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Crustacea caspia.

Contributions to the knowledge of the Carcinological Fauna of the Caspian Sea.

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Part III.

AMPHIPODA.

1-st Article.

Gammaridæ (part).

With 8 autographic plates.

(Lu le 11 mai 1894).

INTRODUCTION.

The Caspian Sea would seem truly to abound in Amphipoda. By the investigations of Dr. Grimm and Mr. Warpachowsky, a rather extensive material has now been brought together, the examination of which shows indeed the Amphipodous Fauna of that isolated basin to be both rich and diversified, comprising, as it does, numerous species belonging to several distinct families. As yet known, the following families are represented in the Caspian Sea: *Lysianassidae, Pontoporeiidae, Gammaridae, Corophiidae.* The 2 last-named families are represented both in the collection of Mr. Warpachowsky and that of Dr. Grimm, whereas only the latter collection contains forms belonging to the 2 first ones. Of the above mentioned 4 families, the *Lysianassidae* and *Corophiidae* are, as well known, exclusively marine in character, whereas the other 2 comprise, besides marine species, also some apparently genuine fresh-water forms. By far the most abundantly represented family is that of the *Gammaridae*, and of the genera comprised within it, the genus *Gammarus* has turned out contain much the greater part of the species. Some of the Gammaroid genera occurring in the Caspian Sea are very remarkable and rather unlike those represented in the Oceans. Especially is the generic form named by Dr. Grimm *Boeckia* highly distinguished by its most strange appearance.

As is the case with the *Mysidae* and *Cumacea*, much the greater part of the Caspian Amphipoda are, as yet known, restricted in their occurrence

to that basin, only a few forms having been stated to be common also to the Black Sea. According to the investigations of Dr. Grimm, several forms descend to very considerable depths, and among them are some, which evidently show themselves to be of true arctic origin.

Our knowledge to the Caspian Amphipoda is still very imperfect, only scattered notes having hitherto been published about this part of the Fauna. It therefore cannot fail that a full account of the species occurring in that isolated basin may have a considerable interest. I give below a summary of the earlier publications referring to the Amphipodous Fauna of the Caspian Sea, as far as I have been enabled to state by looking over the literature accessible to me.

In his «Fauna caspio-caucasia»[1]), Mr. Eichwald mentions 2 species of *Gammarus* occurring in the Caspian Sea, and already noticed many years previously by Pallas[2]). The one of these species was considered by the latter author as identical with *G. pulex* Fabr., whereas the other was noticed as a new species and named *G. caspius*. Mr. Eichwald gives a short diagnosis of the latter form, and describes more at length another species from the Black Sea, *G. haemobaphes*, which he believes is the same as that noticed by Pallas as *G. pulex*. In the Catalogue of Amphipoda in the British Museum (1862), Sp. Bate describes and figures 2 species of *Gammarus*, *G. caspius* Brandt and *G. semicarinatus* n. sp., which both would seem to belong to the Caspian Fauna, though no exact locality was indicated for any of them. The last-named species is unquestionably, to judge from the figure, identical with *G. caspius* of Pallas as characterised by Eichwald, whereas the former is a very different species, perhaps that subsequently named by Dr. Grimm *G. aralo-caspius* (or *G. robustoides*). Sp. Bate refers for this species to Brandt's treatise in Middendorff's Sibirische Reise, but this must be an error, as no species of that name is mentioned in that work; and the locality (Asiatic Russia?) would seem to have merely been inserted because the specimen, from which the description and figure was taken, was presented to the Museum of the Jardin des Plantes by Professor Brandt. The most recent publication referring to the Amphipodous Fauna of the Caspian Sea is that given by Dr. Grimm in «Archiv für Naturgeschichte» for 1880[3]). In this very interesting treatise no less than 18 different species of Caspian Amphipoda are mentioned, collected by him from rather deep water in the southern and middle part of that Sea. But the species are only named, no descriptions whatever having

1) Nouv. Mém. de la Soc. Imp. des Naturalistes de Moscou, T. VII, 1842.
2) «Reise durch Russland I. 1801» (according to Eichwald).
3) «Beitrag zur Kenntniss einiger blinden Amphipoden des Kaspisees.»

been given of any of them. It is only some few points in their organisation (especially the more or less development of the visual organs), which have been treated of in detail, and this treatise is thus quite insufficient for recognizing any of the species named.

As, however, the collection of Dr. Grimm has kindly been placed in my hands for examination, and some of the specimens contained in it are labelled with the names given to them, I have been enabled to identify several of the forms collected by Mr. Warpachowsky in the northern part of the Caspian Sea with species detected at an earlier date by Dr. Grimm, and I have endeavoured in every possible case to retain for the species the names originally given to them by that distinguished naturalist, though in some cases it has been necessary to make a slight change with the names, partly because they have been preoccupied in Zoology, and partly because they have been less correctly formed. It may be noticed that some of the species named in his above-cited treatise (for instance *Gammarus Gregorkowii*, *G. coronifera*, *G. thaumops*) do not seem to be contained in the collection sent to me, and that some others are only represented by apparently quite immature specimens, which hardly suffice for recognizing the species. Moreover some of the specimens have been dried up at an earlier date by the evaporation of the spirit, and on this cause deformed, so as to be only with great difficulty examined. The greater part of the specimens are, however, still in a very good state of preservation, and will suffice for a full examination of the species.

The description of the new species contained in the collection of Dr. Grimm must be suspended for some time, as it has been destined, that the results of the investigations of that naturalist should be published in a separate work. It is therefore only the collection made by Mr. Warpachowsky in the northern part of the Caspian Sea, that will be the object of the present treatise. I have however been authorized by the Academy to refer to the collection of Dr. Grimm, as regards the horizontal and vertical distribution of the species here described.

The collection of Warpachowsky contains no less than 25 different species, and as some of these species are very nearly allied, and moreover the sexual differences often rather pronounced, it has appeared to me desirable, that each species should be described and figured in detail, and that also good and sufficiently large habitus-figures should be given of both sexes. On this cause it has been necessary to divide my treatise on that part of the Fauna into several articles, each accompanied by 8 plates. The present 1st article will give full descriptions and figures of 7 species belonging to 4 different Gammaroid genera, viz., *Boeckia*, *Gmelina*, *Amathillina* and

Gammarus. In the next article, to be shortly published, the remaining species of *Gammarus* will be described, and in a 3rd article some other Gammaroid genera will be treated off, as also the rather numerous species of *Corophium* occurring in the Caspian Sea.

The figures are, as in my two former papers reproduced by the autographic methode, and particular care has been applied in making them as correct and instructive as possible.

Fam. **GAMMARIDÆ.**

Gen. 1. **Boeckia,** Grimm (not Malm).

Generic characteristic. — Body very robust, with greatly incrusted integuments, and having the metasome and urosome poorly developed. Segments of mesosome produced laterally to extant spiniform processes, that of the 5th segment being particularly strong and mucroniform. Cephalon produced in front to a distinct rostrum, and having on each side a greatly prominent spiniform projection. Anterior pairs of coxal plates rather deep; 4th pair but little broader than the preceding pairs, and very slightly emarginated posteriorly. Eyes distinct, placed on the lateral faces of the cephalon. Superior antennæ longer than the inferior and having the accessory appendage obsolete. Oral parts normal. Gnathopoda comparatively small, subcheliform, and but little different; those in male somewhat stronger built than in female, with the propodos broader. Pereiopoda rather elongated and nearly equal in length, basal joint of last pair broader and more laminar than that of the 2 preceding pairs. Branchial lamellæ large, subpedunculated; incubatory lamellæ well developed. Uropoda very unequal in size, the last pair being rather small, not nearly reaching beyond the others and having the inner ramus extremely minute, scale-like, the outer linear and without any terminal joint. Telson very small, unarmed, and slightly cleft at the tip.

Remarks. — The name *Boeckia*, it is true, has been long ago appropriated in Zoology, having even been proposed at different times by 2 different authors, viz., by Malm for a genus of Amphipoda, and by Mr. Geo. Thomson for a fresh-water Copepod. But in both instances the name has been withdrawn, that of Malm being synonymous with *Leptocheirus* of Zaddach, and that of Thomson having been changed by Mrss. Guérin and Richard to *Boeckella*. It seems to me therefore that there cannot be any objection in using this name now in a new sense, and in every case I find it unreasonable that the name of such a diligent investigator as the late Dr. Boeck should not be justly associated with the order of Crustacea that

constituted his special study, merely because some authors erroneously applied his name for the establishment of spurious genera.

The systematic position of this remarkable genus would seem, at the first sight, to be somewhat doubtful. In the robust form of the body, the poor development of the metasome and urosome, as also in the comparatively short caudal appendages, it rather much reminds of the *Orchestiidae*. But the oral parts are constructed upon the very same type as in the true *Gammaridae*, and the branchial lamellæ exhibit the same characteristic pedunculated appearance as in this family. Moreover the superior antennæ are considerably longer than the inferior, differing, however, very markedly from those in the other Gammaridæ in the want of a true accessory appendage. Notwithstanding this and other divergences from the Gammaroid type, I am inclined to believe, that this genus ought more properly to be placed within the *Gammaridae*, though constituting a rather anomalous membre of the family.

Besides the species described below, Dr. Grimm has distinguished 2 other species of this genus under the names *B. nasuta* and *B. hystrix*. Both these species are, however, founded upon quite immature specimens, the first-named agreeing exactly with young specimens of *B. spinosa*, as figured Pl. II, fig. 10; and the other only differing in the dorsal prominences of the segments being somewhat stronger and elevated to acutely triangular projections. In my opinion both these supposed species ought to be withdrawn, the genus being at present only represented by a single species.

1. **Boeckia spinosa**, Grimm.

(Pl. I and II).

