♂ 2 mm., ♀ 3 mm.

Surface smooth and shining. *Head.* Frontal margin sinuate; median V sharply drawn out and produced to slight rostrum. Transverse groove deep and short, reaching to inner edge of eyes. Frontal grooves obsolete or very faintly indicated. Eyes rather small and somewhat pear-shaped. *Thorax.* 1st somite finished with bristles at regular intervals on lateral edges, none on posterior margin. A deep lateral depression on each side reaching hind border. No bristle group. Coxal-plate sutures distinctly marked on last four somites in both sexes; drawn backwards on last three somites only, the 5th somite little if at all drawn back. *Antennal* flagellum reaching back to hind margin of 2nd somite; with 12 segments. *Uropods.* Inner process of base stout, slightly curved and about half as long as base. Endopod by itself slightly longer than exopod; combined with inner process exceeds exopod by about one-sixth of the latter. Exopod about four times as long as inner process. *Telson* with blunt postero-lateral angles moderately deeply notched over uropods.

Pleopods of ♂. 1st exopod with one long bristle; 1st endopod with process moderately drawn-out and blunt, with 3 bristles; 2nd endopod with small rounded lappet.

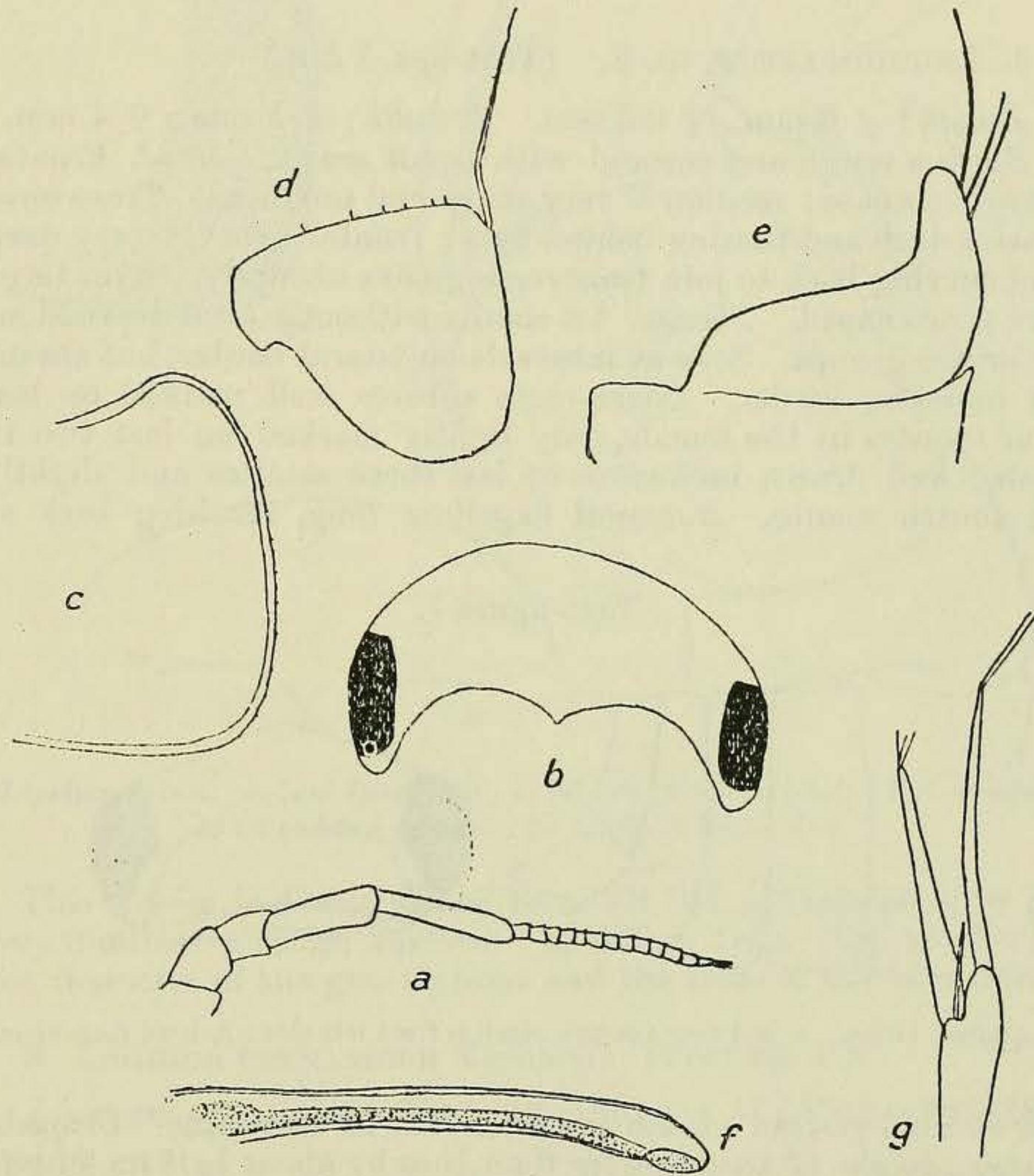
Colour. Brown ground; brown median stripe; mottled on each side with yellow. Yellow stripe along and above sutures of coxal plates, which are brown on each side. Legs yellow. Head mottled.

