A RE-EXAMINATION OF PROFESSOR HASWELL'S TYPES OF AUSTRALIAN *PYCNOGONIDA*.

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Plates XVIII.-XXII., figs. 1-26.

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Diagnostic methods in the case of the interesting group of Pycnogonida have so far altered in the last thirty years, that it needs no apology on my part for attempting a revision of the descriptions of Australian Pycnogonida published by Professor Haswell in the early eighties. This revision has been made possible by the courtesy of the trustees and curator of the Australian Museum, who placed the holotypes at my disposal, and to whom I tender my best thanks. I have also to thank Professor S. J. Johnston of Sydney for the loan of other specimens collected for the use of his department.

In the following description the specimens from the Australian Museum are indicated by the collection number.

It is necessary to state that the holotypes have been preserved as microscope slides, and while this is a convenient method of preservation it has its disadvantages in the case of subsequent examinations. It is sometimes impossible, for example, to make out with any degree of certainty the arrangement and structure of the spines of the ovigers or even of its joints when, as is often the case, it is tucked under the body of the Pycnogonid on a microscope slide. Further, while every care has been taken with the measurements it must be remembered that the flattening of the specimen necessary in preparing a miscroscopic slide, alters very definitely the relation of breadth to length.

Many of the works cited in the following pages are not procurable in Tasmania, and in these cases I have to depend on notes made when on a visit to Sydney.

RHOPALORHYNCHUS TENUISSIMUS, Haswell.

(Pl. XVIII., figs. 1-3.)

1884, *Colossendeis tenuissima*, Haswell, 1884, p. 1029, pl. 56, figs. 5-8.

1893, *Rhopalorhynchus clavipes*, Carpenter, 1893, p. 24, pl. II., figs. 1-10.

1908, *Rhopalorhynchus tenuissimus*, Loman, 1908, p. 24.

1909, *Rhopalorhynchus tenuissimus*, Thompson, 1909, p. 533.

Specimen.—Australian Museum Collection, G5195, holotype, male, Port Denison, Queensland.

Description.—It is only necessary to supplement in a small degree Prof. Haswell's account of this species.

Cephalon is short and narrow, not expanded in front. Segmentation is distinct.

Ocular tubercle is situated on the posterior portion of the cephalon. It is cylindrical with a small rounded cone at the apex.

Abdomen is present, but as usual in this genus is quite minute.

Palps are ten jointed. The first joint is short and thick and expanded at the extremity; the second is very small; the third joint is very long and slender; the remaining joints are as described by Haswell.

Ovigers.—The character of the spines of the last few joints cannot be determined with accuracy as the joints had not been cleaned before the specimen had been mounted originally. The spines, however, seem to be long and sharp and arranged in several rows.

Measurements:—

	mm.
Proboscis, length	4.41
maximum diameter	1.05
Trunk, length	5.28
width behind first crurigers...	.29
,, ,, second ,, ...	.32
width across ,, ,, ...	1.58
Palp, first joint	.12
second ,, ...	.07
third ,, ...	2.92
fourth ,, ...	.19
fifth ,, ...	1.53
sixth ,, ...	.31
seventh,, ...	.38
eighth ,, ...	.42
ninth ,, ...	.40
tenth ,, ...	.38

		mm.
Leg,	second coxa	.48
	third ,, ...	.33
	femur	5.76
	first tibia	5.47
	second ,, ...	4.94

Remarks.—The holotype was taken in Port Denison, Queensland (depth not given).

There is no doubt in my mind that *R. clavipes* (Carpenter) must be regarded as a synonym of *R. tenuissimus* (Hasw). The lengths and proportions of the joints of the trunk, palps, and legs agree perfectly in the two species. The proportion of the length of the proboscis to the trunk is 1 : 1.2 in *R. tenuissimus*. In *R. clavipes* it is 1 : 1.1. The somewhat different shape of the proboscis in *R. tenuissimus* is no doubt due to the distortion caused by the specimen being mounted as a microscope slide.

It is possible that the cheliform arrangement of the terminal portion of the oviger may be confined to the male.

Further, both species come from the Australian region of the Tropics.

Nymphon æquidigitatum, Haswell.

(Pl. XVIII., figs. 4-5; pl. XIX., fig. 6.)

1884, *Nymphon æquidigitatum*, Haswell, 1884, p. 1022, plate 56, figs. 1-5.

1889, *Nymphon æquidigitatum*, Whitelegge, 1889, p. 233.

1908, *Nymphon æquidigitatum*, Loman, 1908, p. 38.

Specimens:—Australian Museum Collection, No. G5196, holotype, ♂, Pt. Jackson; Australian Museum Collection, No. G5198, paratype, ♂; Australian Museum Collection, No. G5197, paratype, ♀, Broughton Island.

In addition, several spirit specimens from Port Jackson and from Shark Island, Port Jackson, contained in the Australian Museum collection and that of the Zoological laboratory of the University of Sydney.

In view of the fact that this genus is an extraordinarily large one, comprising very many species distinguished from one another by relatively insignificant characters, I have thought it desirable to re-describe Haswell's species in some detail.

Description:—*Body.*—Fairly broad and stout, suture lines distinct, *crurigers* well separated, each a little longer than broad—*cephalic segment* large, its length being

greater than that of the other segments together. *Cephalon* is much expanded in front, neck fairly narrow but not particularly long.

Proboscis large and stout, expanded in mid-region and tapering towards each end, the whole organ somewhat pear-shaped with smaller end forward.

Chelifori well developed, scape uni-articulate, expanded distally, about same length as proboscis, hand powerfully developed with fingers shorter than the palm, fingers crossing at the apex and possessing a large number of fine teeth.

Palps five-jointed, first joint very small, second joint longest equalling the third and fourth taken together, fourth less than half the third, fifth joint long but a little shorter than the second, fourth and fifth joints finely setiferous, occasional spines on other joints specially towards end of third.

Ovigers.—Ten-jointed with terminal claw, situated on slight ventral outgrowth in front of first pair of legs. The proximal joints increase in length from the first, which is small, to the fifth, which is the largest joint of the limb; fourth joint is rather swollen and expanded distally; the fifth joint is long and narrow bearing distally a fringe of long delicate hairs, as does also the sixth. This joint is about one third the length of the fifth. The seventh, eighth, ninth and tenth joints are about equal in length, all gently curved and bearing pinnate spines. These spines vary in shape. In the ovigerous male they are arranged in a single row on each joint. The middle spines of each row are long and stiletto-like, finely toothed on each edge, while at either end of row they may become worn to a rounded apex. On the terminal joint, the spines become particularly worn. The terminal spine is long, simple and hook-shaped.