Specific Characteristic. — Body in female extremely stout and very tumid, in male somewhat more slender and less broad; back obtusely carinated throughout, with the segments slightly projecting dorsally; mesosome having on each side, at the junction of the coxal plates, a row of spiniform processes, those of 5th segment being very large and terminating in a sharp point, the others comparatively small and obtuse at the tip; segments of metasome each with a pair of subdorsal, upturned processes, which however in the 1st segment are rather small and tuberculiform; 1st segment of urosome overlapping dorsally the succeeding ones and terminating in a rather large, hooked, median projection, having besides, as the segments of metasome, a pair of upturned subdorsal processes. Cephalon slightly keeled dorsally, rostrum horizontally projected and triangularly pointed, lateral projections longer than the rostrum, and diverging to each side nearly at a right angle. Anterior pairs of coxal plates much deeper than the corres-

ponding segments, and having the distal edge densely setiferous; 1st pair somewhat narrower than the succeeding pairs and slightly curved; 4th pair not fully as deep as the preceeding pairs, and having the distal edge obliquely truncated; the 3 posterior pairs comparatively small and of normal appearance. Last pair of epimeral plates of metasome obtusangular. Eyes small, rounded, with dark pigment. Superior antennæ somewhat exceeding in length $^1/_3$ of the body, and rather densely setiferous, 1st joint of the peduncle comparatively large, flagellum nearly twice the length of the peduncle, and composed of numerous articulations; accessory appendage only represented by an extremely small nodule carrying 2 delicate bristles. Inferior antennæ but little more than half the length of the superior, and of normal structure. Gnathopoda in female rather feeble, subequal, propodos in both pairs about the length of the carpus and scarcely broader, palm well defined, being in the anterior ones more oblique than in the posterior; those in male somewhat stronger, with the propodos considerably expanded, forming below a rounded spiniferous lobe defining the deeply concaved palm, dactylus strong and curved. Pereiopoda rather slender, and having their outer part edged with numerous fascicles of bristles, basal joint of antepenultimate and penultimate pairs comparatively narrow and tapering distally, that of last pair considerably more expanded, with the greatest breadth below the middle. The 2 anterior pairs of uropoda having the rami subequal and falciform in shape; last pair much shorter than the former, with the outer ramus somewhat longer than the basal part, and provided with a few fascicles of small bristles. Telson extremely small, scarcely half as long as it is broad at the base, outer part narrowed and having in the middle a short cleft. Length of adult female 20 mm., of male 25 mm.

Remarks. — This remarkable Amphipod cannot be confounded with any other form, exhibiting, as it does, a most peculiar appearance by the extremely stout and compact body and its strange spinous armature. It may however be observed, that some of the species of *Allorchestes* (or *Hyallella*) found in the Titicaca Sea and described by Mr. W. Faxon, exhibit a somewhat analogous armament of the body. Especially is this the case with the species named *Allorchestes armata*. But here the lateral spines are not formed by the segments themselves, but by the greatly extant coxal plates, the most prominent lateral spines being represented by the 4th pair of coxal plates. It is evident that this peculiar armature of the body, occurring in a similar mode in so widely different forms, must have some significance for the animal. I believe that these laterally projecting acute spines may serve as a means of defence, whereby the animal, which apparently is far less active than the other Gammaridæ, becomes partly secured against the attack of

fishes and other enemies. This may also apply to the above mentioned species of *Allorchestes*, which do not seem to be very habile swimmers.

Description of the female.

(See Pl. I).

The length of the body in adult ovigerous specimens measures, when fully extended, about 20 mm., and this Amphipod attains thus a rather large size.

The form of the body (see figs. 1 and 2) is extremely stout and compact, more so than in any other known Gammarid, and all the integuments are very hard and highly incrusted. In alcoholic specimens the body is generally found to exhibit a strong curvature, the posterior part being folded in beneath the anterior, and the head curved downwards. In this state it looks like an irregular ball, from the centre of which projets on each side the large mucroniform spine of the 5th segment. When fully extended, the back remains still somewhat curved (see fig. 1), though the mutual longitudinal relation of the several body-divisions now may easily be determined. It is found that the mesosome occupies much the greater part of the body, the metasome and urosome being comparatively poorly developed and combined scarcely longer than the former division. All the segments of the body appear very sharply defined, and those of the mesosome are particularly broad and subfornicate in shape, being produced on each side, just above the junction of the coxal plates, to rounded prominences, each tipped by a laterally projecting spiniform process. The 4 anterior and 2 posterior pairs of those processes are comparatively short and obtuse at the tip, whereas those of the 5th pair are very large and prominent, mucroniform, and gradually tapering to a very acute point. Along the back both the mesosome and metasome exhibit a distinct, though somewhat obtuse keel, which in each segment is elevated to a rounded dorsal prominence, those of the segments of the metasome being somewhat more compressed and sublaminar. In each of the latter segments occur near the dorsal face a pair of upturned digitiform processes, which however on the 1st segment are generally very small and merely tuberculiform. The 1st segment of the urosome (see fig. 5) is comparatively large and of a somewhat trigonal form, being produced at the end dorsally to a rather prominent and somewhat hooked projection, fully overlapping the 2 succeeding very short segments, and even reaching somewhat beyond the tip of the last pair of uropoda. At the base of this projection occur a pair of subdorsal digitiform processes of a similar appearance to those found in the posterior segments of the metasome.

The cephalon about equals in length the first 2 segments of mesosome combined. It exhibits dorsally a low keel, and is produced in front to a somewhat flattened, horizontally projected rostrum of an acute triangular form, and reaching nearly to the end of the basal joint of the superior antennæ. The lateral faces of the cephalon are evenly convex in their upper part, but inferiorly they jut out on each side to a remarkable spiniform process extending laterally nearly at a right angle to the longitudinal axis. These processes are considerably longer than the rostrum and terminate each in a sharp point.

The 4 anterior pairs of coxal plates, extending nearly vertically downwards, are rather large, being almost twice as deep as the corresponding segments. They are all densely fringed on the distal edge with delicate bristles, and, when the body is curved in the manner usually found in alcoholic specimens, completely overlap each other with their anterior edges, so as to form together on each side a continuous wall, inside which the oral parts, the gnathopoda, and partly also the 2 anterior pairs of pereiopoda may be wholly concealed. When the body is fully extended (see fig. 1), these coxal plates become somewhat separated in their outer part, still forming in their upper part a continuous wall. The 1st pair of coxal plates (see fig. 15) are somewhat narrower than the succeeding ones and slightly curved, with the anterior edge concave, and the outer part somewhat expanded, forming in front a narrowly rounded lobe, which, when the animal curves itself, is received just beneath the lateral process of the cephalon. The 2 succeeding pairs of coxal plates (see fig. 16) are nearly of equal size and oblong quadrangular in form, with the anterior corner somewhat more projecting than the posterior. The 4th pair (see also Pl. II, fig. 4) are not fully as deep as the 2 preceding pairs and but little broader. They exhibit a rather different form, being obliquely truncated at the end, with the posterior edge slightly emarginated in its upper part, and projecting below the emargination as an obtuse angle.

The 3 posterior pairs of coxal plates are much smaller than the anterior, and successively decrease in size. The 5th pair are scarcely half as deep as the 4th, and, as usual, divided into 2 rounded lobes, the anterior of which is somewhat deeper than the posterior. The 2 last pairs are transversely quadrangular in form.

The epimeral plates of the metasome are not very large; those of the 2 anterior segments are rounded, those of the last segment obtus-angular.

In a dorsal view (fig. 2) the body appears very tumid and of a somewhat fusiform shape, the greatest breadth, which is fully as great as the height (including the coxal plates) and about equals $^1/_3$ of the length, oc-

curring about in the middle, whence the body gradually tapers both anteriorly and posteriorly. The lateral spines become, in this view of the animal, very conspicuous, projecting, as they do, from each side of the mesosome. The extent between the tips of the large mucroniform processes of the 5th segment considerably exceeds half the length of the whole body.

The eyes (see figs. 1 and 2) are placed on the lateral faces of the cephalon, at some distance from the anterior edge and somewhat nearer the dorsal than the ventral side. They are comparatively small and of rounded form, with very dark pigment.

The superior antennæ (fig. 3) somewhat exceed in length $^1/_3$ of the body and are rather slender, being densely supplied with delicate bristles on both edges. They are very flexible and generally so much recurved, as to be nearly completely hidden between the lateral processes of the head and the coxal plates. Of the 3 joints of the peduncle the 1st is much the largest, equalling in length the other 2 combined and being much thicker. The last 2 joints of the peduncle are nearly of equal length, but the last is somewhat narrower than the 2nd.

The flagellum is nearly twice as long as the peduncle, and composed of numerous short setiferous articulations, their number amounting to about 25 in all. The accessory appendage seems at the first sight to be entirely wanting. On a closer examination, however, an extremely small nodule is found in the place, where in other Gammaridæ this appendage occurs. This nodule is distinctly defined from the last peduncular joint, and carries on the tip 2 delicate bristles.

The inferior antennæ (fig. 4) are much shorter than the superior, but little exceeding half their length, and, as the latter, are râther densely setiferous and generally strongly recurved. In every case their basal part remains quite hidden by the lateral processes of the head, and can only be examined by dissection. They are on the whole quite normally constructed, exhibiting a comparatively large globular basal joint, followed by a very short joint, from which inside the olfactory spine issues. The 3rd joint is likewise rather short but comparatively thick, whereas the 2 remaining joints of the peduncle are much more elongated, the penultimate one being the larger. The flagellum is about same length as the last 2 peduncular joints combined, and composed of 9 articulations.

The buccal area is not very much prominent, and scarcely visible in a lateral view of the animal, it being almost completely hidden between the 1st pair of coxal plates. The several oral parts composing it, are on the whole of a quite normal structure, agreeing with that generally found in the typical Gammaridæ.