Distribution. California, St. Clara; Massett (British Columbia). Sitka Island. San Francisco.

The specimens in Budde-Lund's collection that he has identified with *L. gracile* Dana are from St. Clara (California). They

differ in slight particulars from Holmes's (1904) description of Dana's material; the antennæ (judging by Holmes's imperfect figure) are shorter, but as Dana's specimens are larger than these, the point is not of much systematic value; the eyes of Dana's specimens are described as "rather large"—a verbal difference depending on an unknown standard. These specimens have smaller eyes than the average in *Ligidium*. There cannot be much doubt that they are the same, however.

Text-figure 6.



Ligidium gracile. a, antenna; b, head from front; c, 1st tergite, lateral edge; d, e & f, 1st and 2nd pleopods of ♂; g, uropod from below.

The specimens from British Columbia are labelled with an unpublished name by Budde-Lund. They are, however, specifically identical with *L. gracile*, but have interesting differences that entitle them to rank as a variety. Melanin pigment is entirely absent, and the eyes are slightly smaller. I have no

history to these specimens, but one may surmise that they are cave varieties of *L. gracile*.

Budde-Lund (1885) described from Sitka Island a species, *L. tenue*, but the only important points in his description are the detail of the uropods and the size. These agree closely enough with *L. gracile* to justify a provisional inclusion of the species in the synonymy of *L. gracile*, but I have seen no specimens.

Figures in Richardson (1905).