Ocular tubercle low and rounded, visual elements large and of equal size.

Abdomen cylindrical, slightly tapering posteriorly, and projecting upwards.

Legs.—The proportions of the joints vary somewhat from those given in the original descriptions. The length of the first and second coxæ are as stated by Haswell; the third coxa is a short joint less than half the length of the second; femur over six times the length of the third coxa and a little shorter than the first tibia, femur swollen (especially so in the female) and slightly curved; first tibia is as usual long and narrow; second tibia extremely long, being equal in length to the femur and first tibia together;

tarsus is short; propodus somewhat longer; terminal claw stout and curved; auxiliary claws slenderer but about equal in length to the main claw. Minute spines occur scattered over the legs. These are sparse on all joints up to the second tibia but are plentiful on the tarsus and propodus. Distal fringes occur on all joints but the last three. A well-marked lateral line is present on each leg.

Sexual apertures.—These are easily seen in the female in which they are large and oval and present on all four legs. In spite of the examination of a number of specimens I have not been able to see them in the male.

Measurements:—

	Holotype ♂	Paratype ♂	Paratype ♀
Proboscis—	mm.	mm.	
length	1.7	1.82	
greatest diameter ..	1.1	1.16	
Trunk, length...	2.4	2.86	
Cephalon—			
length	1.5	1.58	
greatest width... ...	1.04	1.10	
Neck, width ...	.24	.3	
Trunk—			
width between 1st and 2nd pair of crurigers ...	.70	.76	
width across 2nd pair of crurigers ...	1.50	1.60	
Abdomen—			
length	.32	.40	
Third leg—			
first coxa ...	.48	.52	
second coxa...	1.56	1.66	
third coxa ..	.60	.68	
femur	3.90	4.08	
first tibia ...	4.12	4.50	
second tibia...	6.86	8.64	
tarsus	.52	.54	
propodus... ...	.94	.96	
claw	.20	.20	
auxiliary claw	.20	.20	

Palp—		R.	L.	R.	L.	R.	L.
second	joint..	.84	.92	1.06	1.04	1.30	
third	,, ...	.54	.60	.70	.74	.90	.90
fourth	,, ...	.24	28	.30	.30	.35	.35
fifth	,, ...	.70	.70	.76	.62	.94	.90

Remarks.—Judging by its relative abundance in the collection of the Australian Museum, and of the Zoological Department of the University of Sydney, this must be the most common pycnogonid found in Port Jackson.

Affinities.—I find on consulting my notes that Loman (1908, p. 38) suggests that this species is closely allied to *N. giraffa* from the Strait of Macassar and possibly also to the insufficiently described *N. longiceps* (Grube, 1869) from the China Sea.

Pallene (?) valida, Haswell.

(Plate XIX., figs. 7-8.)

1884, *Nymphon validum*, Haswell, 1884, p. 1024, pl. 54, figs. 6-9.

1908, *Parapallene valida*, Loman, 1908, p. 48.

Specimens.—Australian Museum Collection, G5199, marked "type, Port Stephens"; Australian Museum Collection, G5200, marked "Type ♀, Port Stephens." These are two microscope slides. The former of the specimens is a male, the latter, in spite of its being marked female, is also a male.

Description.—Body is fairly robust with all segments distinctly separated. The *crurigers* are separated from one another by less than their own diameter.

Cephalon is expanded with a prominent anterior margin projecting over the proboscis. Above the base of each chelophore on the cephalon is a prominent tubercle with two spines. The neck is well developed and short but fairly wide.

Ocular tubercle is situated just behind the neck, immediately anterior to the level of the first pair of crurigers. There are four well developed eyes. The shape of the ocular tubercle is not determinable with accuracy, but it appears to be low and rounded.

Abdomen is short and rounded.

Proboscis is short and cylindrical directed obliquely downwards. It is somewhat constricted in the middle, obtusely conical in front with a wreath of very delicate bristles round the mouth. The proboscis is inserted into

the ventral side of the cephalon some distance behind its anterior margin.

Chelophores have a simple scape with ovoid palm and short stumpy fingers. The hand is turned inwards in front of the mouth. The fingers are provided with many small teeth. The scape and palm possess a number of short hairs.

Palps are four-jointed. They are much shorter than the chelophores, but extend well beyond the proboscis. The basal joint is short and thick, the next joint longer, the third joint longest. The fourth joint is shorter than the third but longer than the second. There are scattered hairs on all the joints, but on the last there is a well marked ventral fringe of setæ.

Ovigers.—These are ten-jointed and do not possess a terminal claw. Haswell's description is accurate except in relation to the length of the sixth joint, which is longer than any of the other distal joints.

Legs.—There is nothing to add to Haswell's description of these.

Cement glands are small and numerous.

Male genital apertures occur on all limbs.

Measurements, holotype, male, G5199.

	mm.
Proboscis, length	.81
greatest diameter	.58
Trunk, length	2.71
width behind first crurigers	.64
,, ,, second ,,	.53
width across ,, ,,	1.74
Cephalon, length	1.19
width	.91
Neck, width	.38
Abdomen, length	.31
Palp, first joint	.18
second ,,	.20
third ,,	.30
fourth ,,	.20
Third leg, first coxa	.47
second ,,	.94
third ,,	.63
femur	2.40
first tibia	2.80
second ,,	2.40
tarsus and propodus	1.29
claw	.60
auxiliary claw	.20

Remarks.—The specimens were obtained by dredging in Port Stephens, New South Wales, but the depth is not given.

I have provisionally placed this specimen in the genus *Pallene*. It does not agree with Hodgson's definition of this genus (1910 page 225) and just as little with that given by Schimkewitsch (1909, pp. 8-9). The presence of the four-jointed palp in the male is a feature in which the present species resembles *Pallene dimorpha*, Hoek, with which it also agrees in the following points—the independence of the posterior trunk segments, the forms of the spines on the ovigers, the finely-toothed chelophores, and the possession of auxiliary claws. *Pallene dimorpha*, however, possesses a terminal claw on the oviger, which is absent in *P. valida* (see Loman, 1908, page 40).

The presence of the palps, in my opinion, would not allow of this species being included in the genus *Parapallene* as proposed by Loman.