The anterior lip (fig. 8) is of a rounded form, and somewhat narrowed in its outer part, with the tip scarcely emarginated and finely ciliated at the edge.

The posterior lip (fig. 9) is comparatively large and of the usual submembranaceous consistence. The lateral lobes are rather broad and, as usual, ciliated at the tip and the inner edge, whereas they outside project as an obtusely conical lappet. There is only a very slight rudiment of inner lobes.

The mandibles (figs. 10 and 11) are strongly built, with the molar expansion well developed and the cutting edge divided, as usual, into 2 superposed, dentated plates, somewhat differently shaped in the 2 mandibles. Between the cutting edge and the molar expansion occurs the usual series of curved, finely ciliated spines. The mandibular palp (see fig. 10) is of moderate size, being scarcely longer than the mandible itself. Its terminal joint is about as long as the 2nd, somewhat compressed, and gradually tapering distally. It carries on the inner edge a dense series of comparatively short, ciliated spinules, and has besides on the tip and the outer edge several slender bristles.

The 1st pair of maxillæ (fig. 12) exhibit the normal structure. The masticatory lobe is moderately strong, and armed on the truncated tip with a rather great number of partly denticulated spines arranged in a double row. The basal lobe is oval in form, and carries along the inner edge a row of about 10 ciliated setæ. The palp is, as in most other Gammaridæ, somewhat differently developed in the 2 maxillæ, its terminal joint being on the right maxilla very much expanded and having the distal edge divided into a number of coarse denticles, whereas on the left maxilla this joint is much narrower and provided at the tip with a few slender spines.

The 2nd pair of maxillæ (fig. 13) have the outer lobe a little larger than the inner, both being oblong oval in form and carrying at the tip a number of delicate, curved bristles. The inner lobe, moreover, is provided with about 6 ciliated setæ arranged in a somewhat oblique series on its lower face.

The maxillipeds (fig. 14) are, as usual, quite fused together at the base, springing off from a common basal part composed of 2 somewhat flattened segments. The basal lobes, springing off from the 2nd segment of the basal part and lying in close juxtaposition, are of moderate size and subquadrangular in shape. They carry at the tip a number of delicate curved bristles, between which there occur a few short denticles, and have the inner edge fringed with a series of ciliated setæ. The masticatory lobes are somewhat larger than the basal ones, and are armed along their inner edge

with a series of flattened spines increasing in size towards the tip, where they successively become transformed to strong curved setæ. The palp is well developed, subpediform, and composed of the usual 3 joints, the outer 2 of which form together a more or less pronounced geniculate bend. The last joint is somewhat expanded in its outer part, which is densely setous, and carries at the tip a claw-like movable spine (the dactylus).

The gnathopoda (figs. 15 and 16) are comparatively small and most frequently so closely applied against the buccal area, as to be quite hidden between the 2 anterior pairs of coxal plates, to the inner face of which they are articulated. They are nearly alike both in size and structure, both pairs being densely setous and exhibiting a more or less pronounced sigmoid curve. The basal joint is somewhat more elongated in the posterior ones (fig. 16) than in the anterior, whereas the 3 succeeding joints are exactly alike in both pairs, the carpus being about the length of the 2 preceding joints combined and forming below a slight setous expansion. The propodos is about as long as the carpus and scarcely broader, exhibiting in both pairs a distinct subcheliform structure. Its shape is a little different in the 2 pairs, the palm being in the anterior ones (fig. 15) somewhat oblique, whereas in the posterior ones (fig. 16) it is nearly transverse. The dactylus is not very strong and of the length of the palm.

The pereiopoda (see fig. 1, comp. also Pl. II, figs. 4—7) are rather much elongated and but little different in length, all being fringed on both edges with numerous fascicles of short bristles, and having the dactylus rather slender. The 2 anterior pairs are, as usual, generally turned anteriorly, whereas the 3 posterior pairs are more or less strongly reflexed; in the former the basal joint is comparatively narrow, in the latter more lamellar in character. Of the several joints composing these limbs, the basal one is in all much the largest and the ischial joint the shortest, the 3 succeeding ones being nearly of equal length. The antepenultimate and penultimate pairs are somewhat longer than the others, and have the basal joint but little expanded and gradually tapering distally. The last pair (comp. Pl. II, fig. 7) are a little shorter than the 2 preceding pairs, and differ considerably in the form of the basal joint, which is much broader and considerably expanded in its distal part, the posterior edge being strongly curved below the middle and fringed throughout with short bristles.

The branchial lamellæ, present at the base of all the legs, except the anterior gnathopoda, are well developed, though, as usual, considerably diminishing in size posteriorly. The anterior pairs (see Pl. I, fig. 16) are rather large and broad, subtriangular in form, and attached by a short but

well-marked peduncle inside the coxal plates, at some distance from the insertion of the basal joint of the corresponding leg. Close to them, and somewhat more inside issue the incubatory lamellæ, forming together the marsupial pouch. They are likewise rather large and fringed with long setæ.

The 3 pairs of pleopoda exhibit quite a normal appearance.

The uropoda are very unequal in size (see Pl. I, fig. 5), the 1st pair being much the largest and, as the succeeding pair (comp. Pl. II, fig. 8), having the rami subequal and somewhat falciform in shape, both gradually tapering distally, with a single small apical denticle and another about in the middle of the upper edge. The last pair (Pl. I, fig. 7) are extremely small, not at all reaching beyond the others, and are also rather different in structure. They consist each of a short and thick basal part, to the end of which are attached 2 very unequal rami. The outer one is a little longer than the basal part and of a narrow linear form, with 3 fascicles of small bristles along one of the edges and a similar one at the tip. The inner ramus is very minute and scale-like, with a single small spine at the tip.

The telson (fig. 6) is extremely small, and not easy to examine in the uninjured animal, it being completely overlapped by the hooked dorsal projection of the 1st segment of the urosome. When isolated by dissection, it shows itself to be of a broadly triangular form, with the length not nearly attaining half the breadth, and the tip cleft by a short and narrow incision. On the dorsal side of each of the narrowly rounded terminal lobes occurs a very small spinule; otherwise the telson is quite unarmed.

The adult male (see Pl. II) attains a still larger size than the female, the length of the body, when fully extended, amounting to no less than 25 mm. In general appearance it does not differ much from the female, except by the body being considerably less tumid. In a dorsal view of the animal (Pl. II, fig. 1) the sex may therefore at once be determined. Of the several appendages it is chiefly the gnathopoda, which distinguish themselves by a much stronger build than in the female (see figs. 2 and 3). Especially appears the propodos in both pairs much larger and considerably expanded, forming below a broadly rounded lobe defining the palm inferiorly and armed with a number of strong anteriorly curving spines. The palm is deeply concave, and the strongly curved dactylus impinges, when closed, with the tip somewhat inside the inferior expansion of the propodos. The pereiopoda are on the whole of the same structure as in the female, though being perhaps a little more elongated and having the basal joint of last pair somewhat less expanded. Finally, the outer ramus of the last pair of uropoda (fig. 9) appears a little longer and is provided on the inner edge with several slender bristles not found in the female. Of course no incuba-

tory lamellæ are present in male specimens; but the branchial lamellæ (see figs. 3 and 5) exhibit the very same appearance as in the female.

Very young specimens (fig. 10), of a length of about 6 mm., differ from the adult in all the processes of the body (also those of the cephalon and of the 5th segment of mesosome) being digitiform in shape, terminating with an obtuse point, and moreover in the dorsal prominences of the segments being more strongly elevated, giving the back a serrated appearance. In all these particulars they exactly agree with the form named by Dr. Grimm *B. nasuta.*

Colour. — In none of the specimens examined any trace of pigmentary ornament could be detected, all exhibiting a uniform whitish colour. In the living state, however, the animal may most probably have shown some characteristic colouring.

Occurrence. — This remarkable form was met with by Mr. Warpachowsky in 4 different Stations of the North Caspian Sea, one of which (St. 7) was located at the mouth of the Bai Agrachansky, 2 others (St. 58, 59) between the Tschistyi-Bank and the mouth of the Wolga, and the 4th (St. 61) far North, at some distance outside the Bai Bogutyi Kultuk. In one of the Stations (58) several specimens, both males and females, were secured; in the other 3 Stations only solitary specimens occurred.

In the collection of Dr. Grimm 2 adult male specimens of this form are contained, found in 2 different Stations, the one located off the promontory Schachowa Kosa, the other at some distance South of the peninsula Mangyschlak, the depth being in the former 7 fms., in the latter 90—100 fms. Besides 2 immature specimens (= *B. nasuta* Gr.) were collected in the last-named Station, and another, likewise immature specimen (= *B. hystrix* Gr.) was procured in the southern part of the Caspian Sea, from the very considerable depth of 150 fms.

Out of the Caspian Sea this form has not yet been recorded.

Gen. 2. **Gmelina,** Grimm, MS.

Generic Characteristic. — Body slender and compressed, with rather strongly incrusted integuments, and having the segments sharply defined, partly also produced to conspicuous projections. Metasome and urosome well developed. Cephalon but slightly projecting in front, lateral lobes comparatively small, postantennal corners well defined and rather deep. Anterior pairs of coxal plates of moderate size and larger in the female than in male; 4th pair not very much expanded, and but slightly emarginated posteriorly in their upper part. Eyes well developed and more or less protuberant, being placed near the anterior edges of the cephalon. Antennæ not very

much elongated, and nearly equal in length, the superior ones with a very small, uniarticulate accessory appendage. Oral parts normal. Gnathopoda in female rather feeble, though distinctly subcheliform, in male much more strongly developed and subequal, propodos very large and gradually widening distally. Pereiopoda not very much elongated, the 3 posterior pairs successively increasing in length; last pair having the basal joint somewhat larger and more lamellar than in the 2 preceding pairs. Last pair of uropoda more or less projecting beyond the others, and having the outer ramus well developed and more or less pronouncedly foliaceous in structure, inner ramus small, squamiform. Telson deeply cleft.