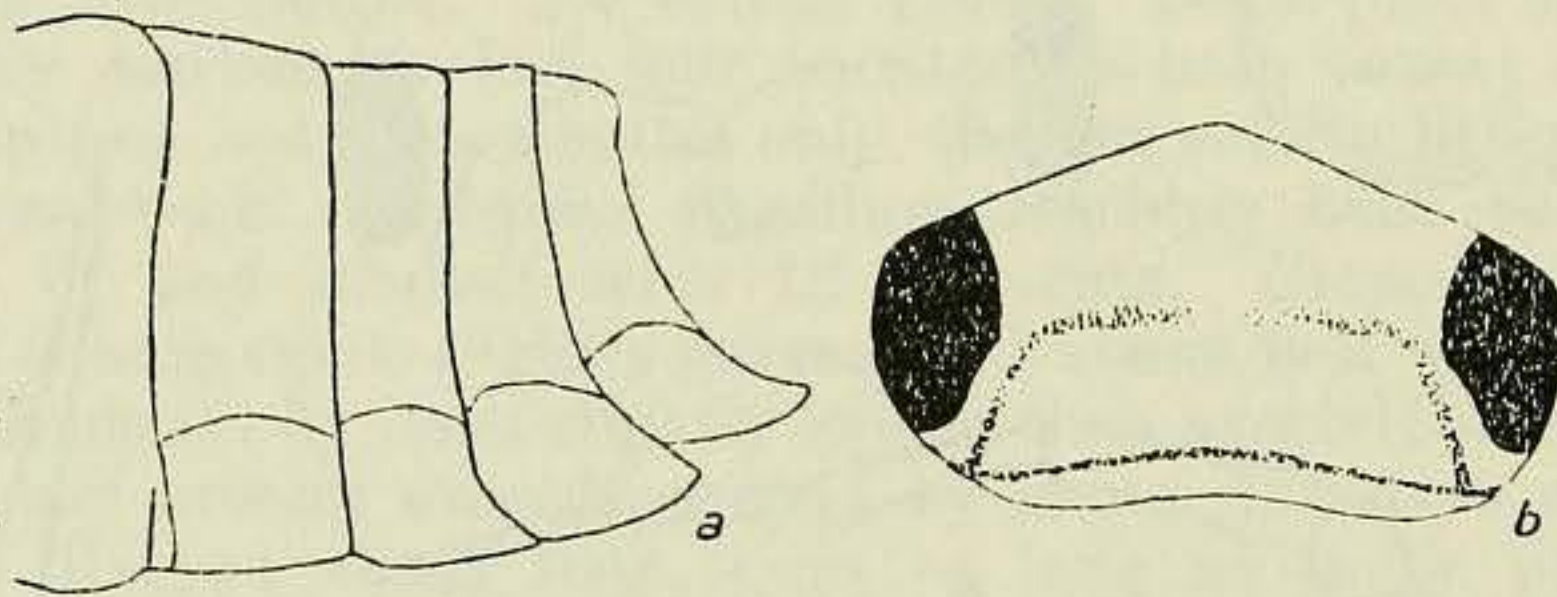
Variety.—*L. gracile* var. *flavum*, n. var. Pigment entirely absent. Eyes rather small, round, and not reaching to lateral margin of head.

4. *LIGIDIUM LATUM*, sp. n. (Text-figs. 7 & 8.)

Length: ♂ 6 mm., ♀ 8.5 mm. *Breadth*: ♂ 3 mm., ♀ 4 mm.

Surface rough and covered with small scales. *Head*. Frontal margin sinuate; median V very sharp and produced. Transverse groove deep and passing behind eyes; frontal grooves very deep and curving back to join transverse groove abruptly. Eyes large and pear-shaped. *Thorax*. 1st somite without lateral depressions or bristle groups. Setae at intervals on lateral border, but absent on posterior border. Coxal-plate sutures well marked on last four somites in the female, only lightly marked on last two in male; well drawn backwards on last three somites and slightly on fourth somite. *Antennal* flagellum long, reaching back as

Text-figure 7.



Ligidium latum. *a*, last four thoracic somites from left side; *b*, head from above.

far as hind margin of 4th somite; with 12 segments. *Uropods*. Inner process of base shorter than base by about half its length, stout and conical. (None of my specimens have undamaged uropods.) The single seta arising from outer side of base, set on sharp and pointed process. *Telson* deeply notched over uropods; blunt, rounded postero-lateral angles.