If, as Thompson suggests (1909, p. 538) a new genus should be created, founded upon Hoek's description of *Pallene dimorpha*, then it is worthy of consideration that the new genus should be so defined as to include the species under discussion.

Pseudopallene pachycheira, Haswell.

(Pl. XIX., fig. 9; pl. XX., figs. 10-11.)

1884, *Pallene pachycheira*, Haswell, 1884, p. 1030, pl. 57, figs. 6-9.

1908, *Parapallene pachycheira*, Loman, 1908, p. 47.

Specimen.—Australian Museum Collection, G5194, holotype ♂, Port Jackson.

Description.—*Body* is robust, smooth, with segments distinct.

Crurigers are separated by small interspaces.

Cephalon is expanded, strongly cleft in front.

Neck is short and wide.

Ocular tubercle is low and rounded, placed on posterior portion of neck.

Proboscis is inserted ventrally into the cephalon, directed obliquely downwards, very short, cylindrical at the base, conically pointed in front with a fringe of delicate setæ round the mouth.

Abdomen is short, tapering posteriorly.

Chelophores are strong and powerful. Scape is single, palm greatly developed with fingers hanging in front of

mouth. Both fingers are wide, blunt, and untoothed. but bearing on each inner edge a single central rounded projection.

Palps are absent.

Ovigers possess ten joints and a claw. First joint is short, second, third, and fourth are progressively longer. Fifth joint is long curved and slender, distally expanded with a peg like process at this end, the process being crowned with a number of short setæ. Sixth joint is short, and the seventh, eighth, ninth, and tenth are progressively shorter. The last four joints are provided with a few bent compound spines arranged in a single row. The terminal claw is long and sharp and is ornamented with fine teeth on the distal half of its inner edge and on the distal third of its outer edge.

Legs.—The first and third coxæ are short and subequal. The second is as long as the other two together and is distally expanded. The femur is a long joint a little longer than the combined coxæ. The first tibia is a little shorter and expands distally. The second tibia is a little longer than the femur. The femur, first tibia, and second tibia are approximately divided into thirds by shallow transverse constrictions. All these joints are minutely spinous. The tarsus is short with a very small dorsal spine and a bunch of closely crowded ventral spines. The propodus is very stout, minutely spinous. On the sole, proximally, there are some four or five well developed spines. The distal half of the sole has smaller spines. The claw is large, strong, and curved, and is equal to more than two-thirds the length of the propodus.

Measurements, holotype ♂, G5194.

	mm.
Proboscis, length	.90
diameter	.56
Cephalon, length	.78
greatest width	.91
Neck, width	.54
Trunk, length	2.05
width between first and second crurigers	.45
width across second crurigers	1.44
Third right leg, first coxa	.45
second ,,	1.09
third ,,	.44
femur ,,	2.05
first tibia	1.82
tarsus and propodus	.93
claw	.51

Locality.—Port Jackson (depth not given).

Remarks.—The general bodily form, the shape of the short proboscis with its wreath of delicate hairs round the mouth, and the form of the chela fingers with their bud-like projections mark this species as belonging to the genus *Pseudopallene*, Wilson, rather than *Parapallene*, Carpenter, as suggested by Loman (1908, page 47). Haswell states that this species is related to *Pallene lævis*, Hoek. As a matter of fact the two differ in a very fundamental point since in *Pallene lævis*, each chelophore has a two-jointed scape, while in the present species the scape is simple.

ANOPLODACTYLUS TUBIFERUS, Haswell.

(Pl. XX., figs. 12-14; pl. XXI., fig. 15.)

1884, *Phoxichilidium tubiferum*, Haswell, 1884, p. 1032, pl. 57, figs. 1-5.

1889, *Phoxichilidium tubiferum*, Whitelegge, 1889, p. 233.

1908, *Anoplodactylus tubiferus*, Loman, 1908, p. 72.

1910, *Anoplodactylus tubiferus*, Cole, 1910, p. 288.

Specimens.—Aus. Mus. Collection, No. G5202, holotype ♂, Port Jackson; Sydney University Zool. Collection, 2 Micro. slides, ♂, P.J.; Sydney University Zool. Collection, 1 Micro. slide, ♀ P.J.; Sydney University Zool. Collection, 3 Spirit specimens labelled "Woollahra Point 2 or 3 fathoms."

There is very little to add to Haswell's description of the holotype The following is to be regarded as supplementary to the original description:—

Body narrow, *crurigers* well separated, longer than wide and expanded distally. *Trunk* is widest at anterior end, while each succeeding segment is narrower than the one immediately preceding it. In old animals segments are completely fused, in young ones only the hindmost two. Two characteristic dorsal spines occur on the body at the level of the second and third pair of crurigers.

Proboscis is of the shape described by Haswell. It is inserted into the ventral side of the cephalic segment which is continued beyond the insertion into the long well-defined and constricted neck characteristic of the genus *Anoplodactylus*. In front of this neck the *cephalon* is slightly expanded. Upon this expanded portion an extraordinarily high *ocular tubercle* arises. This is not mentioned by Haswell in his description, but is shown by him in plate 57, fig 1, lying just alongside the right cheliforus. The pre-

sence of this long cylindrical tubercle no doubt has suggested the name of the species. At the apex of this column are four distinct eyes.

Abdomen and *chelifori* are as described by Haswell.

Palps absent.

Ovigers absent in the female. In the male each oviger is six-jointed, and the joints have the proportions stated by Haswell. The third joint, however, has a slight constriction at about one-fifth the length of the joint from the proximal end. A few simple spines occur on the last few joints. Noteworthy is the presence of a peculiar bent spine on the ventral side of the penultimate joint about one-third the distance from the proximal end.

Legs.—These are as described by Haswell. The only alteration I have to suggest is that the particular spine of the second tibia is situated on a tubercle some little distance from the distal end.

Nervous system.—The nervous system of the species is well shown in some of the slides from the Sydney University Collection, and it is of interest to point out that the arrangement of this system varies a little from that indicated by Loman (1917, p. 83). He figures *Anoplodactylus* with but four ganglia, whereas most other pycnogonida have five, and suggests that owing to the reduction or disappearance of the ovigers and the absence of palps the anterior ganglion which innervates these two organs has fused with the succeeding ganglia. In the species under discussion, however, the anterior ganglion, although small, is present, but is in contact with the next succeeding ganglion.

Genital openings.—Male openings occur on small tubercles at distal end of second coxæ of the two posterior pairs of legs. *Female openings* on all the pairs of legs.