Remarks. — The present genus is very nearly allied to the genus *Pallasiella* G. O. Sars (*Pallasia* Sp. Bate), and indeed at first, before the collection of Dr. Grimm was come in my hands, I referred the 2 species described below to that genus. There is, however, perhaps some raison for supporting the new genus proposed by Dr. Grimm, since the said species exhibit some apparently essential points of difference from the type of the genus *Pallasiella*, for instance the much feebler structure of the gnathopoda, and the fact, that the telson is deeply cleft, not as in the latter genus only emarginated at the tip.

Besides the form upon which Dr. Grimm founded his genus, another very distinct species is contained in the collection of Mr. Warpachowsky, and this species has recently also been recorded from the Azow Sea by Mr. Sowinsky.

2. **Gmelina costata**, Grimm, MS.

(Pl. III).

Specific Characteristic. — Body extremely slender and compressed, especially in the male, with the lateral parts of the segments of mesosome somewhat exstant; back keeled throughout, the keel being elevated in the posterior segments of mesosome and those of metasome to conspicuous dorsal projections. Urosome unusually elongated, and having each of the 2 anterior segments produced dorsally to a small dentiform projection. Cephalon with the lateral faces quite smooth, rostral projection well-marked, lateral lobes but very little projecting and broadly truncated at the tip. Anterior pairs of coxal plates in female much deeper than the corresponding segments, in male considerably smaller; 4th pair but little broader than the preceding pair. Second pair of epimeral plates of metasome rather deep and acutely produced, last pair somewhat smaller and less produced at the lateral corners. Eyes of moderate size and but slightly protuberant, oval reniform, with dark pigment. Superior antennæ a little longer than the inferior, but scarcely

exceeding in length $^1/_3$ of the body, joints of the peduncle successively decreasing in size, flagellum but little longer than the peduncle, accessory appendage not attaining the length of the 1st articulation of the flagellum. Gnathopoda in female somewhat unequal, the posterior ones being a little more slender, and having the propodos narrower; those in male much larger, with the propodos oblong oval in form, palm concave and defined below by a nearly rectangular projection armed with 2 strong spines, dactylus very strong and curved. The 3 posterior pairs of pereiopoda comparatively short and stout, and having their outer part edged with scattered fascicles of spines and delicate bristles, basal joint of the 2 anterior pairs rather small and tapering distally, that of last pair oblong quadrangular in shape. Last pair of uropoda rather fully developed and projecting far beyond the others, outer ramus very large, pronouncedly foliaceous and edged with slender spines and delicate bristles, tip blunt, with a very small terminal joint. Telson rather large, projecting beyond the basal part of the last pair of uropoda, cleft extending nearly to the base, terminal lobes obtusely pointed, and carrying each a single apical spine and a few delicate bristles. Length of adult female 12 mm., of male 16 mm.

Remarks. — The present form is at once recognized by its extremely slender and narrow body, on which cause I at first noted it under the provisional name *Palasiella macera.* The pronounced foliaceous character of the outer ramus of the last pair of uropoda may also serve for distinguishing this form from most of the other Caspian Amphipoda. It is the form upon which Dr. Grimm founded his genus *Gmelina.*

Description of the female.

Fully adult, ovigerous specimens attain a length of about 12 mm.

The general form of the body (see fig. 1) is very slender and highly compressed, the metasome and urosome being both well developed and combined about the length of the mesosome. The integuments are highly incrusted, exhibiting in some places, for instance in the anterior part of the coxal plates (see fig. 11) conspicuous rounded indurations. All the segments are very sharply marked off from each other, whereby the outer contours of the body acquire, both in the lateral and dorsal view of the animal, a somewhat rugged appearance. The segments of the mesosome have their lateral parts slightly prominent at the junction of the coxal plates, forming together an obtuse keel extending along each side of that division of the body. Another keel runs along the back, being anteriorly rather low, but gradually becoming more distinct backwards, and being at the same time successively elevated in the segments to more or less conspicuous dorsal

projections. It is not easy to indicate with exactness where those projections take their begin, as they are only little by little growing out from the segments, but in the antepenultimate segment of the mesosome there is generally found a distinct approach to such a projection, and in the last segment, as also in those of the metasome, they are very conspicuous, being obtusely triangular in form and distinctly laminar. The urosome is unusually prolonged, nearly equalling in length the metasome, and has the 1st segment slightly keeled dorsally in its posterior part and produced at the end to a short acute projection; a similar, but much smaller, dorsal projection may also be observed in the succeeding segment, whereas the last segment is quite smooth above.

The cephalon (fig. 2) about equals in length the first 2 segments of mesosome combined, and is produced in front to a distinct, though not very large rostral projection. The lateral lobes are very slightly projecting and broadly truncated at the tip, being defined from the rather deep and acutangular postantennal corners by a slight emargination. The lateral faces of the cephalon are quite smooth, without any trace of a projection.

The 4 anterior pairs of coxal plates (see fig. 1) are rather large, being considerably deeper than the corresponding segments, and of an oblong quadrangular form, with only a few scattered hairs on the distal edge. The 1st pair (see fig. 11) are somewhat smaller than the succeeding ones, and very slightly expanded in their outer part. The 4th pair are but little broader than the preceeding pair, and exhibit posteriorly in their upper part a very slight emargination defined below by an obtuse angle.

The 3 posterior pairs of coxal plates are, as usual, much smaller than the anterior, and successively diminish in size. The 5th pair are but little broader than they are deeep, and have the anterior lobe somewhat more projecting than the posterior.

Of the epimeral plates of the metasome, the 1st pair are, as usual, the smallest and evenly rounded. The 2nd pair are considerably deeper and acutangular at the lateral corners; the last pair are of a more rounded form, though produced at the lateral corners to a short acute point.

The eyes (see fig. 2) are of moderate size and oval reniform in shape. They are but slightly protuberant and placed near the anterior edges of the cephalon. The pigment is dark.

The superior antennæ (see fig. 1) scarcely exceed in length $^1/_3$ of the body, and are but sparingly supplied with small bristles. Of the joints of the peduncle the 1st is much the largest, being nearly as long as the other 2 combined. The last peduncular joint is considerably smaller than the 2nd. The flagellum is but little longer than the peduncle and composed of about

16 short articulations. The accessory appendage (see fig. 3) is distinctly defined, but rather small. and only composed of a single articulation carrying at the tip 3 slender bristles.

The inferior antennæ are a little shorter than the superior and, as the latter, but sparingly setiferous. Of the joints of the peduncle the penultimate one is the largest. The flagellum is about half the length of the peduncle and composed of 6 articulations.

The buccal area is somewhat projecting, though partly concealed by the 1st pair of coxal plates. The several oral parts composing it are on the whole quite normally constructed.

The anterior lip (fig. 4) exhibits the usual rounded form, and has in front an obtuse prominence.

The posterior lip (fig. 5) does not exhibit any trace of inner lobes. The lateral lobes are narrowly rounded in front, and project outside as an obtusely conical lappet.

The mandibles (figs. 6 and 7) are short and stout, and exhibit the usual armature of their masticatory part. The palp (see fig. 7) is rather slender, being considerably longer than the mandible itself, and has the last joint shorter than the 2nd.

The 1st pair of maxillæ (fig. 8) are comparatively large, with the masticatory lobe rather strongly developed and armed at the tip with coarse, denticulated spines. The basal lobe is subtriangular in form, and carries on the inner edge a row of about 8 setæ. The palp has the terminal joint on the left maxilla rather narrow, on the right, as usual, somewhat more expanded.

The 2nd pair of maxillæ (fig. 9) have the outer lobe considerably broader than the inner, exhibiting otherwise the usual structure.

The maxillipeds (fig. 10) in nearly all their details agree so closely with those in the preceding genus, that a detailled description of them is not needed.

The gnathopoda (figs. 11 and 12) are comparatively small and feeble in structure, though distinctly subcheliform and rather densely setous. They are a little unequal, the posterior ones being somewhat more slender than the anterior, and having the carpus larger. The propodos of the anterior pair (fig. 11) is oblong quadrangular in form and somewhat longer than the carpus, with the palm rather oblique; in the posterior pair (fig. 12) it equals in length the carpus and is somewhat narrower, with the palm nearly transverse.

The pereiopoda (see fig. 1) are comparatively short and stout, and rather unequal in length. The 2 anterior pairs are of same structure, though somewhat differing in length, the 1st pair being the longer.

The 3 posterior pairs successively increase in length, and have their outer part fringed with scattered fascicles of spines and delicate bristles, the dactylus being rather stout and curved, with a small denticle somewhat inside the tip. The antepenultimate pair are much shorter than any of the other pairs and, as the succeeding pair, have the basal joint comparatively small and narrowed distally. The last pair (fig. 13) differ from the preceding pairs in the much larger size of the basal joint, which is oblong quadrangular in form, with the posterior edge nearly straight and edged with scattered short hairs.

The uropoda are very unequal in size, the penultimate pair (fig. 14) being rather small, with the rami narrow linear and spinous only at the tip.

The last pair of uropoda (fig. 15) are of considerable size, projecting far beyond the others and nearly equalling in length the urosome. The basal part is short and thick, and the rami very unequal, the inner one being extremely small and scale-like, whereas the outer is very large and pronouncedly foliaceous in structure. It is nearly of equal breadth throughout and terminates with a blunted tip carrying an extremely minute terminal joint. The edges of the ramus are densely fringed with comparatively short, partly ciliated setæ, and are besides armed with fascicles of slender spines.

