ZOOLOGICAL RESULTS OF A TOUR IN THE FAR EAST.

AMPHIPODA WITH NOTES ON AN ADDITIONAL SPECIES OF ISOPODA.

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[Plates XVIII–XXI.]

This report completes the account of the Crustacea from Dr. Annandale's tour in the Far East, submitted to me for examination. It includes notes and descriptions of the Amphipoda collected in China and Japan, some terrestrial Amphipoda from the Botanical Gardens at Singapore, and an additional Isopod which I discovered in one of the tubes of Amphipoda.

The list of species dealt with is as follows:—

ISOPODA.

Cyathura carinata (Kröyer). China.

AMPHIPODA.

Monoculodes limnophilus, n. sp. China.
Atyloides japonica, n. sp. Japan.
Gammarus annandalei, n. sp. China, Japan.
Gammarus pulex (Linn). Japan.
Talorchestia japonica, n. sp. Japan.
Talorchestia malayensis, n. sp. Singapore.
Grandidierella megnae (Giles). China.

The collection dealt with here supports in the main the conclusions drawn from the study of the Mysidacea and Isopoda.

The Tai-Hu, though a freshwater lake, has a very marked marine element in its fauna. This marine element has been derived from two sources: an immigration from the south, and one from the north.

The southern element is representated among the Amphipoda by *Grandidierella megnae*, a species found also in the Ganges Delta, L. Chilka and Madagascar. The genus is known only from Madagascar, India, and now China, and the fact that the same species is found to inhabit the Ganges Delta and the Tai-Hu is almost if not completely paralleled among the Isopoda, for *Tachaea spongillicola* from the Ganges is remarkably close to, if not identical with *Tachaea chinensis* from China.

The northern element in the marine fauna of the Tai-hu is much more marked

This element may be regarded as a relict fauna and among the Amphipoda is represented by *Monoculodes limnophilus*, a representative of an almost exclusively Arctic genus, and one hitherto known from only strictly marine localities.

The marine element in the fauna of the Tai-Hu suggests a comparatively recent geological origin for this water-system.

The freshwater systems of Japan are of more remote origin and the crustacean fauna provides evidence of affinities with that of the Palaearctic region of Europe and Asia, with America and with Australasia, that is, with the older and more remote, both in time and space, freshwater faunas of the globe.

Among the Isopoda I have already called attention to the occurrence of *Asellus aquaticus* in L. Biwa, a Palaearctic species of wide distribution, and of *Caecidothea kawamurai*, a new species from a well in Otsu near Kyoto, whose nearest allies are found in caves and freshwater wells in America.

Among the Amphipoda there are corresponding relationships. In one of the inland mountain streams of Japan was discovered *Gammarus pulex*, a Palaearctic species with a distribution corresponding to that of *Asellus aquaticus*. This species was, however, absent from L. Biwa, its place being taken by a new species, *Gammarus annandalei*, allied to the freshwater species of the great inland waters of the Palaearctic region (such as the Caspian Sea and Lake Baikal), of America (especially to the species *G. ramellus*) and of Australia.

In one of the other mountain streams of Japan Dr. Annandale discovered a species of *Atyloides* which is very closely allied to two freshwater species of the genus found by Sayce in Victoria, Australia. This discovery provides among the Amphipoda, a precisely parallel case to that already known among the Macrura in the genus *Paratya* (=*Xiphocaridina*).

The results obtained by Dr. Annandale from the point of view of geographical distribution are thus of exceptional interest.

I desire to thank Dr. Annandale for giving me the opportunity of examining and reporting upon this interesting collection, and my wife for the drawings illustrating this report.

ISOPODA.

Tribe *FLABELLIFERA*.

Family ANTHURIDAE.

Genus **Cyathura**, Norm. and Stebb.

Cyathura carinata (Kröyer)?

[Pl. XVIII, figs. 1–9.]

Locality.—Tai-Hu, a little N.E. of Si Dong Ding, China, 2-xii-15, 3 metres, on a bottom of mud with a little decayed vegetation, one female, 10 mm.

Remarks.—The element of doubt in the identification of this specimen is due to the appearance of the telson. This is very short, not much more than half the length of the uropods and very much shorter than in any other member of the family known to me. But though the telson in this specimen is almost symmetrical, it is devoid of setae and has every appearance of having been injured at some period, and I regard it in this light. Otherwise the specimen is in very close agreement with the published descriptions and figures of *C. carinata*. In support of my identification I have given figures of some of the appendages of my specimen. They will be found to agree very closely with the figures given by Norman and Stebbing (1886) and Richardson (1905).

The flagellum of the first antenna (pl. XVIII, fig. 3) is composed of two joints with possibly a minute third. Norman and Stebbing give four joints, while Richardson on the other hand figures only one. The flagellum of the second antenna (pl. XVIII, fig. 4) is composed of a single joint and this agrees with the figures and statements of both the authors named above. The thoracic legs agree absolutely with the description of Norman and Stebbing even to the pectinated spine at the distal extremity of the palm. The powerful second thoracic legs (pl. XVIII, fig. 5) as well as the remainder of these limbs bear a small secondary nail on the inner margin of the finger.

I have been unable to find any satisfactory account of the pleopods in the species of this family. They would appear to form an admirable basis for classification. In the present specimen the inner branch of all the pleopods is branchial in structure and not natatory and is devoid of plumose or simple setae of any kind. It is in all cases opaque and narrower than the outer branchand in the case of the first pair (pl. XVIII, fig. 9) much smaller. Both inner and outer rami in all the pleopods are composed of a single joint. Norman and Stebbing do not describe or figure the pleopods of this species. Harger (1880), however, figures the first and second pleopods and they agree with my own observations. His description is as follows:—"The first pair of pleopods are composed on each side of a short, quadrate basal segment supporting two rami, of which the outer is, like the basal segment, of firm texture, and acts as an operculum; in shape it is semi-oval, with the inner margin nearly straight, and is ciliated distally, and along the outer margin. The inner ramus is much smaller than the outer, and of delicate texture, and in the natural position is covered and concealed by the outer ramus; it is slender, with nearly parallel sides, rounded at the tip, and not ciliated."

I have quoted this description in full because it agrees so well with what I have myself observed and because it represents the only account of the pleopods of this species which I have seen.

Other writers have said very little about the structure of the pleopods in this family. Sars (Crustacea of Norway, Vol. II, Isopoda) figures the first pleopod of *Calathura norvegica* as composed of single-jointed rami, the inner setose distally; while his figure of pleopod two shows the rami to be each two-jointed, the inner setose distally. The pleopods of *Leptanthura tenuis* appear to be of substantially the same form. In *Ptilanthura tenuis* the first pair of pleopods have the rami single-jointed, the inner setose distally, while in the second pair Harger describes the outer ramus as imperfectly articulated near the middle. In *Anthelura remipes* Barnard describes the second pair of pleopods in the female as having the rami obscurely two-jointed and the same would appear to be the case in *Leptanthura fauri*, Barnard.

It is evident that more observation is required on the form and structure of the pleopods in this family but as far as present information goes the genus *Cyathura* would appear to be distinguished by having both rami of all the pleopods single-jointed, the inner ramus in all cases branchial and without setae on its margins.

The occurrence of this species in the fresh waters of the Tai-Hu is of remarkable interest. It was originally described from Greenland and is quite a common form in the shallow waters on the East Coast of the United States. It is also of frequent occurrence in the brackish waters of the Baltic Sea. Gurney has recently recorded it from the rivers of East Norfolk, and notes that "it seems to be capable of living in water either fresh or brackish. At Oulton Broad, at the time of capture, the water was very salt, but on the three other occasions on which it has been met with the water in which it was living was practically fresh." In the Tai-Hu, the water according to Annandale, is quite fresh.

AMPHIPODA.

Family OEDICEROTIDAE.

Genus **Monoculodes**, Stimpson.

Monoculodes limnophilus, n. sp.

[Pl. XVIII, figs. 10–20.]

Localities.—China.

1. Whangpoo River, between Shanghai and Wusung, 5–7 metres, 10-xii-15, abundant.
2. From Walker Island, up Hsi Kon Bay, Tai-Hu, 2–3 metres, 5-xii-15, abundant on a bottom of hard mud with shells in patches: no weeds.
3. Walker Island, Tai-Hu, close in shore, 5-xii-15, three specimens on mud with small stones and some weed.
4. Tai-Hu, a little N.E. of Si Dong Ding, 3 metres, 2-xii-15, thirty-three specimens.
5. Off Mouth of Moo Too Creek, Tai-Hu, 3 metres, 2-xii-15, one specimen.
6. Tai-Hu, a little N.E. of Si Dong Ding, 3 metres, 2-xii-15, abundant. (TYPES.)

Description.—*Body* smooth and not carinated; ornamented by a series of black chromatophores scattered over the back and sides, and on the posterior segments of the thorax and the anterior segments of the pleon, arranged in a transverse band across the posterior part of the somites.