Measurements, holotype, male.

	mm.
Proboscis, length	1.36
greatest diameter	.38
Trunk, length	1.90
width across first pair of crurigers...	1.56
,, behind ,, ,, ,, ,, ...	.30
,, behind second ,, ,, ...	.30
,, ,, third ,, ,, ...	.19
Abdomen, length	.74
width near base	.13
Neck, width	.12

	mm.
Ocular tubercle, height	.58
width near base	.12
Third right leg, first coxa	.36
second ,, ...	.66
third ,, ...	.42
femur	1.28
first tibia	1.24
second tibia	1.12
tarsus and propodus	.66
claw	.44

Remarks.—This pycnogonid has only been recorded from Port Jackson, where it occurs in various localities.

Affinities.—Loman (1908, p. 72) suggests that this species resembles his *Anoplodactylus stylops* from the Banda Sea.

ASCORHYNCHUS LONGICOLLIS, Haswell.

(Pl. XXI., figs. 16-17.)

1884 *Ammothea longicollis*, Haswell, 1884, p. 1028, pl. 56, figs. 1-4.

1889 *Ammothea longicollis*, Whitelegge, 1889, p. 233.

1908 *Ascorhynchus longicollis*, Loman, 1908, p. 32.

1909 *Eurycyde longicollis*, Thompson, 1909, p. 533.

Specimens.—Australian Museum Collection, G5195, holotype, female, Port Jackson; Australian Museum Collection, G5174, spirit specimen, probably male (ovigers missing), Port Jackson.

Description.—Body is long and slender with segmentation well marked. The *crurigers* are well separated from one another, and are much longer than broad. The third and fourth pairs are a little closer than any of the preceding pairs. The posterior pair are directed somewhat backward. Each cruriger possesses a well marked dorsal tubercle at the distal end.

Cephalon is very slightly expanded in front, and is continued backwards into a long and narrow neck. Above the base of each chelophore is a small tubercle. A little more than half the distance along the neck occur two prominent lateral "cervical processes" to which the ovigers are attached. Just dorsal to these is the *ocular tubercle*, a fairly prominent rounded eminence with visual elements poorly developed and not pigmented. Behind this the neck is slightly wider than in front.

Proboscis has the shape of a long oval and possesses a short scape. It is directed downwards.

Abdomen is long and narrow and slightly expanded at the apex.

Chelophores are as described by Haswell.

Palps consist of ten joints, not of nine as stated by Haswell. As Loman has suggested, the single basal joint in the original description really consists of two joints. The most proximal is short and thick, the next is quite small The remainder agree with Haswell's description, except of course that in numbering the joints allowance must be made for the missing segment.

Ovigers are ten jointed. Unfortunately they are missing in the case of the spirit specimen. The length of the joints agrees with Haswell's account.

Legs.—Genital openings, female, occur on the coxæ of all legs. For the rest, there is nothing to add to Haswell's description.

Measurements, holotype, female G5195.

	mm.
Proboscis, length	3.08
greatest diameter	1.41
Cephalon, greatest length	2.55
anterior width	.74
Neck, anterior width	.35
posterior ,,	.52
Trunk, length	5.23
width behind first crurigers	.57
width across second crurigers	3.30
Abdomen, length	1.54
Palp, first joint	.33
second ,,	.06
third ,,	1.45
fourth ,,	.48
fifth ,,	.92
sixth ,,	.22
seventh ,,	.44
eighth ,,	.48
ninth ,,	.33
tenth ,,	.36
Third leg, first coxa	.87
second ,,	1.10
third ,,	.80
femur	2.55
first tibia	3.96
second tibia	2.42
tarsus	1.18
propodus	1.10
claw	1.18

Remarks.—This species has only been recorded from Port Jackson (depth not stated). Although Thompson (1909, page 533) suggests that this specimen belongs to the genus *Eurycyde*, nevertheless the slender body, the large proboscis, and the simple scape of the chelophores, put it undoubtedly in the genus *Ascorhynchus*.

NYMPHOPSIS gen. Haswell.

Genotype *Nymphopsis armatus*—Australian Museum Coll. G5201.

1884 *Nymphopsis*, Haswell, 1884, p. 1025.
1887 *Nymphopsis*, Schimkewitsch, 1887, p. 272.
1906 *Nymphopsis*, Cole, 1906, p. 218.
1908 *Nymphopsis*, Loman, 1908, p. 49.
1909 *Nymphopsis*, Thompson, 1909, p. 534.
1912 *Nymphopsis*, Loman, 1912, p. 3.
1915 *Nymphopsis*, Loman, 1915, p. 204.

This genus was first defined by Haswell. His description is as follows:—

"*First pair of appendages well developed, cheliform, "second pair well developed, palpiform with nine joints. "Third pair with seven joints, none of them provided with "compound spines.*"

In 1887 Schimkewitsch obtained another species (*N. korotnewi*) referable to this genus, and by comparing the characters of his own species with Haswell's description of *N. armatus*, came to the conclusion that Haswell's specimen was immature. Schimkewitsch therefore re-defined the genus as follows:—

"*Ce genre presente les mandibules (I.) triarticulées, pas "cheliformes, les extremités II. 10 articulées, les extremités "III. 10 articulées, privées du crochet et des épines plumi- "formes, l'article tarsale (8) des extremités IV. - VII. est "muni d'épines basales et de crochets secondaires tout à fait "rudimentaires (au moins chez notre espèce).*"

Loman's (1908) definition goes much further, and in substance is as follows:—

"*Body segments quite coalescent, lateral processes separate "Proboscis large, thick, and moveable; chelifori delicate, shaft "two jointed, pincers delicate, occasionally rudimentary in "older animals. Palps nine jointed, second and fourth joints "longest, the remainder short. Ovigers of male slender, fourth "joint very long also the second and fifth, distal joints small, "terminal joint long. No toothed spines, only hairs or plates.*

"*Female oviger short, particularly the middle joints, feet* "*powerful. Cement gland as in Ammothea, accessory claws* "*small or absent. Female genital openings on all pairs (?),* "*male openings on posterior two pairs of legs. Eggs small,* "*larvæ with two large pincers without byssus gland and byssus* "*spine.*"

The genotype is an adult female with fully developed eggs in the two distal coxæ and femora of all the legs.

So far as can be made out (with exception of the ovigers referred to in the description of the species) Haswell's specimen agrees with Loman's definition of the genus.

Genus *Nymphopsis* includes the following species:—

Nymphopsis armatus, Haswell, 1884, p. 1025, Port Molle, 15 fathoms.