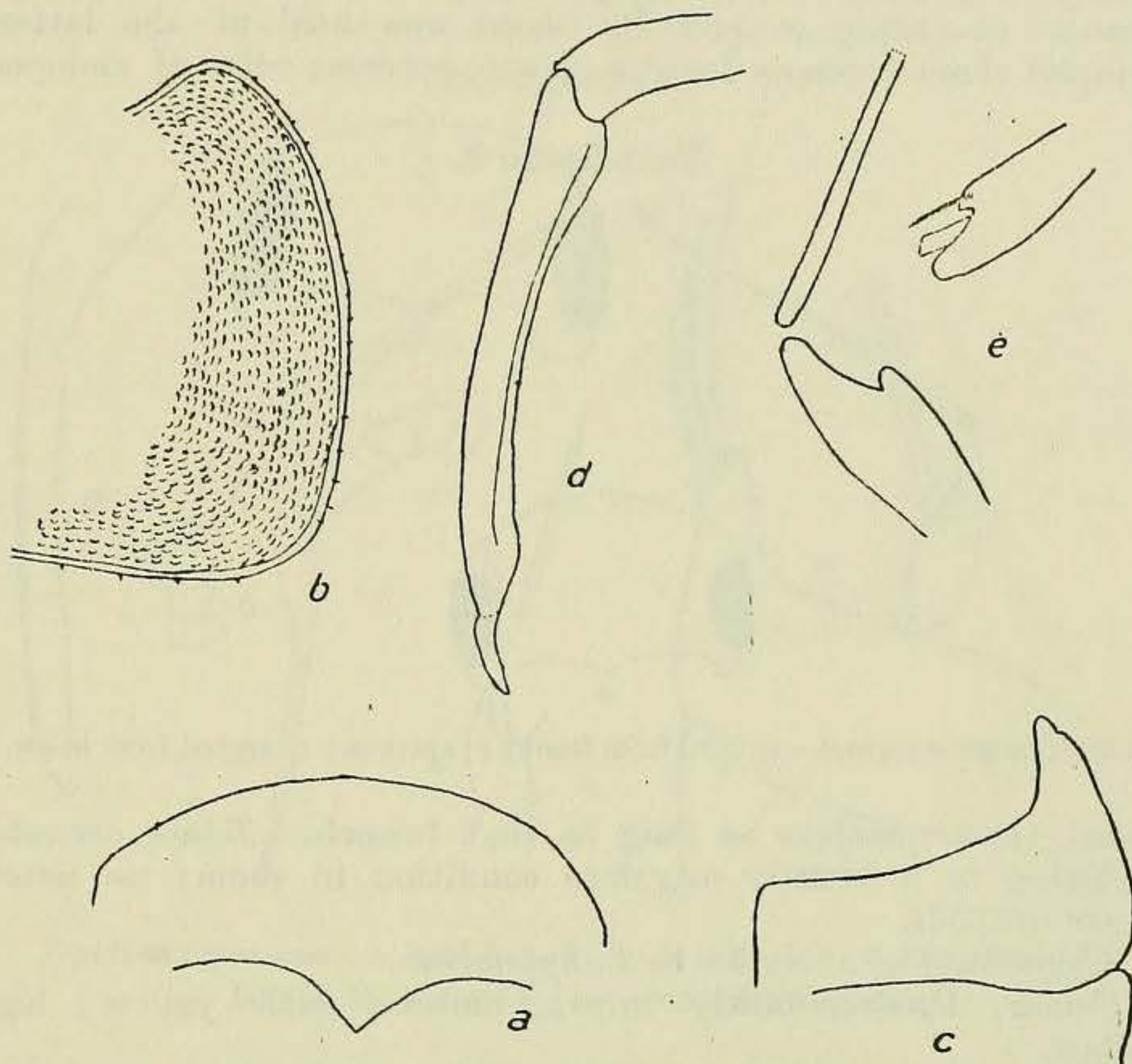
Pleopods of ♂. 1st exopod with one (?) bristle; 1st endopod with moderate process and one (?) bristle; 2nd endopod ending in pointed process.

Colour. Brown and yellow mottled; slightly lighter streak down middle of back. Coxal plates light and sharply defined

from brown of tergite at the suture. Legs banded with yellow and brown.

Distribution. San Francisco.

Text-figure 8.



Ligidium latum. a, head from front; b, 1st tergite, lateral edge; c & d, endopod of 1st and 2nd pleopods, ♂; e, uropod from below.

This species is distinguished from all but *L. nodulosum* by its very distinctive rough surface. It differs from that species in the character of the granulations and the form of the 1st somite.