Head (pl. XVIII, fig. 10) produced into a moderately long, acute and curved rostrum which extends to the distal end of the first joint of the peduncle of the first antenna. The head is not narrowly produced behind the eyes as in *M. hanseni*, *M. kröyeri* and *M. longirostris*.

Eyes moderately large, contiguous, pigment black, a large mass of ramose black chromotophores situated dorsally over the eyes and almost masking them in dorsal view.

Side-plates of the thorax presenting no special features but much as in the remaining species of the genus; the first side-plate somewhat expanded; side-plates 1–4 fringed with setae on their lower margins and with a specially strong spiniform seta on the posterior margin where the second joint of the limb comes off. The first three segments of the pleon have the lower hinder corners rounded and are without spines or setae.

First antenna (pl. XVIII, fig. 11) about equal to or slightly longer than the peduncle of the second antenna, first joint of the peduncle about as long as the second but considerably stouter, third joint shorter than the second, flagellum shorter than the peduncle, composed of 9–10 joints. In the male the second and third joints of the peduncle are shorter and stouter than in the female and the flagellum is composed of about 12 joints but there is no special development of sensory hairs.

Second antenna (pl. XVIII, fig. 12) in the female about one and a half times as long as the first, last joint of the peduncle elongate and slender about one and a half times as long as the preceding joint, flagellum longer than the last joint of the peduncle and composed of about 11–12 joints. In the male the flagellum is composed of about 20 joints.

Mouth parts and first thoracic limbs (maxillipedes) as for the genus.

Second thoracic limbs (first gnathopods) (pl. XVIII, fig. 13) rather slender and elongate, second joint long and narrow, very nearly as long as the rest of the limb, third and fourth joints short, fifth joint with the carpal process very long and narrow extending to the margin of the palm of the hand, sixth joint long and oval in shape, at least three times as long as broad, palmar margin longer than the hind margin of the joint, from which it is defined by a slight angle armed with a small spine, palmar margin furnished with long setae.

Third thoracic limbs (second gnathopods) (pl. XVIII, fig. 14) longer and somewhat more slender than the second, second joint longer than the rest of the limb, carpal process of the fifth joint very long and narrow, reaching to the margin of the palm of the hand, sixth joint smaller than the corresponding joint on the second thoracic limbs, long and almost linear in form, about three times as long as broad, palm about as long as the hind margin of the joint, defined by a slight angle furnished with a spine, and armed with long setae.

Pl. XVIII, fig. 15 shows the form of the fifth pair of thoracic limbs. The fourth to the seventh pairs resemble this figure in general structure. In all the carpus is about equal to the propodus and the nail long and well developed and only slightly shorter than the propodus.

In the sixth and seventh pairs the second joint is furnished with long plumose setae.

Eighth thoracic limbs (pl. XVIII, fig. 16) very elongate, second joint somewhat pyriform in shape, posterior margin fringed with short setae and having the lower distal corner produced into a lobe as long as the third joint, which is quite short; fourth to the seventh joints long and successively narrower, the propodus slightly longer than the merus, carpus and dactylus, which are subequal in length.

Telson (pl. XVIII, fig. 17) entire, quadrangular in shape, almost parallel-sided, distal margin truncate or perhaps faintly emarginate and armed with two feeble spiniform setae.

Uropods (pl. XVIII, figs. 18–20) having the outer ramus shorter than the inner in the first two pairs and equal to the inner in the third pair. The peduncles successively shorter in each pair and furnished with a few spines. The rami each with two or three spines.

Length of the largest specimens, 6 mm.

Nineteen species of the genus *Monoculodes* are at present known. The present species is distinguished from them all by the structure of the second and third thoracic limbs. The second thoracic limb especially forms a good distinguishing character. The sixth joint is longer and more oval in shape, and the carpal process of the fifth joint much longer and narrower than in any other species of the genus. The second thoracic limb, moreover, approaches the form of the third thoracic limb more closely in this species than in any other known to me.

The occurrence of this typically arctic genus in fresh water in China is a matter of great surprise and interest. It is, moreover, the first record of any member of the family from waters other than strictly marine. Of the known species of the genus, one is known from the Gulf of Naples, one from deep water in the North Atlantic (Lat. 46° N.) and one from the American coast. The remaining species are distributed widely in the Arctic Ocean, some few extending to Norway and the Kattegat and to the British Isles.

[This is the common aquatic amphipod of the Tai-Hu system, taken in shallow water (3–7 metres) on a muddy bottom both in the lake and in the river, *N. A.*]

Family PONTOGENEIIDAE.

Genus **Atyloides**, Stebbing.

The new species described below is certainly congeneric with *Atyloides gabrieli*, Sayce, and *A. fontana*, Sayce, and for that reason I retain the generic name *Atyloides*. But I must confess that the validity of the genus is somewhat doubtful and I am not sure that a new genus ought not to be formed for the three freshwater species, leaving the marine forms to be distributed among one or other of the recognised genera in this family.

The genus was originally established by Stebbing in his report on the Challenger Amphipoda. No definite type species is indicated but the definition of the genus is immediately followed by descriptions of *A. australis* (Miers), *A. assimilis*, Stebbing, and *A. serraticauda*, Stebbing, in that order.

In 1906, Stebbing cancelled the first two species as synonyms of *Paramoera austrina* (Bate). It seems to me that *Atyloides* thus becomes a direct synonym of *Paramoera*. In 1901 and 1902 Sayce described two freshwater species from Victoria, Australia, *A. gabrieli*, and *A. fontana* and in 1906 these species with *A. serraticauda*, Stebbing, remained the only three species in the genus. Of these, the last named has been referred by Vanhöffen to the genus *Leptamphopus* in quite a separate family !

Since 1906 the following new species have been attributed to the genus: *A. brevicornis*, Chevreux, *A. longicornis*, Chevreux, *A. calceolata*, Chilton, and *A. aucklandicus*, Walker, while a fifth species, originally described by Stebbing as *Atylopsis magellanica* and transferred later by him to the genus *Pontogeneia*, was also referred to *Atyloides* by Chilton. Barnard (1916) has, however, shown that *A. magellanica* is the same species as *Pontogeneia capensis* (Dana) and is in reality a species of *Paramoera*.

The genus *Atyloides* therefore at the moment contains seven species. According to Stebbing (1906) the genus is distinguished from *Paramoera* only by having the first antenna longer than the second instead of shorter and both genera are distinguished from all the others in the family by having a small one-jointed accessory flagellum to the first antenna. Of the seven species still retained in *Atyloides*, *A. brevicornis* and *A. longicornis* have no accessory flagellum and in both species the second antenna is longer than the first. It is impossible from the published descriptions to define the condition in respect to these characters in *A. calceolata* and *A. aucklandicus*. So that only three species, *A. gabrieli*, *A. fontana* and *A. serraticauda* conform to the original generic definition.

Apart from the question as to whether *Atyloides* is not in reality a synonym of *Paramoera*, it will be seen that a good deal of confusion and uncertainty exists among the genera and species of this family. We may endorse Chilton's remarks that "in this family of Amphipods particularly there has been an unnecessary multiplication of genera, and consequently some characters have been introduced into the generic descriptions which are subject to individual variation."

Into this confusion it does not seem opportune to introduce new generic names. I have therefore referred the new species described below to the genus *Atyloides* because it seems to me to be clearly congeneric with *A. gabrieli* and *A. fontana* and possibly with *A. aucklandicus*, Chilton, 1909, which is doubtfully the same as *A. aucklandicus*, Walker.

Atyloides japonica, n. sp.

[Pl. XIX, figs. 13–19.]

Locality.—Small torrent in hills behind Komatsu on Lake Biwa, 28-x-15, two specimens, 7 mm.

Description.—*Body* smooth, without ridges, carinae or spines but with a few very short, scattered setae on the dorsal surface. First four coxal plates deeper than their respective segments, with a few short setae on their lower margins, first two not expanded distally, fourth not quite as broad as deep, excavated posteriorly. Third segment of the pleon having the posterior margin with 6–7 slight crenulations, a seta in each notch, lower posterior angle only very slightly produced, lower margin with three setae. Eyes large, at least half as deep as the head, reniform in shape, pigment black.

First antenna (pl. XIX, fig. 13) about half as long as the body, first joint of the peduncle slightly longer and stouter than the second, third joint about two-thirds of the length of the second, flagellum composed of about 40 joints, accessory flagellum minute, about one-fourth of the length of the first joint of the main flagellum and tipped by three setae.

Second antenna (pl. XIX, fig. 14) shorter than the first, with its peduncle equal in length to that of the first, fifth joint slightly shorter than fourth, both with two or three fascicles of short setae on the lower margin, flagellum of about 30 joints.

Mouth parts agreeing very closely with those of *A. fontana*, Sayce, except that there are only two triangular teeth on the distal margin of the inner plate of the maxillipedes. *A. japonica* agrees with *A. fontana* as against *A. gabrieli*, Sayce, in the less expanded form of the mandible palp and in having the inner lobe of the first maxilla furnished with 10 plumose setae.