The telson (fig. 16) is comparatively rather fully developed, being considerably longer than it is broad at the base, and projecting beyond the basal part of the last pair of uropoda. It is divided by a deep cleft into two obtusely pointed lobes, which are finely ciliated on the outer edge and carrie each at the tip a single short spinule and a few delicate bristles.

The adult male (figs. 17, 18) grows to a considerably larger size than the female, reaching, when fully extended, a length of 16 mm. (excluding the last pair of uropoda).

The form of the body appears still more slender than in the female, and is also more compressed. In a dorsal view of the animal (fig. 18) the body therefore exhibits an extremely narrow, almost linear form. The sexual differences otherwise refer chiefly to the antennæ, the gnathopoda and the last pair of uropoda.

The antennæ (see fig. 17) appear somewhat more elongated than in the female, and also less unequal, the inferior ones being about same length as the superior. In both pairs, moreover, the flagella are composed of a greater number of articulations.

The gnathopoda (figs. 19 and 20) are very different from those in the female, being much more strongly built and nearly equal both in size and structure. In both pairs the propodos is very large, oblong oval, or rather somewhat clavate in form, gradually widening somewhat distally, with the

palm distinctly concave, and defined below by a nearly rectangular projecting lobe armed with 2 strong spines, between which the strongly curved dactylus impinges, when closed.

The last pair of uropoda (fig. 22) are still larger than in the female, exceeding even considerably the whole urosome in length. This is chiefly caused by the fuller development of the outer ramus, the structure of which otherwise agrees with that in the female.

Colour. — All the specimens examined exhibited a uniform greyish white colour, without any conspicuous pigmentary marks; but this may most probably not have been the case in the living state of the animal.

Occurrence. — This form has been collected by Mr. Warpachowsky in 4 different Stations of the North Caspian Sea. Two of these (St. 16 anp 52) were located off the island Podgornoj, another (St. 49) between the islands Kulaly and Morskay, the 4th (St. 58) at some distance north of the Tschistyi-Bank. In the latter Station only a single specimen was secured, in each of the others several specimens occurred.

Dr. Grimm collected the species at Baku, from the shores down to 6 fathoms, and moreover at the west coast of Sara among Zostera, and at Krasnowodsk in a depth of 20 fms.

Out of the Caspian Sea this species has not yet been recorded.

3. **Gmelina Kusnezowi** (Sowinsky).

(Pl. IV).

Gammarus Kusnezowi, Sowinsky, Les Crustacés de la mer d'Azow, p. 95, Pl. VIII.

Specific Characteristic. — Body rather slender and compressed, especially in the male, the back being, however, not carinated, but having a double series of tuberculiform projections, successively increasing in size, and assuming on the posterior segments of mesosome and those of metasome a mammilliform shape. Segments of mesosome (except the last 2) produced on each side, just above the junction of the coxal plates to very conspicuous, lateraly projecting rounded prominences. Segments of urosome smooth above, the last 2 having on each side dorsally 2 small spinules. Cephalon considerably attenuated in front and having on each side a conspicuous, umboniform prominence, rostral projection extremely small, lateral lobes narrowly rounded in front. Anterior pairs of coxal plates rather deep and of a similar shape to those in the preceding species; 5th pair somewhat oblique and much deeper anteriorly than posteriorly. The last 2 pairs of epimeral plates of metasome nearly rectangular. Eyes oval reniform and highly protuberant, being placed

close to the anterior extremity of the cephalon. Antennæ nearly equal-sized and rather short, scarcely exceeding in female ¼ of the length of the body. Gnathopoda nearly as in the preceding species, and exhibiting a similar difference in the two sexes. Pereiopoda likewise of a structure very similar to that in the said species, though being perhaps a little more slender. Last pair of uropoda not nearly so much elongated as in *G. costata*, the outer ramus being far less fully developed and also less pronouncedly foliaceous in character. Telson rather short, cleft narrow and extending nearly to the base, terminal lobes obtusely rounded and armed with several spines both at the tip and the outer edge. Length of adult female 14 mm., of male 18 mm.

Remarks. — There cannot be any doubt that the above-characterised form is that recently described by Mr. Sowinsky from the Asow Sea as *Gammarus Kusnezowi*. It is, however, certainly not a true *Gammarus*, but ought, in spite of the rather different armature of the body and the less fully developed last pair of uropoda, to be referred to the same genus as the preceding species, with which it agrees very closely in nearly all anatomical details. It is a very easily recognizable form, being highly distinguished by the peculiar subdorsal, mammilliform projections, on which cause I at first noted it under the provisional name of *Pallasiella mammillifera*.

Description of the female.

Adult ovigerous specimens attain, when fully extended, a length of about 14 mm.

The form of the body (see fig. 1) is rather slender and compressed, though perhaps not to such a degree as in the preceding species. As in the latter, all the integuments are highly incrusted, and the segments sharply marked off from each other.

The mutual longitudinal relation of the several body-divisions is about as in that species, except that the urosome is somewhat shorter. The body is generally more or less strongly curved, and has the back rounded off, not, as in the preceding species, carinated. On the other hand, there occurs along the back a double series of subdorsal prominences (one pair in each segment), which anteriorly are very low and tuberculiform, but farther back, on the last 2 segments of mesosome and those of metasome, assume a distinctly mammilliform shape, and, when the animal is viewed laterally, considerably project beyond the dorsale line. The lateral parts of the 5 anterior segments of the mesosome are, moreover, just above the junction of the coxal plates, produced to very conspicuous laterally projecting, tuberculiform prominences, best seen in a dorsal view of the animal (comp. fig. 13). The segments of the urosome are smooth above, without any projections, but, as in most

species of the genus *Gammarus*, there occurs in the 2 posterior ones, on each side of the dorsal face, a fascicle of small spinules, their number being generally 2 in each fascicle.

The cephalon is somewhat shorter than the first 2 segments of the mesosome combined, and exhibits a rather irregular form. As seen laterally (fig. 2) it rapidly tapers anteriorly, being narrowly truncated at the tip, with the rostral projection extremely small and the lateral lobes narrowly rounded in front. The inferior edges of the cephalon between the latter and the postantennal corners are nearly straight and obliquely descending, and just above them issues from the lateral faces on each side a rather large umboniform prominence, best seen in the dorsal view of the animal (comp. fig. 13).

The coxal plates nearly agree in their shape with those in the preceding species, the 4 anterior pairs being rather large and considerably deeper than the corresponding segments. The 5th pair (see fig. 7) are somewhat oblique and much deeper in their anterior than posterior part.

The epimeral plates of the metasome are well developed, the 1st pair being, as usual, rounded, whereas the 2 succeeding pairs are nearly rectangular, with the lateral corners but slightly produced.

The eyes (see fig. 2), which are placed close to the extremity of the cephalon, are of oval reniform shape and remarkable by being so highly protuberant as nearly to exhibit a stalked appearance (comp. fig. 13). They have the visual elements well developed and the pigment of a very dark hue.

The superior antennæ (see fig. 1) are comparatively short, scarcely exceeding in length $^1/_4$ of the body, and are, as in the preceding species, but sparingly setiferous. The 1st joint of the peduncle is but little longer than the 2nd, and the 3rd only half the length of the latter. The flagellum does not attain the length of the peduncle, and is composed of about 15 short articulations. The accessory appendage (see fig. 3) is very small and exactly of same appearance as in the preceding species.

The inferior antennæ are about same length as the superior, and have the penultimate joint of the peduncle the largest. The flagellum is scarcely half as long as the peduncle and composed of 6 articulations.

The gnathopoda (figs. 4 and 5) exhibit a structure very similar to that in the preceding species, the posterior ones (fig. 5) being a little more elongated than the anterior and having the carpus somewhat larger. The propodos is in both pairs oblong oval in form, and but little broader than the carpus, with the palm somewhat oblique, though not nearly as long as the hind margin.

The 2 anterior pairs of pereiopoda (fig. 6) do not differ in any way from those in the preceding species, and also the posterior pairs (figs. 7 and 8)

exhibit much the same structure, though being perhaps a little more slender and less coarsely spinous in their outer part. The basal joint of the last pair (fig. 8), as in *G. costata*, is considerably larger than that of the 2 preceding pairs, and exhibit a similar oblong quadrangular form.

The 2 anterior pairs of uropoda (fig. 9) are likewise of much the same structure as in that species.

The last pair of uropoda (fig. 10), on the other hand, do not nearly attain such a large size as in *G. costata*, though they somewhat project beyond the others. The rami are, as in that species, very unequal, the inner one being very small and scale-like, whereas the outer ramus is well developed and about twice as long as the basal part. This ramus does not, however, exhibit such a pronouncedly foliaceous character as in *G. costata*, being gradually narrowed distally and having the edges fringed with only a restricted number of slender spines and short bristles; at the tip occurs a distinct, though rather small terminal joint carrying several delicate bristles.

The telson (fig. 11) is comparatively small, not extending beyond the basal part of the last pair of uropoda. It is considerably broader than it is long, and divided by a narrow cleft into two obtusely rounded lobes, each armed with several spines (5—6 in number), 2 of which issue from the outer edge, the others close together from the tip.

The adult male (figs. 12 and 13) is considerably larger than the female, attaining a length of 18 mm.

The form of the body is about as in the female, though, as usual, somewhat more compressed, on which cause the body exhibits, in a dorsal view of the animal (fig. 13) a very narrow, nearly linear form.

The antennæ (see fig. 12) appear somewhat more elongated, though not nearly attaining $^1/_3$ of the length of the body, and have a somewhat greater number of articulations in the flagella.