5. LIGIDIUM GERMANICUM Verhoeff. (Text-fig. 9.)

Ligidium germanicum Verhoeff (1901), p. 41; Verhoeff (1918), p. 114.

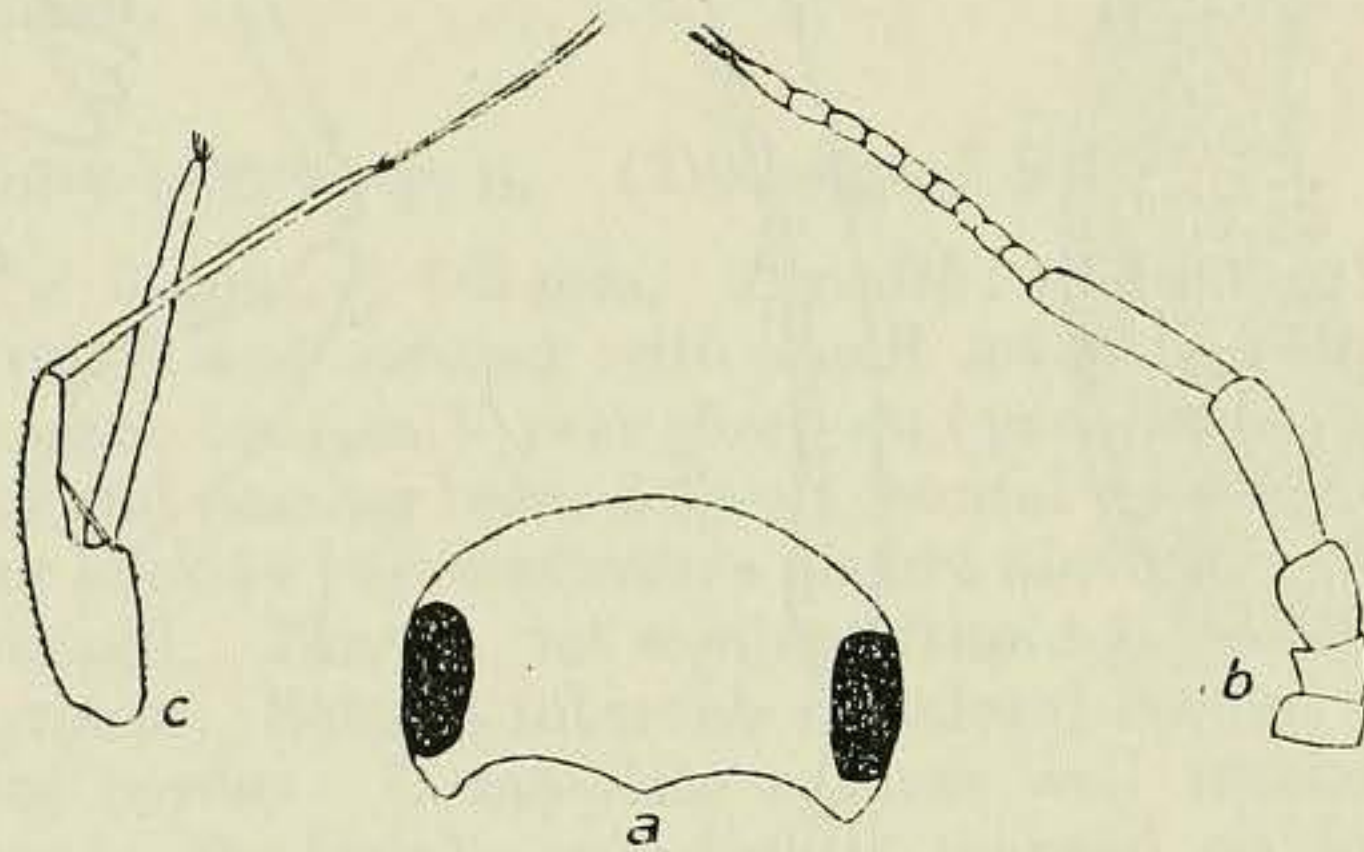
Ligidium herzegowinense Verhoeff (1918), p. 114; Dahl (1916 & 1917).