Second and third thoracic limbs (first and second gnathopods) (pl. XIX, figs. 15–16) subequal in size and very similar in form, second joint with a few very long setae on its margin, carpus shorter than the propodus, hardly if at all lobed, with a few fascicles of setae on the inner edge, propodus oblong, subquadrate, nearly twice as long as broad, palm slightly oblique with a fringe of short setae and four or five spines on the outer corner, inner margin of the propodus with four or five bunches of setae, outer margin with a bunch of setae at the distal end and two or three other fascicles, finger equal to the palm. Second joint of the last thoracic limbs (pl. XIX, fig. 18) broadly oval, front margin with a few spines, hind margin regularly and finely serrate and produced beyond the third joint.

First uropods with the peduncles longer than the subequal rami. Peduncle with one spine on each of the upper distal corners. Inner ramus with two spines on the upper margin and two small and one large spine at the tip. Outer ramus with one spine on the upper margin and three at the tip.

Second uropods extending back to the level of the first uropods, peduncle longer than the rami, with one spine on the upper margin and one at each upper distal corner. Inner ramus slightly longer than the outer, both with two spines on the upper margin and three at the apex.

Third uropods (pl. XIX, fig. 19) outreaching the first and second by about half the length of their branches, peduncle shorter than the rami, with one spine on the inner margin and one at each upper distal corner. Rami equal in length, lanceolate, with 5–6 spines on their inner margins and 3–4 spines on their outer margins, a plumose seta accompanying each spine.

Telson (pl. XIX, fig. 19) at least as long as the peduncle of the third uropods, cleft almost to the base, each lobe furnished with four long setae in a row at the apex and a single long seta anterior and lateral to the terminal setae.

Length of both specimens, 7 mm.

Remarks.—This species is, I think, without doubt, congeneric with *A. gabrieli* and *A. fontana*, Sayce. It agrees specially closely with the latter species and is distinguished by the larger eyes of reniform shape, the relatively longer third uropods, the very many fewer spines on the first and second uropods, the armature of the telson, the form of the posterior margin of the third somite of the pleon, the less lobed form of the carpus of the gnathopods and the presence of only two triangular teeth, instead of three, on the distal margin of the inner lobe of the maxillipedes. It differs from *A. gabrieli* in these points and in addition in the number of setae on the inner lobe of the first maxilla and in the less expanded form of the second joint of the palp of the mandible.

All three species are freshwater and found in mountainous streams at good altitudes, Sayce's species in Victoria, Australia, the present species in Japan. It is a matter of great interest to note the curious distribution of these three species, which, however, finds its parallel among Crustacea in the genus *Paratya* among the Macrura. Whether the three species of *Atyloides* here dealt with are congeneric with the marine species referred to that genus is a point which I am unable to decide.

On the sternum of certain of the thoracic somites of both specimens I found a number of finger-like processes. As far as I can make out these processes are present on the third to the seventh somites and there may be one or two pairs, symmetrically arranged, on each somite. I am quite unable to suggest what these processes are or what their function may be, but they suggest the similar processes found by Sars in *Gammarus pulex* and *Pontoporeia affinis*, by Smith in *Pontoporeia hoyi* and by Shoemaker (1920) in *Synurella johanseni*.

It is probable, too, that the processes found by Chilton in *Gammarus barringtonensis* are of the same nature. They are quite distinct from the accessory branchial vesicles which I have described below in *G. annandalei*, which are definitely additional processes on the outside of the branchial lamellae themselves.

Family GAMMARIDAE.

Genus **Gammarus**, Fabricius.

Gammarus annandalei, n. sp.

[Pl. XX, figs. 1–18.]

Localities.—CHINA.

1. Off Si Dong Ding, Tai-Hu, 10-xii-15, ten specimens, 5–7 mm.
2. Outskirts of Shanghai, in ditches and small ponds, 17-ix-15, five specimens, 4–5 mm.

JAPAN.

Lake Biwa.

1. Station 5, off Komatsu, on west side of lake, 74 metres, firm mud, 1-x-15, twenty-one specimens.
2. Station 6, off Komatsu, nearer the shore than station 5, 53 metres, soft mud mixed with shells and small pebbles, 1-x-15, ten specimens.
3. Station 8, in the centre of the lake near White Rocks, 77 metres, mud with fragments of shell, about fifty specimens. (TYPES.)
4. Station 12, two specimens from a depth of 190–200 feet in Lake Biwa.
5. Station 13, shore at Chikubushima, on lower surface of stones, four young, 2-x-15.

6. Station 14, off Suga, on west side of lake, 52 metres, fine grey mud, 2-x-15, eight specimens.
7. Station 15, West Coast of Oura Bay, at north end of lake, 17–31 metres, sand mixed with mud, 2-x-15, ten specimens.
8. Station 22, Hikone Fishery Station near the east side of the lake, in irrigation channels among weeds, about fifty specimens.
9. Off Komatsu, 30 feet, fine gravel, seven specimens.
10. Off Komatsu, in the interior of *Spongilla clementis,* five young specimens.
11. Zézé, on lower surface of stones on shore, 3-x-15, about forty specimens.

Northern Japan.

12. Sapporo, Hokkaido (Yezo), April 1915, e. coll. Akatsuka, about forty specimens. (Presented by Dr. T. Kawamura.)

Description.—First three somites of the pleon with a fringe of 10–12 short fine hairs on the median dorsal portion of the posterior margin, their lower margins with three or four spiniform setae and a few hairs on the anterior portion, postero-lateral corner acute and slightly produced. Pl. XX, fig. 14 shows the lower margin of the third pleon somite in one of the specimens and gives the essential structure of these somites in this species. The fourth to the sixth pleon somites (pl. XX, fig. 18) are armed with spines on the dorsal surface. On the fourth and fifth somites there are two pairs of dorsal spines and a few short setae, on the sixth pleon somite there is only one pair of spines, one on each side. There is considerable variation in the number of spines on these somites and the figure I give showing their arrangement must be taken as the average typical armature.

Head not rostrate, antero-lateral angles rounded.

Eyes moderate in size, broadly oval, almost circular in outline, pigment black.

Side-plate 4 (pl. XX, fig. 11) with the posterior angle distinct but obtuse and the margin above slightly concave.

First antenna (pl. XX, fig. 1) not half the length of the body, second joint of the peduncle as long as the first but narrower, third joint of the peduncle rather more than half as long as the second, primary flagellum with about 20 joints, accessory flagellum with 5 joints, the terminal joint minute. The whole appendage is but sparingly provided with setae.

Second antenna (pl. XX, fig. 2) about $\frac{2}{3}$–$\frac{3}{4}$ of the length of the first, the peduncle reaching beyond the level of the peduncle of the first antenna. There is variation in this character. In some specimens the peduncle of the second antenna outreaches that of the first by half the last peduncular joint and in other specimens the difference is much less. The last joint of the peduncle is shorter than the fourth and the flagellum is composed of about 12 joints. The males have a few calceoli on the flagellum joints. *Mouth parts* are normal for the genus *Gammarus. The first maxilla* has the inner lobe moderately broad with about 18 plumose setae on the inner margin and 6 or 7 simple setae on the distal part of the outer margin.

The second thoracic limbs (first gnathopods) of the female (pl. XX, fig. 6) with the propodus rather larger than the carpus, somewhat dilated, palmar margin oblique and armed with a few simple spines. In the male (pl. XX, fig. 3) these appendages have the propodus larger and more robust than in the female, more quadrangular in shape, palmar margin more transverse and armed with a number of stout peculiarly striated blunt spines (pl. XX, fig. 5).

Third thoracic limbs (second gnathopods) in the female (pl. XX, fig. 7) longer than the first, propodus as long as the carpus, rectangular in shape, twice as long as broad, armed with numerous tufts of setae, palmar margin almost transverse. In the male (pl. XX, fig. 4) these appendages have the propodus rather stouter than in the female, the palmar margin armed with stout blunt spines similar to those on the first gnathopod of the female.

The form of the remaining thoracic limbs may be seen from pl. XX, figs. 8–9, representing the fourth and eighth thoracic limbs. The last three pairs of thoracic limbs are characterized by the rather narrow pyriform shape of the second joint, which, in the eighth pair, is nearly twice as long as broad.

The branchial lamellae of the third to the eighth thoracic limbs have accessory branchiae in the form of long cylindrical finger-like processes arising at the base of the main lamella on the outside of the peduncle. These accessory branchial processes are shorter on the last thoracic somite than on the others and may be two in number on some of the gills (pl. XX, fig. 10).

Third uropods of similar form in both sexes, but in the male (pl. XX, fig. 17) considerably larger than in the female and extending well behind the first and second pairs. In the female the third uropods only extend slightly beyond the first and second pairs. In the male the peduncle is short, about $\frac{1}{5}$ of the length of the outer branch. Inner branch slightly shorter than the peduncle and $\frac{1}{6}$ of the length of the outer branch. Latter two-jointed with the second joint $\frac{1}{8}$ of the length of the first, with groups of spines along both margins but only a few setae.