Nymphopsis korotnewi, Schimkewitsch, 1887, Iles de la Sonde, East Coast of Timor, 34 metres.

Nymphopsis muscosus, Loman, 1908, East Indies, 16-130 metres; Japan, 50-130 metres.

Nymphopsis armatus, Haswell.

(Pl. XXI., figs. 18-20; pl. XXII., fig. 21.)

1884, *Nymphopsis armatus*, Haswell, 1884, p. 1025, pl. 55, figs. 1-4.

1908, *Nymphopsis armatus*, Loman, 1908, p. 49.

Specimen.—Australian Museum Collection, G5201, holotype, female, Port Molle.

Description.—*Trunk* is quite smooth tubular and tolerably slender. The portion behind the third pair of crurigers is narrower than that in front. Segmentation is absolutely suppressed. *Crurigers* are well separated at the base and diverge towards their extremities. The posterior pair extend almost directly backward. Each cruriger is distally expanded with a single dorsal spine.

Cephalon is very small.

Ocular tubercle is situated on the level of the first pair of crurigers and arises by a wide base narrowing above to form a fairly high almost perpendicular tube terminating in a bluntly conical apex. The eyes are large and strongly pigmented, the posterior pair being the smaller.

Proboscis is of large size. It arises by a wide base on the ventral side of the trunk at the level of the first pair of crurigers. It projects diagonally downwards. Its shape is that of an ellipse with the narrower end forward and truncated.

Chelophores are remarkable in shape. The shafts of the two chelophores arise from the anterior margin of the abbreviated cephalon, but are separated from one another by a distinct interval. The division of the scape into two joints is not apparent in the holotype. Each scape is longer than the proboscis and is quite narrow at the base, but expands distally to form a cup into which the terminal portion of the scape is involuted. To the bottom of this cup on the inside is attached the chela. The rim of the cup has a characteristic armature consisting of a series of some eight spines. Of these spines those of the ventral portion of the rim are short and simple, those on the dorsal side being larger and possessing each at its base a pair of short auxiliary spines. The chela is delicate; the palm is small, the fingers curved and untoothed. The movable finger is external. The fingers enclose a wide space, and their points cross at the apex. In its natural position the chela is more than half hidden in the cup. The involution is held in place by muscle fibres. It is possible that the chela can be protruded. (In the holotype slide the right chela cup has been evaginated, having broken from its fastening evidently under the influence of the pressure used in making the slide.)

Abdomen is a cylindrical tube extending almost vertically upwards. Its posterior side is somewhat concave—on the anterior side, near the apex, is a pair of papillæ each bearing a long simple spine.

Palps are evidently normally nine jointed, although the right palp only possesses eight joints. The palps arise laterally to and below the chelophores. The following description applies to the left palp:—The second and fourth joints are longest, the first and third short. The fourth joint is curved and possesses a distinct tubercle about one-third the distance from the distal end. On this opens the duct of the palp gland which lies in this joint (Hoek, 1881, p. 105). The remainder of the joints of the palp are all small, the sixth being the longest of them. It forms an angle with the shorter fifth joint. The seventh, eighth, and ninth joints are all small. In the palps, the first and second joints are devoid of spines, the third and fourth have occasional spines and a distal fringe. The remainder of the joints are well provided with spines.

Ovigers.—It is a matter for regret that in the slide these appendages are so broken that it is impossible to count the joints. One portion which has altogether come apart from the animal consists of seven joints, but this is

manifestly incomplete. The terminal joints are rolled up and seem to be provided with long hairs.

Legs.—First coxa is of normal length, second about twice as long—third a little longer than the first. All the coxæ are narrow proximally and distally expanded. The second coxa bears a well developed tubercle at its distal end, on which opens the female genital pore. This tubercle bears two long simple spines. The first and third coxæ have similar tubercles but not so well developed.

Femur is long and stout, slightly expanded at the distal end. Its spinous armature is very regular in arrangement. At one quarter the length from the proximal end there is on the ventral side a pair of small spines. About half way there are two larger spines each on a tubercle. At the distal dorsal angle there are a couple of pairs on tubercles, one of which is particularly large. All these have small subsidiary spines at their base. In nearly every case the simple looking spines on the coxæ and femur are found under the highest powers to be very minutely toothed.

First tibia is stout and not quite as long as the femur. It bears from ten to fifteen compound spines on the dorsal side. They are larger and more numerous on the anterior legs than on the posterior. Each spine consists of two segments. The proximal of these is long and cylindrical with large processes and also possessing a microscopic serration. The distal segment is long, sharp, and microscopically toothed.

The second tibia is about equal in length to the first tibia but is slenderer. It has about fifteen compound spines on its dorsal surface. These decrease in size and become simpler in structure towards the distal extremity. In addition to the spines mentioned above the first and second tibiæ possess a more obscure surface spination consisting of fine spines arranged in approximately longitudinal rows.

Tarsus is small, dorsal spine is absent, but there are some simple ventral spines.

Propodus is strong and curved with about a dozen long simple spines on the dorsal surface. The sole is armed with a number of spines varying in number from twenty-one on the anterior foot to fifteen on the posterior. These are re-curved spines, decreasing in size towards the distal end. Claw is long strong and curved. The auxiliary claws are rudimentary.

The *genital apertures*, female, occur on the second coxæ of all the legs.

Measurements, holotype, female.

	mm.
Proboscis, length	2.25
greatest diameter	.97
Trunk, length	2.40
width behind first crurigers	.56
,, ,, second ,,	.53
,, ,, third ,,	.44
greatest width across second crurigers	2.75
Cephalon, breadth	1.05
Ocular tubercle, height	.72
diameter	.24
Abdomen, height	1.46
smallest diameter	.19
Chelophore shaft, length	1.6
width at base	.24
greatest width	.67
Right palp, first joint	.10
second ,,	.87
third ,,	.06
fourth ,,	.76
fifth ,,	.22
sixth ,,	.20
seventh ,,	.10
eighth ,,	.06
ninth ,,	.05
Third right leg, first coxa	.65
second ,,	1.35
third ,,	1.04
femur	3.35
first tibia	3.30
first tibia, longest spine	1.17
second tibia	3.04
second tibia, longest spine	1.20
tarsus and propodus	1.56
claw	.97

Remarks.—This species was found by Haswell in Port Molle, Queensland, at a depth of fifteen fathoms.

Achelia assimilis, Haswell.