Length 7 mm. *Breadth* 2.5 mm.

Surface smooth and shining. *Head.* Frontal margin slightly sinuate, median V almost obsolete, not produced. Transverse groove deep and passing behind eyes; frontal grooves shallow and curved, passing into transverse groove at less than a right angle. Eyes large and pear-shaped. *Thorax.* 1st somite without lateral depressions or bristle groups. Coxal plates: sutures

faintly visible on last three somites of male, very faint or obsolete on female; hind corners of last three but little drawn out. *Antennal* flagellum reaching back as far as halfway across 3rd somite; stout and somewhat setose; with 9-10 segments. *Uropods*. Inner process of base curved and longer than base. Endopod by itself about as long as exopod; combined with inner process exceeding exopod by about one-third of the latter. Exopod about twice as long as inner process; setæ of endopod

Text-figure 9.



Ligidium germanicum. a, head from front; b, antenna; c, uropod from below.

about three-quarters as long as that branch. *Telson* arcuate, inclining to a bluntly angulate condition in some; no notch above uropods.

Pleopods of ♂. Similar to *L. hypnorum*.

Colour. Predominantly brown, mottled with yellow; legs yellow.

Distribution. Central Europe.

6. *LIGIDIUM JAPONICUM* Verhoeff. (Text-fig. 10.)

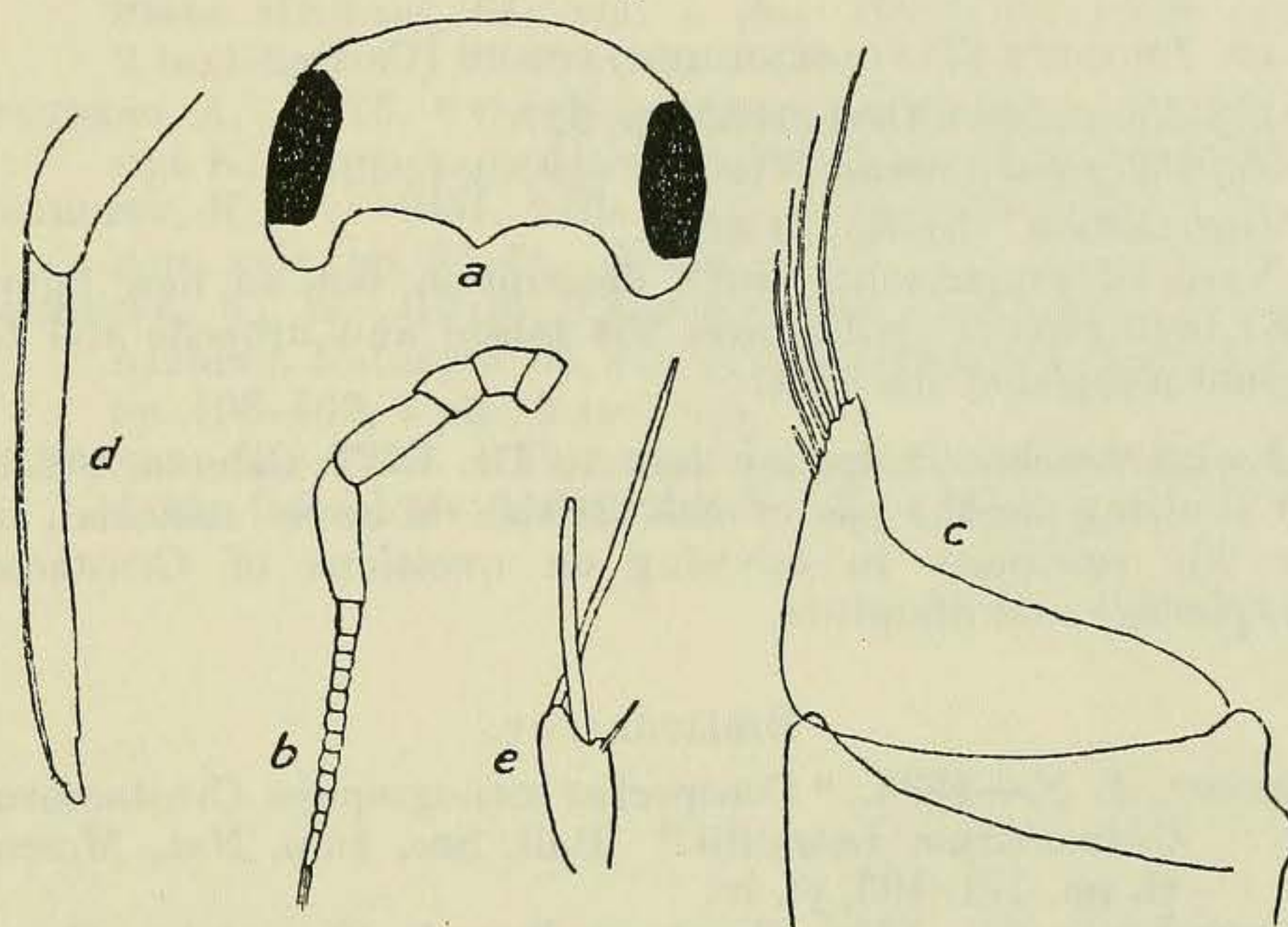
Ligidium japonicum Verhoeff (1918), p. 114.