Telson (pl. XX, fig. 18) cleft almost to the base, lobes dehiscent with their apices rounded and armed with one spine and one or two setae. Lateral margins with one or two (in one case three) spines.

Length of males and females, 15 mm.

The description given above applies to those specimens captured in the deeper part of L. Biwa, from 20–77 metres, i.e. Stations 5, 6, 8, 12, 14 and 15 in the above list, and I have selected these as the types of the species. I have referred all the Gammarids captured in L. Biwa to the same species but a few notes on variation may be useful.

The specimens from Sapporo differed from those in L. Biwa in having more numerous spinules on the pleon somites and in having more setae on the telson and a development of setae on the inner margin of the outer ramus of the third uropods. An adult male from Sapporo, quite as large as any from L. Biwa, had one pair of spinules on the second pleon segment, two pairs on the third segment, three pairs on the fourth and fifth segments and five spinules on the sixth segment. Each lobe of the telson had two prominent spines and five or six setae while the inner margin of the outer ramus of the third uropods bore about fifteen long plumose setae. The remaining specimens from this locality had the pleon segments similarly armed with spinules but occasionally the pair on the second pleon segment and one of the pairs on the third pleon segment were absent. The setae on the uropods were only found on adult males. In other characters the specimens were in substantial agreement with the specimens from L. Biwa. All had accessory branchial vesicles on the branchial lamellae.

The specimens from St. 13 are quite small and immature. The pleon segments have the following arrangements of spinules commencing with somite: 1, 0 prs, 2 prs, 4 prs, 3 prs, 3 prs, 2 prs. There are thus many more spinules on the pleon than in the typical form. Moreover, there is a greater development of setae on the antennules and antennae. But both these characters appear to become less pronounced with age. The setae on the antennules and antennae become fewer and the spinules on the pleon reduced in number.

The specimens from Komatsu, from the interior of *Spongilla clementis*, are also young specimens. The number of pairs of spinules on the pleon segments is 0, 1, 1, 2, 2, 1. These specimens are therefore less spinulose than those from St. 13, but in having spinules on the second and third segments of the pleon they show a divergence from type.

The specimens obtained in 30 feet of water off Komatsu are seven in number and include a typical male of *G annandalei*, 11 mm. in length and agreeing with the type in the spinulation of the pleon. The smaller specimens from 4–8 mm. in length have more spinules on the pleon and in four of them there are spinules on the second and third segments.

It will be seen therefore that there is considerable variation in the specimens in two characters :—

(1) The number and arrangements of spinules on the segments of the pleon.

(2) The development of setae on the antennules, antennae, telson and uropods.

This variation is of two kinds :—

(*a*) Variation with age. In the L. Biwa specimens there is definite evidence that young specimens have more spinules on the segments of the pleon and a greater development of setae on the antennae and antennules.

(*b*) Variation of specimens of approximately equal age from different localities. The Sapporo specimens have a greater number of spinules on the segments of the pleon, more setae on the telson and, in adult males, a development of setae on the inner margin of the outer branch of the third uropods.

But similar types and degrees of variation are known in *Gammarus pulex* and there seems no reason to regard it as of specific importance in the present cases.

In his synopsis of the Amphipoda Gammaridea, Stebbing (1906) gives a key to thirty species of the genus *Gammarus* and an additional species (*G. tunitanus*, Simon) is regarded as doubtful. In the appendix to this valuable work a further seven species of the genus are listed, and, since its publication, as far as I can make out, sixteen new species have been referred to the genus which now comprises fifty-four species.

It is as well, perhaps, to indicate the relationship of the new species here described by reference to Stebbing's key and for that purpose I give below a list of all the species of *Gammarus* not included in that key with an indication of their approximate position as far as can be judged from the published description.

Species.	*Position in Stebbing's Key.*
G. caecus, Weckel, 1907. *G. haasei*, Sayce, 1902.	Distinguished at once from all other species by the absence of eyes.
G. tetrachantus, Garbini, 1902.	Distinguished from all the other species by having the last thoracic and first three abdominal somites produced dorsally into a median process. I should very much doubt if it is correctly referred to *Gammarus*.
G. capensis, Barnard, 1916. *G. nigroculus*, Barnard, 1916. *G. crassicornis*, Barnard, 1916. *G. auricularis*, Barnard, 1916. *G. barringtonensis*, Chilton, 1916.	Excluded in Stebbing's key under heading 7 and therefore allied to *G. obesus*, Sars.
G. australis, Sayce, 1901.	Excluded in Stebbing's key under heading 13 and therefore allied to *G. weidemanni*, G. O. Sars, and *G. maeoticus*, Sowinsky.
G. ramellus, Weckel, 1907. *G. sowinskii*, Behning, 1914.	Excluded in Stebbing's key under heading 22 and therefore allied to *G. pungens*, M.–Ed.
G. chevreuxi, Sexton, 1913.	Excluded in Stebbing's key under heading 24 and therefore allied to *G. duebenii*, Lillj.
G. limnaeus, S. I. Smith, 1874.	Excluded in Stebbing's key under heading 26 and therefore allied to *G. pulex*, Linn.
G. zaddachi, Sexton, 1912. *G. pribilofensis*, Pearse, 1913.	Excluded in Stebbing's key under heading 29 and therefore allied to *G. locusta*, Linn.

Owing to deficiencies in the published descriptions and figures I am unable to place the following species in their proper place in Stebbing's key :—

G. sarsii, Sowinsky, 1898.
G. ripensis, G. Smith, 1909.
G. antipodeus, G. Smith, 1909.
G. breweri, Kunkel, 1910.
G. purpurascens, W. P. Hay, 1902.
G. propinquus, W. P. Hay, 1902.

Of these six species, the first three have the inner ramus of the third uropods very short and are comparable in this respect to *G. annandalei*. But the descriptions and figures are wanting in respect to the armature of the last three segments of the pleon.

The only specimen of *G. breweri* as yet collected had lost the third uropod and the published description gives no information as to the armature of the pleon.

In *G. purpurascens* and *G. propinquus* the inner branch of the third uropod is at least half as long as the outer and thus both species are very distinct from *G. annandalei.*

I have not been able to consult the descriptions of *G. polymorphus*, Helfer, 1914, and *G. argaeus*, Vavra, 1906. With this brief review of the known species of the genus it is possible to state shortly the affinities of *G. annandalei.* With the aid of Stebbing's key it is excluded under heading 22, and is thus related to *G. pungens*, M.-Ed., *G. ramellus*, Weckel and *G. sowinskii*, Behning. From these three species it is distinguished by the shorter first and second antennae, by the form of the second and third thoracic limbs in both sexes and by the third uropods which have the inner ramus comparatively longer than any of the above three species. It is, however, as well to point out that *G. ramellus* has the palm of the second and third thoracic limbs armed with the same type of peculiar spine as in *G. annandalei.* But *G. annandalei* differs from all the species of the genus, in the possession of accessory vesicles on the branchial lamellae. Chilton (1916) in describing *G. barringtonensis* notes that "on some of the segments of the peraeon" there are finger-like appendages which appear to be of the same nature as the 'single accessory branchiae' described in *Hyalella jelskii*, Wrzesn., and *H. dybowskii*, Wrzesn.". Chilton further says that these appendages appear to arise from the sternum of the segment internal to the branchiae, but he was unable to determine their exact occurrence. The processes seen by Chilton must be, I think, of the same nature as those I have noted above in *Atyloides japonica* and those seen by other authors in species of *Gammarus*, *Pontoporeia*, and *Synurella*. They are quite distinct from the accessory branchial processes of *G. annandalei* which are attached distinctly to the *outside* of the branchial lamellae. In no other species of *Gammarus* have I been able to find any mention of accessory branchial vesicles though they are found in the genus *Hyalella* and in some of the Lysianassidae.

It is to be regretted that Smith's inadequate descriptions of *G. ripensis* and *G. antipodeus* do not permit of a closer comparison of these species with *G. annandalei.* They agree with the latter in the short inner ramus to the third uropods but Smith makes no mention of the armature of the pleon or of the structure of the branchial lamellae and it is not possible to say how nearly allied to *G. annandalei* they really are. This is unfortunate because Smith regards these two species as in a measure intermediate in structure between the genera *Gammarus* and *Neoniphargus* and he suggests that the latter genus has been derived from the former in the Southern hemisphere and is not genetically related to the genus *Niphargus* of the Northern hemisphere, the resemblance between *Niphargus* and *Neoniphargus* being regarded as a remarkable case of convergence.

G. annandalei is a true *Gammarus* in all the characters that are supposed to distinguish that genus from *Neoniphargus*. The first maxillae are of the true *Gammarus* type and not of the intermediate form found in Smith's two species.