(Plate XXII., figs. 22-26.)

1884, *Ammothea assimilis*, Haswell, 1884, p. 1026, pl. 55, figs. 1-5.

1899, *Ammothea assimilis*, Whitelegge, 1889, p. 233.

1908, *Ammothea assimilis*, Loman, 1908, p. 59.

1913, *Achelia assimilis*, Bouvier, 1913, p. 140.

Specimens.—Australian Museum Collection, G5220, one microscope slide labelled "type." This contains three specimens, all immature, one of doubtful sex, the others female. Zoological Collection, Sydney University, one microscope slide containing two specimens (adult), both males.

As Loman has pointed out, Haswell's description of this species, published in the early days of Pycnogonid research, is not critical enough for present day purposes. I have, therefore, decided to give a full account of the species.

The slide in the Australian Museum marked "type" contains only immature specimens with chelate chelophores and immature ovigers. I cannot suppose that it was upon these specimens that Haswell's original description was based. The specimens from the University of Sydney were certainly the originals of Haswell's drawings, and no doubt it is an oversight that these were not designated as the types.

Description.—The *body* is disc like and broad, segmentation practically non-existant, *crurigers* closely approximated with no space between.

Cephalon is very slightly developed.

Ocular tubercle is situated near anterior edge of cephalon and is of medium length, rounded at apex, with eyes large, distinct, and pigmented.

Abdomen is of medium length, semi-erect, tubular, tapering and ornamented with a few spines towards apex.

Chelophores are imperfect in adult specimens. Scape is simple, chela rudimentary. The whole organ measures considerably less than half of the length of the proboscis.

Palps are eight-jointed, second and fourth joints are longest, remainder small. The last five joints are provided with hairs.

Ovigers (male) ten jointed. First joint small and about as long as wide, the second, third, fourth, and fifth are progressively longer, the remainder are small, the tenth being particularly so. The last four joints bear simple spines and there is a terminal spine. The five terminal joints are twisted into a spiral.

Legs.—The three coxæ are short, the second being a little longer than the others. The first coxa bears terminally a few simple spines each set upon a papilla. In the succeeding coxæ a distal fringe is present consisting of many

delicate spines without papillæ. In the male the genital apertures occur on the second coxæ of the two posterior pairs at the apices of large genital tubercle. Femur is stout, expanded at distal end, a little shorter than the combined coxæ. The femoral gland ends on a well marked papilla situated distally and bearing a prominent spine. Some small spines occur with occasional longer ones on the dorsal surface. First tibia is also short and expanded armed in a similar fashion to the femur, to which it is about equal in length. The second tibia is stout, slightly curved, and about equal to each of the two preceding segments. The tarsus is small with a single dorsal spine and a ventral bunch of hairs. Propodus is stout, curved, sole being ornamented proximally with three large spines separated by a space, for the rest with about five or six spines which decrease in size towards extremity. Terminal claw is stout and curved, less than half the length of the propodus. Auxiliary claws are well developed.

Genital openings (male) are situated on genital tubercles on the two posterior pairs of limbs.

Measurements:—	mm.
Proboscis, length	.70
greatest diameter	.36
Cephalon, greatest width	.47
Trunk, length	.70
width across second crurigers	.78
Abdomen, length	.27
Chelophore, length	.31
Third right leg, first coxa	.19
second ,,	.25
third ,,	.22
femur	.55
first tibia	.56
second ,,	.58
tarsus and propodus	.52
claw	.20
auxiliary claw	.12
Palp, second joint	.27
third ,,	.05
fourth ,,	.24
fifth ,,	.08
sixth ,,	.06
seventh ,,	.07
eighth ,,	.08

Remarks.—Whitelegge (1889, page 233) records the locality of the species as Clark Island, Port Jackson.

Affinities.—Haswell suggests that this species is nearly related to *Achelia* (*Ammothea*) *langi*, Dohrn.

It is necessary to point out some errors in Haswell's description and drawings of this species. Fig. 5 shows the proboscis and palps, not the *first* pair as stated by Haswell. The basal joint of the palp is omitted. Fig. 6 shows the terminal joints of the palps, not of the first pair. Fig. 7 is evidently a representation of the oviger (third pair) not of the palp (second pair). This drawing is not quite accurate. There is an evident oversight in the description of the second pair (palps). This commences with an account of the structure of the palps but merges into a description of the ovigers.

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EXPLANATION OF FIGURES.

Plate XVIII.

Figs. 1-3.—*Rhopalorhynchus tenuissimus*, Hasw., holotype male.

Fig. 1.—Cephalon, dorsal view.

Fig. 2.—Leg.

Fig. 3.—Palp.

Figs. 4-5.—*Nymphon equidigitatum*, Hasw. (from spirit specimen).

Fig. 4.—Dorsal view, ovigers, palps and legs not shown.

Fig. 5.—Third right leg.

Plate XIX.

Fig. 6.—*Nymphon equidigitatum*, Hasw. (from spirit specimen).

Fig. 6.—Lateral view, legs removed.

Figs. 7-8.—*Pallene (?) valida*, Hasw., holotype, male.

Fig. 7.—Dorsal view, with third right leg.

Fig. 8.—Ventral vein of anterior portion of body (one chelophore not shown).

Fig. 9.—*Pseudopallene pachycheira*, Hasw., holotype, male.

Fig. 9.—Ventral view (legs and chelophores not shown).

Plate XX.

Figs. 10-11.—*Pseudopallene pachycheira*, Hasw., holotype, male.

Fig. 10.—Dorsal view (legs not shown).

Fig. 11.—Third right leg.

Figs. 12-14.—*Anoplodactylus tubiferus*, Hasw. (from spirit specimen).

Fig. 12.—Ventral view (♂), with third right leg.

Fig. 13.—Terminal joints of oviger.

Fig. 14.—Sexual aperture (♂).

Plate XXI.

Fig. 15.—*Anoplodactylus tubiferus*, Hasw., female.

Fig. 15.—Lateral view, legs removed.

Figs. 16-17.—*Ascorhynchus longicollis*, Hasw., holotype, female.

Fig. 16.—Dorsal view, with third left leg.

Fig. 17.—Oviger (female), spines not shown.

Figs. 18-20.—*Nymphopsis armatus*, Hasw., holotype, female.

Fig. 18.—Dorsal view, showing third left leg.

Fig. 19.—Spine from rim of chelophore.

Fig. 20.—Palp gland.

Plate XXII.