Length 6 mm. *Breadth* 2.5 mm.

Surface smooth and shining. *Head*. Frontal margin sinuate, forming moderately sharp V; not produced. Transverse groove narrow and deep, and passing behind eyes. Frontal grooves shallow, joining transverse grooves abruptly. Eyes large and pear-shaped. *Thorax*. 1st somite with deep lateral depressions; no bristle groups, but a group of little processes lies in each depression. Coxal plates: sutures not visible; hind corners of last three slightly drawn out. *Antennal* flagellum reaching as far back as hind margin of 3rd thoracic somite; with 14 segments; long and setose. *Uropods*. Inner process of base short and blunt, hardly one-third base and shorter than width of base. Endopod by itself about half as long again as exopod, combined with inner process nearly two-thirds as long again. Exopod about six times as long as inner process. *Telson*. Only slightly notched above uropod; no postero-lateral production.

Pleopods of ♂. 1st exopod with 5-6 large setæ; 1st endopod drawn out internally into sharp triangular process with 5-6 large setæ; 2nd exopod "divided very distinctly by a suture in two parts" (Verhoeff); 2nd endopod with small rounded projecting terminal lappet and three small spines on inner edge at distal end.

Text-figure 10.



Ligidium japonicum. *a*, head from front; *b*, antenna; *c* & *d*, endopod of 1st and 2nd pleopods, ♂; *e*, uropod from below.

Colour. Light brown with whitish speckling; longitudinal band of large spots over coxal plates; median brown band without mottling; legs whitish.

Distribution. Japan; "Moheri" (Japan).

Figured by Verhoeff (1916).

I have not seen specimens of the following species:—

7. *LIGIDIUM BOSNIENSE* Verhoeff.

Ligidium bosniense Verhoeff (1901), p. 40; (1918), p. 114.

Distribution. Sarajevo, Bosnia.

Briefly described but not figured.

8. *LIGIDIUM NODULOSUM* Verhoeff.

Ligidium nodulosum Verhoeff (1918), p. 114.

Distribution. Caucasus.

Described with figures by Verhoeff.

9. *LIGIDIUM LONGICAUDATUM* Stoller.

Ligidium longicaudatum Stoller (1902), p. 208; Richardson (1905), p. 688; Verhoeff (1918), p. 114.

Distribution. New York.