It would be interesting to be able to define more accurately the relationship of *G. annandalei* to the Australian and Tasmanian species in view of the occurrence of the genus *Atyloides* in Japan and Australia and the parallel case of *Paratya* among the Macrura.

[This is the common aquatic Amphipod of Lake Biwa. It is abundant on a muddy bottom in from 50 to 77 metres and occurs more sparingly in shallower water. It is also found, both in China and Japan, in ditches and similar situations. The young apparently conceal themselves more carefully than the adults and their occurrence in the patent exhalent channels of a sponge (*Spongilla clementis*) is noteworthy. *N. A.*]

Gammarus pulex (Linn.).

[Pl. XX, figs. 19–27.]

Locality.—Hills above Otsu, L. Biwa, among moss and gravel in small streamlet in wood, forty specimens, up to 11 mm. in length.

Remarks.—I cannot find any characters of specific importance in which these specimens differ from typical *Gammarus pulex*.

Chevreux (1907) has noted the most important points in which specimens of this species from different localities vary and it will be as well to describe the characters of the Japanese specimens in these respects.

1. *The form of the lower posterior angle of the third pleon segment.*—Pl. XX fig. 25 shows the form of this plate in my specimens. The lower posterior angle is slightly produced and bluntly pointed. There are three or four short setae on the posterior border and one stronger seta on the lower border.

2. *The spinulation of the last three segments of the pleon.*—On the fourth and fifth somites of the pleon there is a pair of dorsal spines, with a pair of fine short setae between them and a pair of setae to the outside of each spine. There do not appear to be any lateral spines on these segments. On the sixth somite of the pleon there is a lateral spine (sometimes two), on each side of which there is a pair of setae. There is no dorsal pair of spines but the dorsal pair of setae is present.

3. *The accessory flagellum of the first antenna.*—The specimens show considerable variation in the number of joints in this accessory appendage, from three joints of more or less equal size to five joints, four of which are subequal and the terminal joint very small.

4. *Armature of the telson.*—Pl. XX, fig. 27 depicts the telson of a male specimen, 11 mm. Each lobe has two spines and four or five setae at the apex and a few setae on the lateral margins.

5. *The proportions of the rami of the third uropods* (pl. XX, fig. 26).—The internal ramus is about three-quarters of the length of the first joint of the outer ramus. I figure in addition the second and third thoracic limbs (first and second gnathopods) of both male (pl. XX, figs. 21–22) and female (pl. XX, figs. 19–20), the last thoracic limb of the male (pl. XX, fig. 23) and the fourth coxal plate (pl. XX, fig. 24). I

was not able to detect any calceoli on the first antenna of the male. The branchial lamellae are simple, without accessory vesicles.

Distribution.—This is the first record of the species from Japan but its occurrence there is not unexpected. Its distribution can now be traced right across the Palaearctic region from the British Isles to Japan.

Family TALITRIDAE.

Genus **Talorchestia**, Dana.

Talorchestia japonica, n. sp.

[Pl. XXI, figs. 1–10.]

Locality.—Among damp weeds on the shore of Lake Biwa at Zézé, 3-x-15, thirty specimens up to 9 mm. in length.

Description.—*Body* smooth without ridges or carinae, or armature of spinules or setae; preserved specimens show extensive traces of a rose-coloured pigment on the thoracic and abdominal somites in bands across the dorsal surface, most pronounced on the last three thoracic and first three abdominal somites; first and second antennae also tinged rose colour.

Eyes moderately large, separated dorsally by a distance less than their greatest diameter, pigment black.

Side-plates one to four with a few small setae on their lower margins, second to fourth with a prominent lobe on the hind margin about the centre; third segment of the pleon (pl. XXI, fig. 6) with its lower posterior corner slightly produced and its hind margin with four or five minute serrations, each serration armed with a small spinule.

First antenna equal in length to the first four joints of the peduncle of the second pair; three joints of the peduncle subequal in length, each furnished with a single spine on its upper distal corner, the second and third joints with one or two spines at their lower distal corners; flagellum of 4–5 joints.

Second antenna with the fifth joint of the peduncle equal in length to the preceding four joints but narrower; third joint with a group of seven spines on the lower distal corner, two on the upper distal corner and two or three scattered over the surface; fourth joint with three groups of two spines on the lower border, one spine at the upper distal corner, one on the outer margin and five or six scattered over the surface; fifth joint with 9–10 spines on the upper margin and three or four on the distal part of the lower margin; flagellum slightly longer than the peduncle and composed of 11–14 joints.

Second thoracic limbs of the male (pl. XXI, fig. 3) with the side-plate widening slightly distally, its lower margin provided with four or five setae; no pellucid lobe on the merus; carpus about equal to the propodus with a prominent rounded pellucid lobe on the hind margin towards the distal end; propodus widening distally to the usual lobe on its hinder margin, a row of setae marking the junction of the lobe with the joint proper; dactylus shorter than the palm formed by the wider end of the propodus; setae on the limb few and short.

Third thoracic limb of the male (pl. XXI, fig. 4) with the side-plate furnished with about a dozen small setae on its lower margin and a prominent lobe on its hinder margin; propodus broadly oval, the anterior margin convex and without setae except for two small ones at the base of the finger, posterior margin very convex, about half of it occupied by the palm which consists of a shallow groove flanked on each side by a row of 17–18 spinules and ending in a small pocket into which the nail fits; nail long and curved with a number of minute setae on its inner margin; setae on the limb very small and few.

Second thoracic limb of the female (pl. XXI, fig. 1) of the usual form, propodus slightly shorter than the carpus, its inner margin furnished with strong spiniform setae and with just a suggestion of a palm at its distal end.

Third thoracic limb of the female (pl. XXI, fig. 2) with the second joint wider proximally than distally, merus with a small pellucid lobe, carpus slightly longer than the propodus, each of these joints with the usual rounded lobes, that on the propodus extending well beyond the short oblique palm; setae on the limb few and small.

Sixth to eighth thoracic limbs (pl. XXI, fig. 5) having the front margins of the second joints armed with 8–10 spinules and the hind margins of the same joints with about 12 small serrulations, spinules between the teeth.

First uropods (pl. XXI, fig. 7) with the peduncle longer than the rami; peduncle with four or five spines on each of the upper and outer margins; inner branch with four spines on the upper margin and two large and two small spines at the apex; outer branch with no spines on its margins and two large spines at its apex.

Second uropods (pl. XXI, fig. 8) peduncle about equal to the branches; peduncle with two or three spines on each of the upper and outer margins; inner branch with two spines on the upper margin and three at the apex; outer branch with two spines on the upper margin and two strong spines and a small spinule at the apex.

Third uropods (pl. XXI, fig. 9) with the proximal joint bigger and broader than the distal joint, with two spines on the upper distal corner; distal joint with two small spines on the upper margin and one large and two or three small spines at the apex.

Telson (pl. XXI, fig. 10) slightly notched with three or four spines of various sizes at the apex of each lobe and two strong spines on each lateral margin.

Length of adult males and females, 9 mm.

Remarks.—Four of the specimens have the pigment of the eyes imperfectly developed and irregularly arranged. Chilton has called attention to similar specimens of *Talorchestia parvispinosa*.

Talorchestia malayensis, n. sp.

[Pl. XXI, figs. 11–20.]

Locality.—Botanical Gardens, Singapore, among dead leaves on ground in the shade of trees, on damp walls of drain and on damp earth under logs, 26–30-xii-15 3 males, 11 females.

Description.—This species is very closely allied to *T. japonica* and is best described by reference to the figures given herewith and by pointing out the differences between the two forms.

T. malayensis differs from *T. japonica* in the following points :—

(1) absence of serrulations on the hind margin of the third segment of the pleon (pl. XXI, fig. 16);
(2) there are only three joints in the flagellum of the first antenna;
(3) the second thoracic limb of the female (pl. XXI, fig. 11) has no trace of a palm and is therefore strictly simple in type;
(4) the presence of a distinct lobe on the merus of the second thoracic limbs of the male and the more pronounced lobe on the carpus of the same limb (pl. XXI, fig. 13);
(5) the shorter and broader hand of the third thoracic limb of the male;
(6) the hind margin of the second joint of the last thoracic limb (pl. XXI, fig. 15) is minutely serrated throughout, the serrations much more numerous than in *T. japonica*.

Small differences in the proportions and armature of the limbs, telson and uropods can be detected by a comparison of the figures given for the two species [pl. XXI, figs. 11–20].

Length of the largest male, 7 mm., of the largest female, 9 mm. [This is the most completely terrestrial Amphipod with which I am acquainted. It is found in damp places at considerable distances from water. *N. A.*]

Remarks.—Stebbing (1906) refers nineteen accepted and two doubtful species to the genus *Talorchestia*. Since that date I have described one new species, *T. kempii*, and referred *Orchestia parvispinosa*, Weber, to this genus and Barnard (1916) has described three new species from South Africa, *T. quadrispinosa*, *T. ancheidos* and *T. australis* and transferred *Orchestia capensis* to the genus *Talorchestia*. The latter, therefore, now includes twenty-five accepted and two doubtful species.