The gnathopoda (figs. 14, 15) are very strongly developed, and exhibit a structure closely agreeing with that in the preceding species, the propodos being in both pairs very large and of an oblong clavate form.

The last pair of uropoda (fig. 16) appear a little larger than in the female, with the outer ramus somewhat more elongated, but otherwise exhibit the very same structure.

This is also the case with the telson (fig. 17).

Colour. — In some of the specimens received short time after having been captured, there was still trace of a darkish pigment arranged in bands across the segments, similar to what occurs in the nearly allied Norwegian fresh-water Amphipod, *Pallasiella quadrispinosa*. Most of the specimens, however, exhibited a uniform greyish colour.

Occurrence. — This species also was collected by Mr. Warpachowsky in 4 different Stations. Three of these (St. 50, 58, 59) are located in the western part of the North Caspian Sea, whereas the 4th (St. 61) lies far north, at some distance outside the Bai Bogutyi Kultuk.

In the collection of Dr. Grimm this form is not represented.

Distribution. — The Azow Sea (Sowinsky).

Gen. 3. **Amathillina** [1]), Grimm.

Generic Characteristic. — Body comparatively robust, with the back to a more or less extent distinctly keeled, the keel being in all, or in some only of the segments elevated to compressed, posteriorly pointing projections. Urosome short and stout, without dorsal projections, but with fascicles of subdorsal spinules, as in the genus *Gammarus*. Integuments not very much incrusted. Cephalon with a small rostral projection, lateral lobes short and obtuse, postantennal corners well marked, lateral faces smooth. Anterior pairs of coxal plates of moderate size, 4th pair the largest and distinctly emarginated posteriorly in their upper part. Eyes well developed. Superior antennæ slender and much longer than the inferior, with a well-developed accessory appendage. Oral parts normal. Gnathopoda in female rather feeble, though distinctly subcheliform; those in male very strongly built and nearly equal, exhibiting a structure similar to that in the male of the genus *Gmelina*. Pereiopoda of moderate length and edged in their outer part with fascicles of stiff bristles, dactylus in all strong and curved; last pair somewhat shorter than the penultimate one, and having the basal joint rather large and laminarly expanded. Last pair of uropoda comparatively small, scarcely reaching beyond the others, outer ramus sublinear, with scattered fascicles of spines, and having a distinct, narrow terminal joint, inner ramus small, squamiform. Telson short and broad, cleft to the base.

Remarks. — In the comparatively robust body, the back of which is to a more or less extent distinctly keeled and provided with lamellar dorsal projections, this genus somewhat reminds of the genus *Amathilla*. It differs, however, rather materially in the structure of the several appendages, and in this respect comes much nearer to the genus *Gammarus*, being chiefly distinguished from that genus by the poor development of the last pair of uropoda.

1) Dr. Grimm spells the name *Amathillinella*, but this term cannot properly be accepted since it is a diminutive of *Amathillina*, a generic name which does not as yet exist. Probably Dr. Grimm had in view to form a diminutive of *Amathilla*, but this would correctly have been *Amathillella*, a name which would be inconvenient by its cacophony. Moreover *Amathilla* is itself a diminutive of *Amathia*, and to form a diminutive of a diminutive, would in every case seem to be objectionable.

In the collection of Mr. Warpachowsky 2 distinct, though nearly allied species are represented, one of which was named by Dr. Grimm, whereas the other is new to science. Besides Dr. Grimm has distinguished 2 other species as *A. intermedia* and *A. macrophthalma;* but I am at present unable to see any essential differences between the specimens so named and normal specimens of *A. cristata.* On the other hand, a very beautiful form, which has been collected by Dr. Grimm in great profusion from rather considerable depths in the middle and southern part of the Caspian Sea, and which was labelled *A. cristata*, var. *spinata*, would more likely seem to represent a distinct species.

4. **Amathillina cristata,** Grimm.

(Pl. V, Pl. VI, figs. 1—8).

Specific Characteristic. — Body rather stout and not very much compressed, with the back distinctly keeled throughout, the keel being, however, in its anterior part rather low, and scarcely elevated to any distinct projections in front of the 4th segment of mesosome, the succeeding projections successively increasing somewhat in size and being rather broad, triangular, that of last segment of metasome, however, differing from the others in being evenly rounded, not angulary produced. Cephalon with the rostral projection short and blunt, lateral lobes obtusely truncated. Anterior pairs of coxal plates somewhat deeper than the corresponding segments, 1st pair but slightly expanded distally, though considerably broader than the 2nd; 4th pair with the posterior expansion transversely truncated and forming below the emargination a nearly right angle. The last 2 pairs of epimeral plates of metasome but very slightly produced at the lateral corners. Eyes not very large, narrow reniform, with dark pigment. Superior antennæ nearly equalling half the length of the body, joints of the peduncle successively diminishing in size, flagellum half as long again as the peduncle, accessory appendage about the length of the last peduncular joint and 5-articulate. Inferior antennæ in female scarcely more than half as long as the superior. Gnathopoda in female comparatively small and about same length, propodos in the posterior ones considerably narrower than in the anterior, palm in both pairs somewhat oblique; those in male much stronger, with the propodos very large and somewhat claviform in shape, palm concave and defined below by an angular projecting lobe armed with 2 strong spines. Basal joint of antepenultimate and penultimate pairs of pereiopoda of nearly same form, though somewhat differing in size, posterior edge in both pairs but slightly curved; that of last pair considerably broader in female than in male, posterior expansion forming below a rounded lobe reaching beyond the ischial joint.

The 2 anterior pairs of uropoda strongly spinous; last pair with the outer ramus somewhat longer than the basal part, its proximal joint having on either side a single fascicle of spines. Telson nearly semicircular in outline, cleft very narrow, each half armed with a lateral and an apical spine, the latter accompanied by a number of delicate bristles. Length of adult female 13 mm., of male 15 mm.

Remarks. — The present species, established by Dr. Grimm, may be regarded as the type of the genus *Amathillina*. It is chiefly distinguished by the number of the dorsal projections, and particularly by the peculiar, gibbous form of the last one, moreover by the shape of the basal joint of the last 2 pairs of pereiopoda.

Description of the female.

(Pl. V).

The length of fully adult ovigerous specimens amounts to about 13 mm.

The body (see figs. 1 and 2) is on the whole of a rather stout and compact form, being generally strongly curved. Its integuments are, however, not nearly so strongly incrusted as in the species of the 2 preceding genera, and do not exhibit any conspicuous sculpturing. In a dorsal view of the animal (fig. 2), the body appears much less compressed than in the species of the genus *Gmelina*, exhibiting a somewhat subfusiform shape, the greatest breadth (across the 4th segment of mesosome) equalling about $^1/_5$ of the length. The back is keeled throughout the whole mesosome and metasome; but the keel is in the anterior part rather low, becoming gradually more conspicuous posteriorly, where it is elevated in each segment to a lamellar, posteriorly pointing projection. The exact number of these dorsal projections is not easy to indicate, as they only little by little grow out from the segments. But in the 2 anterior segments of the mesosome there is never found any trace of such projections, and in the 3rd segment only in some specimens a slight attempt to a projection is observed. Not rarely even the dorsal projections are not at all distinctly formed in front of the 5th segment, that of the latter segment being in such cases rather small. In the last 2 segments of mesosome and those of metasome they, however, always appear well formed. The projection of the last segment of the metasome in all specimens distinguishes itself very markedly by its peculiar form, it being not, as in the preceding segments, triangular, but broadly rounded at the tip, giving that segment, in a lateral view of the animal, a somewhat gibbous appearance. The urosome is comparatively short and massive, without any dorsal keel or projections, but each of the segments carries dorsally a few simple

hairs, and the 2 posterior ones have besides, on either side of the dorsal face, 2 small juxtaposed spinules, as in some species of the genus *Gammarus*.

The cephalon (see fig. 1, comp. also Pl. VI, fig. 2) scarcely exceeds in length the first 2 segments of mesosome combined, and is comparatively deep in proportion to its length, with the lateral faces quite smooth. The rostral projection is very short and blunt, though distinctly defined, and the lateral lobes are but little projecting and broadly truncated at the tip, being defined from the acutely projecting postantennal corners by a slight emargination encircling the basal joint of the inferior antennæ.

The coxal plates are of moderate size, the 4 anterior pairs being, as usual, much larger than the 3 posterior, and somewhat deeper than the corresponding segments. The 1st pair (see fig. 11) are slightly expanded distally, and considerably broader in their outer part than the 2nd pair (see fig. 12), their terminal edge being broadly rounded and, as in the other pairs, only fringed with a few scattered hairs. The 2 succeeding pairs are somewhat deeper than the 1st and of oblong quadrangular form, the 3rd being somewhat broader than the 2nd. The 4th pair (see fig. 13) are much the largest, being rather expanded in their outer part and produced posteriorly to an obtusely truncated lobe, above which the posterior edge forms a distinct emargination, to receive the anterior part of the 5th pair. The latter (see fig. 14) are about twice as broad as they are deep, and, as usual, divided into 2 lobes, the anterior of which is but little larger than the posterior. The 2 posterior pairs (see figs. 15 and 16) successively decrease in size, and are also slightly bilobed.

The epimeral plates of the metasome are of moderate size, the 2 posterior pairs being, as usual, somewhat larger than the 1st pair, and nearly rectangular in form, with the lateral corners but little produced.

The eyes (see fig. 1), which are placed on the sides of the head, at a short distance from the anterior edges, are not very large and of a narrow reniform shape, with dark pigment.

The superior antennæ (see fig. 1) nearly attain half the length of the body, and are rather slender, with only small scattered bristles at the edges. The peduncle is somewhat elongated, being about twice as long as the cephalon. The 1st joint is by far the largest, though scarcely as long as the other 2 combined, and the latter are not very different in length. The flagellum is about half as long again as the peduncle, and composed of numerous short articulations, their number varying from 20 to 25. The accessory appendage (see fig. 3) is well developed and about as long as the last peduncular joint, being composed of about 5 articulations.