Verhoeff remarks of this species that the figure given by Stoller can scarcely be accepted. The descriptions are also inadequate, and the specimens should be redescribed in the light of recent work.

10. *LIGIDIUM (TYPHLOLIGIDIUM) CÆCUM* (Carl).

Ligidium cæcum Carl (1905), p. 327.

Typhloligidium cæcum Verhoeff (1918), p. 114.

Distribution. Crimea, in caves.

Verhoeff supplements Carl's description, but no new figures have been given. Carl figures the telson and uropods and the second pleopod of the male.

I wish to acknowledge my debt to Dr. W. T. Calman, F.R.S., for allowing me the use of the British Museum material, and for his readiness in advising on questions of Crustacean morphology and literature.

BIBLIOGRAPHY.

- BRANDT, J. F.—1833. "Conspectus monographiæ Crustaceorum Oniscodorum Latreillii." Bull. Soc. Imp. Nat. Moscou, vi. pp. 171-193, pl. iv.
- BUDDE-LUND, G.—1885. Crustacea Isopoda Terrestria. Copenhagen.
- CARL, J.—1905. "Materialen z. Höhlenfauna der Krim." Zool. Anz. xxviii. Leipzig, pp. 322-329, 2 text-figs.
- CUVIER.—1792. "Mémoire sur les Cloportes Terrestres." Journ. d'Hist. Nat. ii. Paris, pp. 18-31.
- DAHL, F.—1916. "Die Verbreitung der Landasseln in Deutschland." Mitt. Zool. Mus. Berlin, viii. 2, pp. 149-201.
- DAHL, F.—1917. "Die Landisopoden Südwestdeutschlands." Mitt. Zool. Mus. Berlin, viii. 3, pp. 405-423.
- DANA, J. D.—1856. "Catalogue etc. of Crustacea collected in California." Proc. Acad. Nat. Sci. Phil. vii. (for 1854), pp. 175-177.
- HOLMES, S. J.—1904. "On . . . West American Crustacea." Proc. Calif. Acad. Sci. 3rd ser. Zool. iii. 12, San Francisco, pp. 307-324, pls. xxxv-xxxvii.
- KOCH, C. L.—1847. ". . . Verzeichnissen u. Berichtigungen zu Deutschlands Crustaceen etc." Heft 1-40. Regensburg.
- KOCH, L.—1901. "Die Isopoden Süddeutschlands v. Tirols." Naturhist. Ges. Festschrift, Nürnberg, pp. 19-72.
- MICHAELSEN, W.—1897. "Land- u. Süßwasser-Asseln aus . . . Hamburgs." Mitt. Naturhist. Mus. Hamburg, xiv. pp. 121-134.

- RICHARDSON, HARRIET.—1905. "A Monograph on the Isopods of North America." Bull. U.S. Nat. Mus. no. 54.
- SARS, G. O.—1899. Crustacea of Norway. II. — Isopoda. Bergen.
- SCHÖBL, J.—1861. Korýši stejnonozi (Crustacea Isopoda) . . . Živa. Časopis Přírodnický. Prague, pp. 307–321.
- STOLLER, J. H.—1902. "Two new Land Isopods." Rept. N.Y. State Museum, 54, vol. i. (for 1900), pp. r238-r213. 2 text-figs.
- STUXBERG, A.—1875. "Om Nord-Amerikas Oniscider." Öfversigt K. Vetenskaps-Akad. Förhandl. xxxii. 2, pp. 43–63.
- VERHOEFF, K. W.—1901. "Über paläarktische Isopoden." Zool. Anz. xxiv. pp. 33–41. Leipzig.
- VERHOEFF, K. W.—1918. "Zur Kenntniss der *Ligidium* etc." Archiv f. Naturges. 82. Jahrg. (for 1916), Abt. A, 10 Heft, pp. 108–169, 2 pls., 3 text-figs.
- WAHRBERG, R.—1922. "Terrestre Isopoden aus Australien." Arkiv f. Zool. xv. 1, Stockholm. Text-figs.