By the use of the key to the species provided by Stebbing we find a group of very closely allied forms at the end of the key grouped under the headings 17 and 18. These species are *T. brito*, Stebb., *T. novaehollandiae*, Stebb., *T. martensii*, Weber, *T. kempii*, W.M.T., *T. parvispinosa*, Weber, *T. ancheidos*, Barnard, and *T. australis*, Barnard, to which must now be added the two species described above.

These nine species are very closely related to one another but may be separated, partially at any rate, in the following manner :—

I. Side-plates 2–4 *without* a well-marked lobe or tooth on the hinder posterior border .. .. *T. ancheidos*, Barn.

II. Side-plates 2–4 *with* a well-marked lobe or tooth on the hinder posterior boder.

(*a*) Second thoracic limb (first gnathopod) of the male *without* a meral lobe.

(1) Hind margin of the third pleon segment with a few small serrations .. .. *T. japonica*, W.M.T.

(2) Hind margin of the third pleon segment smooth, without serrations .. .. *T. brito*, Stebbing.
T. australis, Barn.
T. novae-hollandiae, Stebb.
T. martensii, Weber

(*b*) Second thoracic limb (first gnathopod) of the male *with* a meral lobe.

(1) Serrations on the hind margin of the second joint of the last thoracic limb few (about 10–12) and distant .. *T. parvispinosa*, Weber.
T. kempii, W.M.T.

(2) Serrations on the hind margin of the second joint of the last thoracic limb very numerous and closely set .. *T. malayensis*, W.M.T.

This table will indicate the relationships of the two new species described in this report and the characters by which they may be distinguished from their allies.

Talorchestia, sp.

Locality.—Si Dong Ding, Tai-Hu, China, under vegetable debris on shore, one female.

Remarks.—This specimen does not appear to show any appreciable differences from females of *T. japonica*, described earlier in this paper, but in the absence of male specimens I prefer not to give it a name.

Family AORIDAE.

Genus **Grandidierella**, Coutière, 1904.

Grandidierella megnae (Giles).

[Pl. XIX, figs. 1–12.]

G Bonnieri, Stebbing, 1908
G. megnae, Chilton, 1921 (with synonymy).

Localities.—Whangpoo River, between Shanghai and Wusung, 5–7 metres, 10-xii-15, twenty-two specimens.

Whangpoo River, *ca.* 10 mi. below Shanghai, 5–7 metres, 10-xii-15, one specimen.

Walker Island, Tai-Hu, China, close inshore, 5-xii-15, three specimens.

Tai-hu, a little N.E. of Si Dong Ding, China, 3 metres, 2-xii-15, nine specimens.

Off Si Dong Ding, China, 2½ metres, 2-xii-15, nine specimens.

Remarks.—The following points of differences are to be noted between the Chinese specimens and the Indian specimens described by Stebbing:—

1. In Indian specimens the second joint of the peduncle of the first antenna is equal in length to the first and three times as long as the third.

   In Chinese specimens the second joint of the peduncle of the first antenna (pl, XIX, fig. 1) is one-third longer than the first and twice as long as the third in the male and one-quarter as long as the first and two and a half times as long as the third in the female.

2. The second joint of the second thoracic limb (first gnathopod) of the male (pl. XIX, fig. 5) is stouter in the Chinese than in the Indian specimens.

3. The fifth joint of the fourth and fifth thoracic limbs (first and second peraeopods) (pl. XIX, fig. 7) is only slightly longer than broad in Indian specimens and nearly twice as long as broad in those from China.

These differences are very small compared with the very close resemblance between the Indian and Chinese specimens in other characters. I have given detailed figures of the Chinese forms to support my identification and to compare with the figures given by Stebbing for the Indian examples.

I do not consider the differences I have pointed out are of specific importance. The Chinese examples are somewhat larger than those from India, 6 mm. for both sexes as against 4 mm. for the male and 5 mm. for the female.

The agreement between my specimens and Stebbing's description extends to the details of the mouth parts and the armature of all the appendages. The accessory appendage of the first antenna is shorter than the first joint of the flagellum and is tipped by a few setae. The flagellum of the first antenna has eighteen joints in both sexes and that of the second antenna six joints in both sexes.

Distribution.—This species is only known from brackish pools, Port Canning, Lower Bengal, and from the localities in China enumerated above. The distribution of the genus is quite remarkable. The type species, *G. mahafalensis*, Coutière, was found in an inland lake (water saline) in Madagascar, so that the genus now occurs in three isolated localities, Madagascar, Bengal and China.

(Since the manuscript of this paper left my hands, the important paper by Professor Chilton (1921) on the Amphipoda of Chilka Lake has been published. In this paper Chilton has identified *Grandidierella bonnieri*, Stebbing, with the earlier *Microdeutopus megnae*, Giles. I had overlooked Giles' species but I accept Chilton's identification and, while leaving the main body of my manuscript as it was written, I have altered the name of the species to read *Grandidierella megnae* (Giles). In the light of Chilton's description and figures practically all the small differences noted between Chinese and Indian specimens disappear and the identity of the Indian and Chinese forms is confirmed. Chilton goes further and identifies the original species of Coutière, *G. mahafalensis*, with Giles' species, so that the same species occurs in Madagascar, India and China. All my male specimens belong to Chilton's form I. Chilton places the genus in the family Aoridae and describes a second species, *G. gilesi*. W.M.T. September, 1921).

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EXPLANATION OF PLATES.

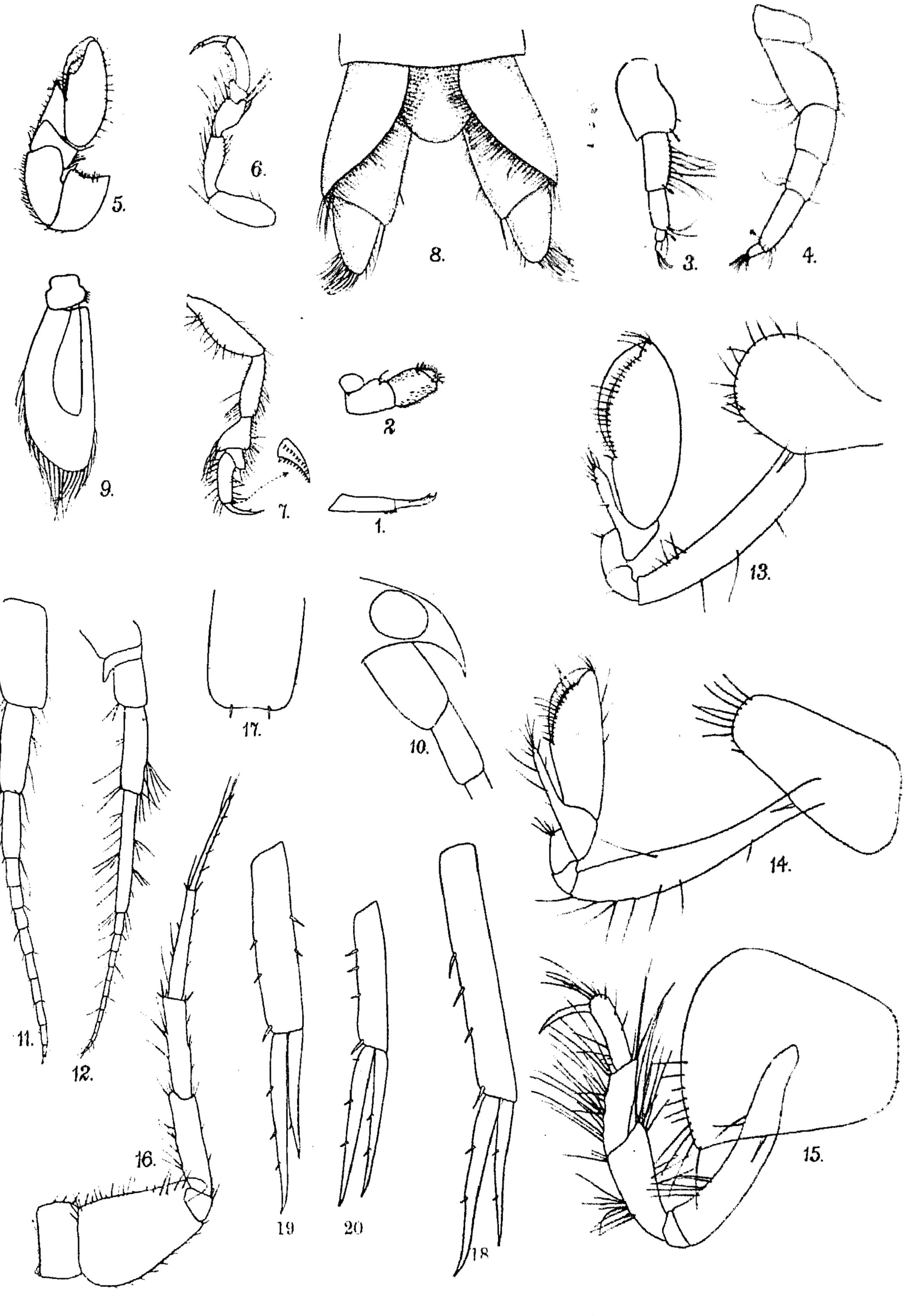
PLATE XVIII.