The inferior antennæ (see fig. 1) are much shorter than the superior, scarcely exceeding half their length. They are constructed in the usual manner, exhibiting a large globular basal joint followed by two short and 2 elongated peduncular joints. The flagellum considerably exceeds half the length of the peduncle, and is composed of about 12 articulations.

The buccal area (see fig. 1) is rather projecting, being only partly obtected by the 1st pair of coxal plates. The several oral parts (figs. 4—10) composing it, are quite normal in their structure, and need not therefore to be described in detail.

The gnathopoda (figs. 11 and 12) are rather small and nearly of equal length, though the posterior ones (fig. 12) appear somewhat more slender than the anterior. Both pairs are rather richly supplied with bristles, partly arranged in dense fascicles, especially on the lower edge of the carpus and propodos. The latter appears in the anterior pair (fig. 11) somewhat broader and more expanded distally than in the posterior pair, where it (see fig. 12) exhibits a rather narrow oblong oval form. The palm in both pairs is somewhat oblique, being defined below by an obtuse angle carrying a pair of short spines.

The pereiopoda are of moderate length and rather strongly built, having their outer part edged with fascicles of stiff bristles intermingled with spines, especially at the end of the meral and carpal joints. In all of them the dactylus is very strong, terminating in a sharp curved point. The 2 anterior pairs are, as usual, of the same structure, though somewhat unequal in length, the 2nd pair (fig. 13) being a little shorter than the 1st.

Of the 3 posterior pairs the penultimate ones (fig. 15) are the longest, and have the basal joint oval in form, with the posterior edge but very slightly curved. In the antepenultimate pair (fig. 14) the basal joint is somewhat smaller, but otherwise of a much similar form, being in both pairs broadest in its proximal part and somewhat narrowed distally. The last pair (fig. 16) differ considerably from the others in the form of the basal joint, which is very broad, forming posteriorly a large, laminar expansion terminating below in a broadly rounded lobe which extends beyond the ischial joint. The edges of the expansion are minutely serrate, with small bristles springing of from the serrations, and having between them a very fine ciliation.

The branchial and inbubatory lamellæ (see fig. 12) exhibit a similar structure to that in the 2 preceding genera.

The uropoda successively decrease in size, the 1st pair (fig. 17) being rather large and about twice as long as the 2nd (fig. 18). In both pairs the basal part as also the rami are coarsely spinous, the latter being subequal

and each tipped by a dense fascicle of unequal spines. The last pair (fig. 19) are very small, scarcely at all reaching beyond the others, and of a rather different structure. They consist each of a rather thick and massive basal part armed at the end with several spines, and of 2 very unequally developed rami. The inner ramus is extremely small and scale-like, whereas the outer is somewhat longer than the basal part and of a rather narrow, sublinear form, having a distinctly defined terminal joint setiferous at the tip. The proximal joint of this ramus carries on each side a single fascicle of spines intermingled with delicate bristles, and from its tip also issue several spines and fine bristles.

The telson (fig. 20) is rather broad in proportion to its length, and nearly semicircular in outline. It is divided by a deep and narrow cleft into two halves, each of which carries at the outer edge, near the base, a small spinule and at the tip another spinule accompanied by a few fine hairs.

The adult male (Pl. VI, fig. 1), as usual, attains a somewhat larger size than the female, its length amounting to nearly 15 mm.

The form of the body is not very much different form that in female, though perhaps a little more slender and compressed. The dorsal projections generally appear somewhat larger and more prominent, being more pronouncedly lamellar in character. In the specimen here figured there was a distinct attempt to such projections even in the 3rd and 4th segments of the mesosome, a case rather rarely met with, the projections being, as a rule, not distinctly developed in front of the 5th segment.

The antennæ (see fig. 1) appear somewhat more elongated than in the female, especially the inferior ones, which however still are considerably shorter than the superior.

The gnathopoda (figs. 3 and 4) are very strongly developed and nearly equal in size, with the propodos rather large and of an oblong clavate form, being somewhat expanded distally, especially in the posterior ones (fig. 4). The palm is distinctly concave, and defined below by a projecting, nearly rectangular corner armed with 2 spines. Another rather strong spine occurs on the outher side of the palm below the middle, and is accompanied by a fascicle of slender bristles.

The pereiopoda appear a little more elongated than in the female, and the basal joint of the 3 posterior pairs is comparatively narrower. Especially is this the case with the last pair (fig. 6), where that joint appears much less expanded than in the female (comp. Pl. V, fig. 16) and thereby acquire a rather different form.

The last pair of uropoda (fig. 7) and the telson (fig. 8) do not differ much from those parts in the female.

Colour. — In some specimens received short time after they had been captured, a few light reddish markings were observed on the sides of the body, apparently being the remnant of a pigment; but whether this may have been something merely accidental, I cannot assertain. In another bottle all the specimens exhibited along the edges of the dorsal projections a border of a very dark hue, as indicated in the figs. 1 and 2 on Pl. V.

Occurrence. — Of this characteristic form numerous specimens were collected by Mr. Warpachowsky in several localities of the North Caspian Sea. It has been noted from no less than 16 different Stations, distributed partly along the western coast, from the Bai Agrachansky up to the mouth of the Wolga, partly in the tract extending north of the peninsula Mangyschlack, and also in 2 Stations (31 and 32) lying about midways between the latter peninsula and the opposite western coast. In some of the Stations it would seem to have occurred in great profusion.

Dr. Grimm collected this form in the Bai of Baku, and besides in several Stations both of the southern and middle part of the Caspian Sea, up to the peninisula Mangyschlak; the depth varying from 2 to 35 fathoms. A small variety (perhaps a news species) was also collected by the same naturalist at Baku in comparatively shallow water, among the grass.

Out of the Caspian Sea this form has not yet been recorded.

5. **Amathillina affinis**, G. O. Sars, n. sp.

(Pl. VI, figs. 9—19).

Specific Characteristic. — Very like the preceding species, but of much inferior size. Anterior part of mesosome not keeled dorsally; the last 2 segments of mesosome and those of metasome each produced dorsally to a prominent, acutely triangular projection, that of last segment nearly of same form as the preceding ones. Cephalon and urosome almost as in *A. cristata*. Anterior pairs of coxal plates somewhat smaller than in the said species; otherwise of a similar shape. Eyes comparatively larger and distinctly reniform. Superior antennæ very slender and exceeding half the length of the body, 1st joint of the peduncle but little longer than the 2nd, accessory appendage shorter than the last peduncular joint, and only 3-articulate. Gnathopoda in female very small and of a similar structure to that in *A. cristata*, propodos of the posterior ones much narrower than that of the anterior and having the palm nearly transverse; those in male largely developed, with the propodos in both pairs oblong oval in form, scarcely widening distally. Basal joint of penultimate pair of pereiopoda very different in shape from that of the antepenultimate pair, being strongly expanded, with the

posterior edge boldly curved below the middle; that of last pair having the posterior expansion produced below to an obtusely truncated lobe reaching almost to the middle of the meral joint. Uropoda nearly as in the preceding species. Telson without any spines, and having the terminal lobes obtusely pointed, each being tipped by 3 fine hairs. Length of adult female 6 mm., of male 8 mm.

Remarks. — This new species is very nearly allied to the preceding one, but unquestionably specifically distinct. Besides by its much inferior size, it differs in the anterior part of the back being quite smooth, without any trace of a keel, in the last dorsal projection not differing in shape from the preceding ones, and in the rather different form of the basal joint of the last 2 pairs of pereiopoda, finally, in the telson having no trace of any spines.

Description. — The length of adult, ovigerous female specimens is about 6 mm., and that of male specimens scarcely exceeds 8 mm. This form is consequently much inferior in sexe to the preceding species.

The general form of the body nearly agrees with that in *A. cristata*, and there is a quite similar difference between the 2 sexes as described in that species, the females being somewhat shorter and stouter than the males. On this cause I have regarded it sufficient for the recognition of the species to figure only one of the sexes, in this case the male (fig. 9). In both sexes the anterior part of the back is quite evenly rounded, without any trace of a keel. In the 5th segment of the mesosome there is found in some specimens a very slight approach to a keel, but in no specimen this keel is elevated in the form of a dorsal projection. In the 5 succeeding segments, on the other hand, the dorsal projections are very distinctly developed, being rather projecting and of an acutely triangular shape. The last of these projections does not differ much from the others, being, as the latter, acutely produced, not, as in the preceding species, rounded. The segments of the urosome are, as in that species, without any dorsal keel or projections, but provided with a similar supply of fine hairs and small subdorsal spinules.

The cephalon (fig. 10) does not differ much in its form from that in *A. cristata.*

The coxal plates are comparatively somewhat less deep than in the preceding species and also narrower, otherwise of a much similar appearance.

This also applies to the epimeral plates of the metasome.

The eyes (see fig. 10) are comparatively larger than in *A. cristata*, and of a pronounced reniform shape, their anterior edge being distinctly insinuated in the middle.

The superior antennæ (see fig. 9) are very slender, and considerably exceed in length half the body. The 1st joint of the peduncle does not much

exceed in length the 2nd, and the 3rd joint is considerably both shorter and narrower than the latter. The flagellum is about half again as long as the peduncle, and composed in the female of about 15 articulations, in the male of nearabout the double number. The accessory appendage in both sexes is much smaller than in *A. cristata*, and is only composed of 3 articulations.