Fig. 21.—*Nymphopsis armatus*, Hasw., holotype, female.

Fig. 21.—Simple spine from leg.

Figs. 22-6.—*Achelia assimilis*, Hasw., male (drawn from slide in Dept. of Zoology, University of Sydney).

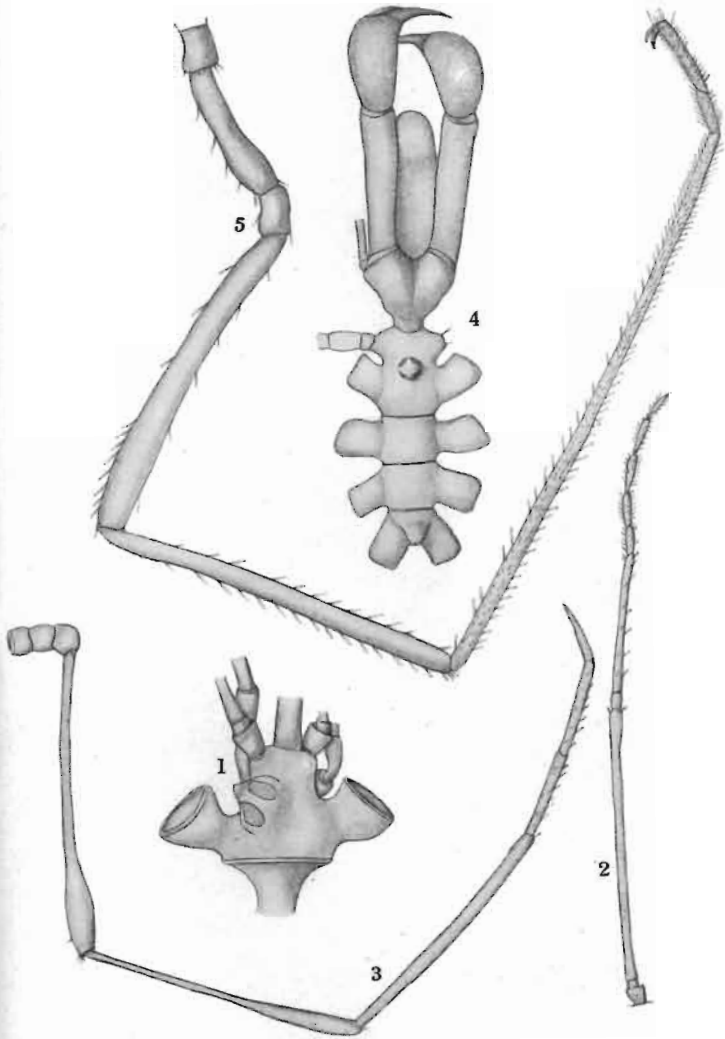
Fig. 22.—Dorsal view, showing third right leg.

Fig. 23.—Oviger (male).

Fig. 24.—Terminal joints of oviger (male).

Fig. 25.—Cement gland.

Fig. 26.—Gland from 2nd tibia.



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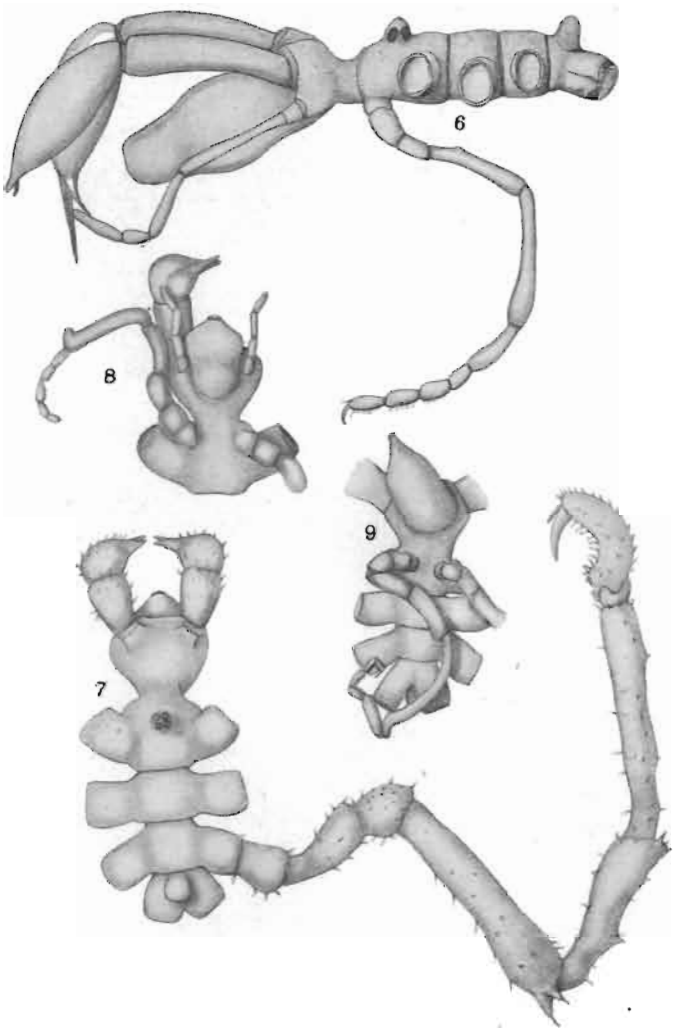
Rhopalorhynchus tenuissimus. figs. 1-3
Nymphon æquidigitatum, figs. 4-5