Cyathura carinata (Kröyer).

FIG. 1.—First maxilla. × 34·3.
,, 2.—Maxillipods. × 34·3.
,, 3.—First antenna. × 22·7.
,, 4.—Second ,, × 22·7.
,, 5.—Second thoracic leg. × 22·7.
,, 6.—Third ,, ,, × 22·7.
,, 7.—Eighth ,, ,, × 22·7.
,, 8.—Telson and uropods. × 22·7.
,, 9.—First pleopod. × 22·7.

Monoculodes limnophilus, n. sp.

FIG. 10.—Head and rostrum. × 24.
,, 11.—First antenna. × 44·6.
,, 12.—Second ,, × 34·3.
,, 13.—Second thoracic leg. × 44·6.
,, 14.—Third ,, ,, × 44·6.
,, 15.—Fifth ,, ,, × 44·6.
,, 16.—Eighth ,, ,, × 22·7.
,, 17.—Telson. × 68·7.
,, 18.—First uropod. × 44·6.
,, 19.—Second ,, × 44·6.
,, 20.—Third ,, × 44·6.



Figs. 1—9. Cyathura carinata (Kroyer).
Figs. 10—20 Monoculodes limnophilus, sp. nov.

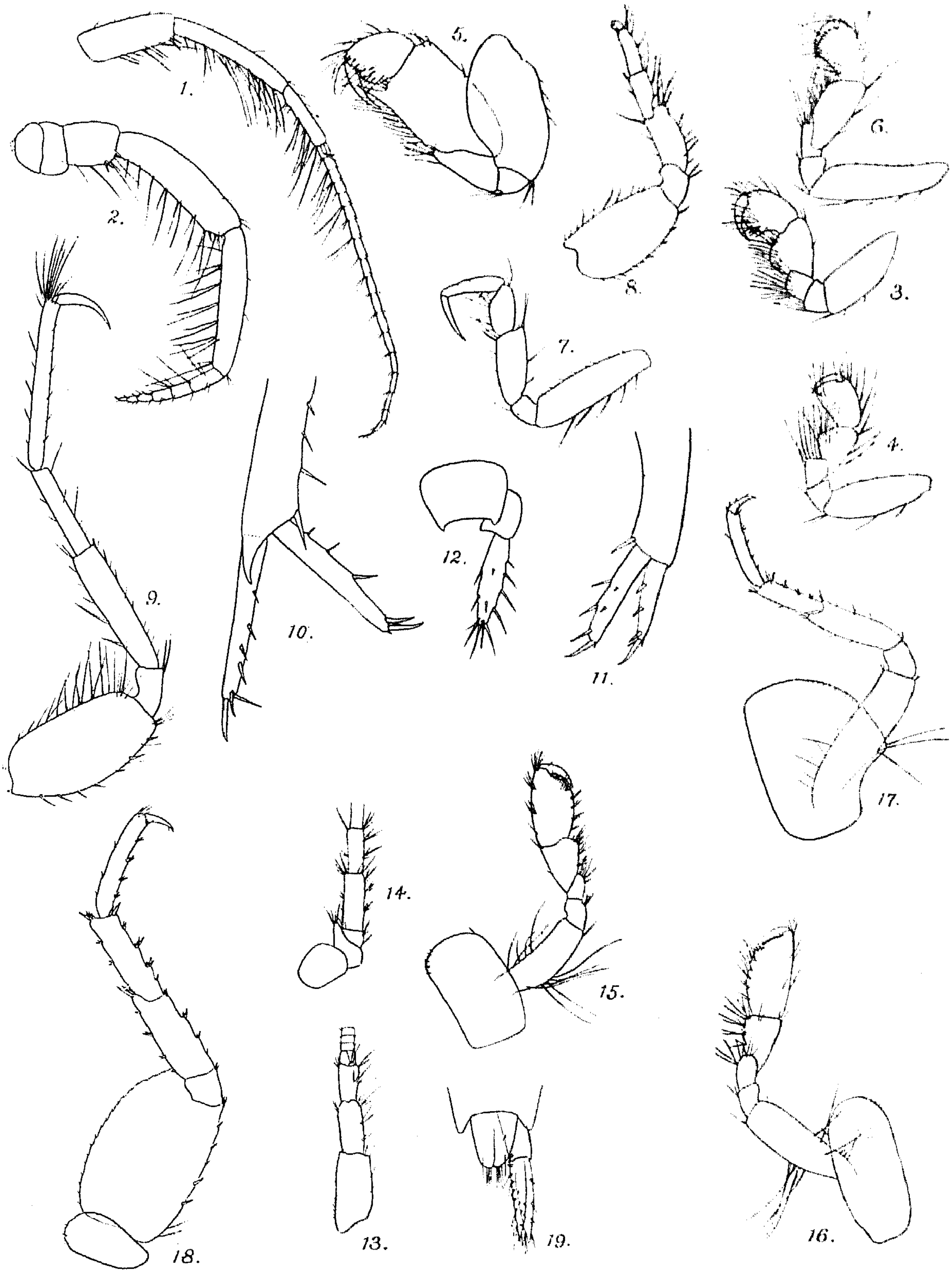
Plate XIX.

Grandidierella megnae (Giles).

Fig. 1.—First antenna of male. × 22·7.
,, 2.—Second ,, ,, ,, × 22·7.
,, 3.—Second thoracic leg of female. × 22·7.
,, 4.—Third ,, ,, ,, ,, × 22·7.
,, 5.—Second ,, ,, ,, male × 22·7.
,, 6.—Third ,, ,, ,, ,, × 22·7.
,, 7.—Fifth ,, ,, ,, ,, × 22·7.
,, 8.—Sixth ,, ,, ,, ,, × 22·7.
,, 9.—Eighth ,, ,, ,, ,, × 22·7.
Fig. 10.—First uropod. × 44·6.
,, 11.—Second ,, × 44·6.
,, 12.—Third uropod and telson. × 44·6.

Atyloides japonica, n. sp.

Fig. 13.—Peduncle of first antenna and accessory appendage. × 22·7.
,, 14.—Peduncle of second antenna. × 22·7.
,, 15.—Second thoracic leg. × 22·7.
,, 16.—Third ,, ,, × 22·7.
,, 17.—Fifth thoracic leg. × 22·7.
,, 18.—Eighth ,, ,, × 22·7.
,, 19.—Third uropods and telson. × 22·7.



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Figs. 1—12. Grandidierella megnae (Giles).
Figs. 13—19. Atyloides japonica. sp. nov.

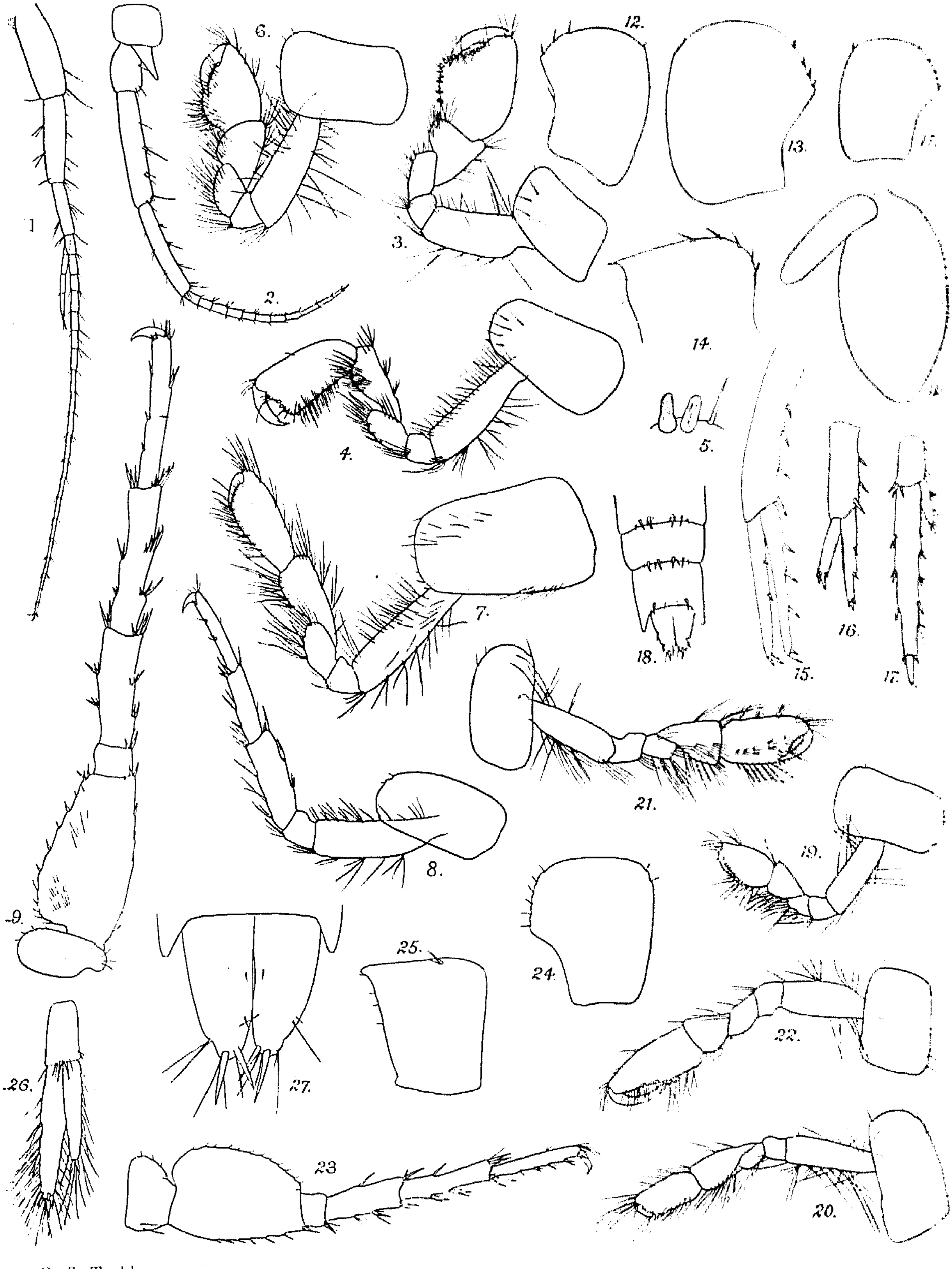
PLATE XX.

Gammarus annandalei, n. sp.

FIG. 1.—First antenna. × 15·1.
„ 2.—Second „ × 15·1.
„ 3.—Second thoracic limb of male. × 15·1.
„ 4.—Third „ „ „ „ × 15·1.
„ 5.—Spines on palm of second and third thoracic legs of male. × 82·4.
„ 6.—Second thoracic limb of female. × 15·1.
„ 7.—Third „ „ „ „ × 15·1.
„ 8.—Fourth „ „ „ male. × 15·1.
„ 9.—Eighth „ „ „ „ × 15·1.
„ 10.—Gill with accessory vesicle. × 15·1.
„ 11.—Fourth coxal plate of specimen from L. Biwa. × 15·1.
„ 12. „ „ „ „ „ „ Hikoné. × 15·1.
„ 13. „ „ „ „ „ „ Sapporo. × 15·1.
„ 14.—Lower margin of third pleon segments.
„ 15.—First uropods. × 15·1.
„ 16.—Second „ × 15·1.
„ 17.—Third „ × 15·1.
„ 18.—Last three segments of the pleon, and telson. × 15·1.

Gammarus pulex (Linn.).

FIG. 19.—Second thoracic limb of female. × 13·0.
„ 20.—Third „ „ „ „ × 13·0.
„ 21.—Second „ „ „ male. × 13·0.
„ 22.—Third „ „ „ „ × 13·0.
„ 23.—Eighth „ „ „ „ × 13·0.
„ 24.—Fourth coxal plate. × 15·1.
„ 25.—Lower margin of third segment of pleon. × 15·1.
„ 26.—Third uropod. × 15·1.
„ 27.—Telson. × 34·3.



O. S. T. del.

Figs. 1—18. *Gammarus annandalei*, sp. nov.
Figs. 19—27. *Gammarus pulex* (Linn.)

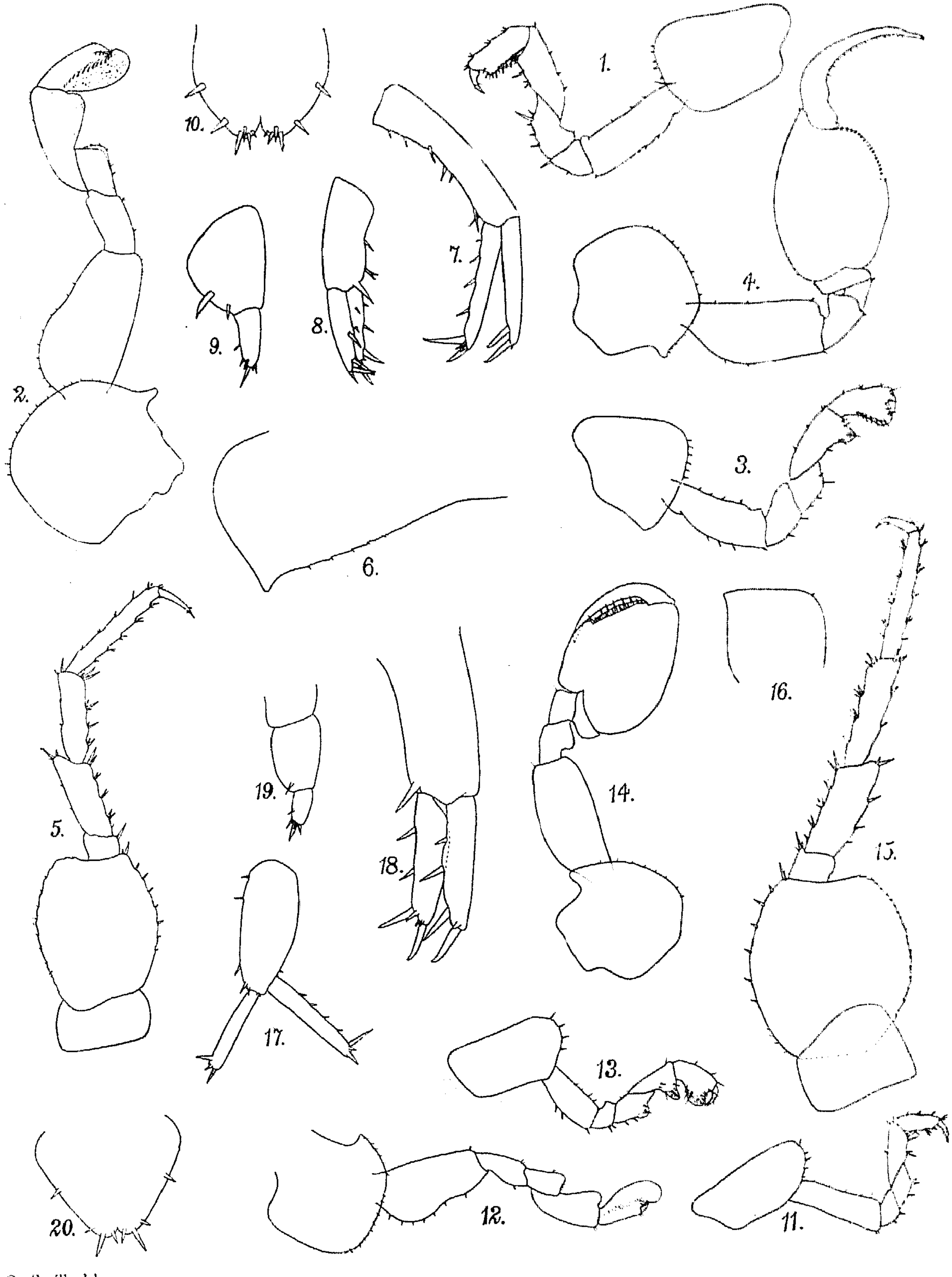
PLATE XXI.

Talorchestia japonica, n. sp.

FIG. 1.—Second thoracic limb of female. × 22·7.
,, 2.—Third ,, ,, ,, ,, × 22·7.
,, 3.—Second ,, ,, ,, male. × 22·7.
,, 4.—Third ,, ,, ,, ,, × 22·7.
,, 5.—Eighth ,, ,, ,, ,, × 15·1.
,, 6.—Lower and hinder margin of third segment of pleon. × 22·7.
,, 7.—First uropod. × 44·6.
,, 8.—Second ,, × 44·6.
,, 9.—Third ,, × 44·6.
,, 10.—Telson. × 44·6.

Talorchestia malayensis, n. sp.

FIG. 11.—Second thoracic limb of female. × 22·7.
,, 12.—Third ,, ,, ,, ,, × 22·7.
,, 13.—Second ,, ,, ,, male. × 22·7.
,, 14.—Third ,, ,, ,, ,, × 22·7.
,, 15.—Eighth ,, ,, ,, ,, × 22·7.
,, 16.—Lower hinder margin of third segment of pleon. × 22·7.
,, 17.—First uropod. × 22·7.
,, 18.—Second ,, × 44·6.
,, 19.—Third ,, × 44·6.
,, 20.—Telson. × 68·7.



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Figs. 1—10. Talorchestia japonica, sp. nov.
Figs. 11—20. Talorchestia malayensis, sp. nov.