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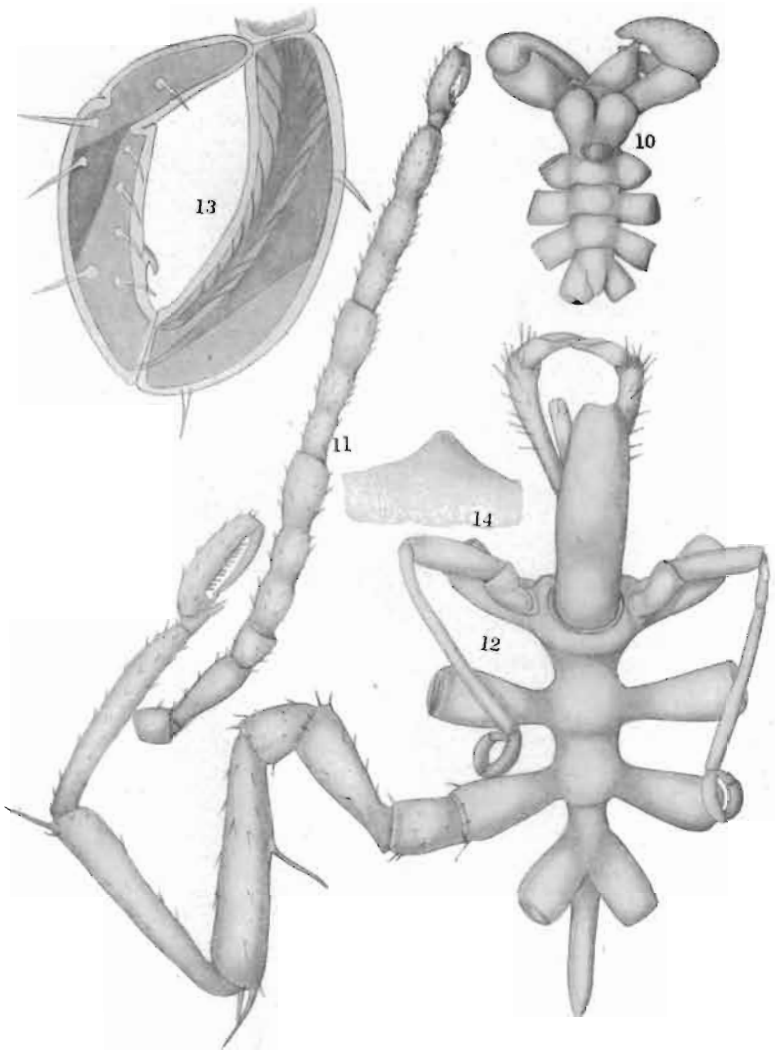
Nymphon æquidigitatum, fig. 6
Pallene (?) valida, figs. 7-8
Pseudopallene pachycheira, fig. 9



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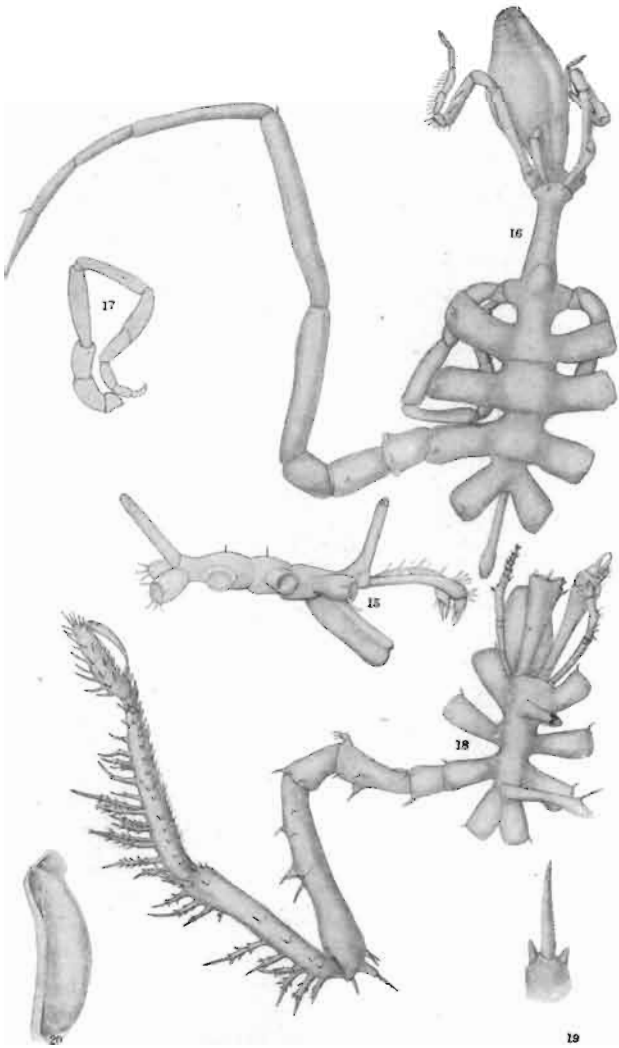
Pseudopallene pachycheira, figs 10-11
Anoplodactylus tubiferus, figs. 12-14



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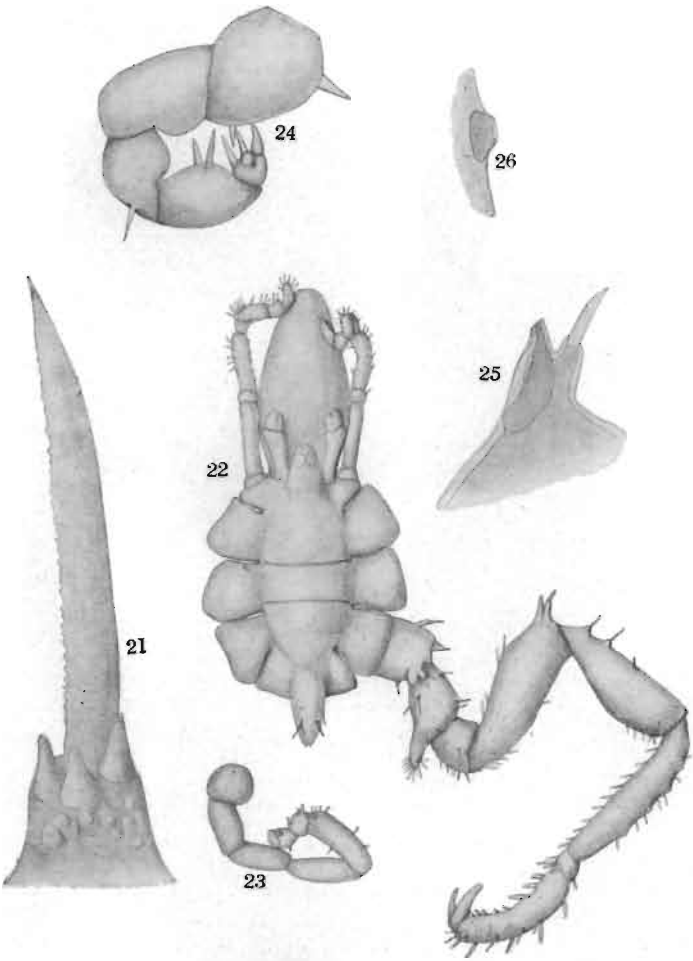
Anoplodactylus tubiferus, fig. 15
Ascorhynchus longicolis, figs. 16-17
Nymphopsis armatus, figs. 18-20



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Nymphopsis armatus, fig 21
Achelia assimilis, figs. 22-26