The inferior antennæ are much shorter than the superior, especially in the female, and of a similar structure as in *A. cristata.*

The gnathopoda in the female (figs. 11 and 12) are rather small and nearly of equal length, though the posterior ones appear somewhat feebler in structure. The propodos in the latter (fig. 12) is much narrower than in the anterior, and has the palm nearly transverse. In the male these limbs (figs. 18 and 19) are very strongly developed and of a similar structure to that in the male of the preceding species, though differing in the propodos being more regularly oval in form, that of the anterior pair (fig. 1) being rather tumid in the middle.

Of the pereiopoda, the last 2 pairs differ very markedly from those of the preceding species in the shape of the basal joint. In the penultimate pair (fig. 14) this joint is very unlike that of the antipenultimate pair (fig. 13), forming a large and broad expansion posteriorly, whereby it acquires a somewhat heart-shaped form, the posterior edge being boldly curved below the middle. In the last pair (fig. 15) it expands obliquely to a greatly projecting lobe, obtusely truncated at the tip and extending almost to the middle of the meral joint. In the male these joints are somewhat less expanded than in the female, being however much broader than in the male of *A. cristata.*

The uropoda are nearly of same structure as in that species, except that the 2 anterior pairs are armed with a less number of spines, and that the outer ramus of the last pair (fig. 16) is somewhat more elongated.

The telson (fig. 17) has the terminal lobes obtusely pointed and each only tipped by 3 fine hairs, no spine being found neither on the tip nor on the outer edge.

Occurrence. — This species also has been collected by Mr. Warpachowsky in several localities of the North Caspian Sea, it being noted from no less than 11 different Stations, but in none of them it occurred in any abundance. Of these Stations one (St. 2) is located off the Tschistyi-Bank, another (St. 12) in the inner part of the Bai Agrachansky, 4 other (St. 16, 17, 28, 29) in the tract north of the peninsula Mangyschlak, an 8th (St. 32) about midway between that peninsula and the opposite western coast, another (St. 49) between the islands Morskay and Kulaly, and the

last 3 (St. 54, 55, 56) at some distance north and west of the last-named island.

In the collection of Dr. Grimm this species is only represented by a few specimens collected in the Bai of Baku, from a depth of 2—3 fathoms.

The species is, as yet known, restricted in its occurrence to the Caspian Sea.

Gen. 4. **Gammarus,** Fabr.

Remarks. — Of all the Amphipodous genera represented in the Caspian Sea, this comprises the greatest number of species. In the collection of Mr. Warpachowsky I have distinguished no less than 11 different species, and in the collection of Dr. Grimm several additional species are represented. Whereas the hitherto known species of *Gammarus*, in the restriction of the genus now generally adopted, exhibit a very uniform appearance, the Caspian species partly diverge rather markedly in their character from the type, both as regards the outward appearance and the structure of the several appendages. Thus the *Gammarus caspius* Pallas, to be described below, is highly distinguished by the segments of metasome being produced dorsally to similar acuminate projections to those occurring in the genus *Amathillina*, and whereas in the earlier known species of *Gammarus*, the superior antennæ are invariably very slender and considerably longer than the inferior, in several of the Caspian species they are rather much reduced in length, so as not at all exceeding the inferior ones in size. Moreover the last pair of uropoda sometimes are unusually short, and in all the Caspian species as yet examined their inner ramus is very small and scale-like. The most normally looking species is that described below as *Gammarus haemobaphes* Eichwald.

6. **Gammarus caspius,** Pallas.

(Pl. VII).

Gammarus caspius Pall., Eichwald: «Fauna caspio-caucasia nonnullis observationibus novis illustr.». Nouv. Mém. de la Soc. Imp. des Naturalistes de Moscou, T. VII, 1842, p. 230.

Syn.: *Gammarus semicarinatus*, Sp. Bate.

» *Gammarus Dybowskyi*, Grimm MS.

Specific Characteristic. — Body moderately slender, with the segments of mesosome generally smooth, though in some specimens the last one is slightly keeled above and produced at the posterior edge to a small dentiform projection, those of metasome provided with well-marked posteriorly

pointing dorsal projections. The 2 anterior segments of urosome having each a much elevated tubercle, transversely truncated at the tip and armed with 4 strong apical spines arranged in pairs; last segment with a single small spinule on each side of the dorsal face. Cephalon with the rostral projection extremely small, nearly obsolete, lateral lobes rather broad and obtusely truncated at the tip. Anterior pairs of coxal plates but little deeper than the corresponding segments and rapidly increasing in size to the 4th, which are much expanded in their outer part, with a very distinct emargination posteriorly. The last 2 pairs of epimeral plates of metasome rather large and acutely produced at the lateral corners. Eyes well developed and of an oblong form, slightly instricted in the middle. Superior antennæ very slender and much longer than the inferior, joints of the peduncle rapidly diminishing in size, flagellum nearly twice as long as the peduncle, accessory appendage well developed and 5-articulate. Gnathopoda in both sexes rather unequal in size, the posterior ones being much the larger; those in male being, as usual, more powerful than in female, with the propodos rather large, especially in the posterior ones, palm in both pairs somewhat oblique and nearly straight. Pereiopoda moderately slender and edged in their outer part with spines and delicate bristles, antepenultimate pair much shorter than the last 2 pairs, which are nearly equal in length, basal joint of last pair not much expanded and oblong quadrangular in form, with the posterior edge distinctly serrate. Last pair of uropoda reaching considerably beyond the other, inner ramus small, squamiform, outer ramus rather elongated and edged with long ciliated setæ and a few fascicles of spines. Telson of moderate size and cleft to the base, each half armed at the tip with 2 small spines and a few delicate bristles. Length of adult female 13 mm., of male 16 mm.

Remarks. — The diagnosis given by Eichwald in the above-cited work does not leave any doubt, that the above-characterised form is that originally recorded by Pallas as *Gammarus caspius*. Under the latter name Sp. Bate, in his Catalogue of Amphipoda in the British Museum, describes a very different form, whereas I am much inclined to believe that the form recorded by him in the same work (without any locality) as *G. semicarinatus* is that here treated of. In Dr. Grimm's collection this species is labelled *G. Dybowskyi* n. sp. From all other known species this is at once recognized by the strong dorsal projections of the metasome. In spite of this anomalous feature, it is a true *Gammarus*, as shown by the structure both of the oral parts and the other appendages.

Description of the female.

The length of adult ovigerous specimens amounts to about 13 mm.

The body (see fig. 1) is of moderately slender form and somewhat compressed, with the metasome and urosome well developed and combined about equalling the length of the mesosome. The segments of the latter division are in most of the specimens quite smooth, with the back evenly rounded. In larger specimens there is however (as indicated in the figures here given) not rarely found in the last segment a slight dorsal keel, which at the posterior edge is produced to a small dentiform projection. The segments of metasome in all specimens are distinctly keeled, the keel being elevated to rather large and compressed, posteriorly pointing dorsal projections terminating in a very acute point. The last of these projections is generally the largest and of same form as the 2 preceding ones. The 2 anterior segments of the urosome are each provided dorsally with a rather conspicuous, almost cylindrical tubercle, transversely truncated at the tip, and carrying 4 strong apical spines arranged in pairs and accompanied by a few delicate bristles (see fig. 15). The anterior tubercle projects nearly at a right angle to the longitudinal axis, whereas the posterior one is slightly recurved, both being otherwise of the very same appearance. The last segment of the urosome has on each side of the dorsal face a single small spinule.

The cephalon (fig. 2) is fully as long as the first 2 segments of mesosome combined, and has the rostral projection extremely small, nearly obsolete. The lateral lobes are somewhat projecting and rather broad, being obtusely truncated at the tip and defined from the acutely produced postantennal corners by a rather deep emargination encircling the globular basal joint of the inferior antennæ.

The 4 anterior pairs of coxal plates are but little deeper than the corresponding segments, and rapidly increase in size posteriorly, the 1st pair (see fig. 4) being rather small and scarcely at all expanded distally, whereas the 4th pair (see fig. 6) are very broad, with the outer part much expanded and forming below the rather deep posterior emargination a distinct, almost right angle.

The 3 posterior pairs of coxal plates are comparatively small and of the usual shape.

The epimeral plates of the metasome are rather large, especially the 2 posterior pairs, which both are produced at the lateral corners to an acute point.

The eyes (see fig. 2) are of moderate size and narrow oblong in form, with a slight instriction in the middle, thus exhibiting a shape somewhat

similar to that in the northern species, *G. campylops* Leach. The pigment in most of the specimens is dark, but Dr. Grimm has stated a case of the eyes being nearly devoid of pigment.

The superior antennæ (see fig. 1) about equal half the length of the body, and are very slender, with only scattered short hairs at the edges. The joints of the peduncle rapidly diminish in size, the 1st being much the largest and about equalling in length the other 2 combined. The last peduncular joint is considerably shorter and also narrower than the 2nd. The flagellum does not fully attain twice the length of the peduncle, and is composed of numerous short articulations. The accessory appendage (fig. 3) is well developed, somewhat longer than the last peduncular joint, and composed of 5 articulations.

The inferior antennæ are much shorter than the superior, but little exceeding half their length, and have the penultimate joint of the peduncle the largest. The flagellum somewhat exceeds half the length of the peduncle, and is composed of about 9 articulations.

The oral parts do not differ in any way from those in the other species of *Gammarus*.

The gnathopoda (figs. 4 and 5) are moderately strong and rather unequal in size, the posterior ones (fig. 5) being much the larger. In both pairs the carpus is rather short and expanded distally, forming below a rounded, setiferous lobe. The propodos is in the posterior ones considerably larger than in the anterior, but of a similar form in both pairs, being oval quadrangular in shape, with the palm somewhat oblique, and defined below by an obtuse angle carrying a strong spine.

The pereiopoda are of moderate length and have their outer part edged with fascicles of short spines and delicate bristles. The 2 anterior pairs (see fig. 6) are rather slender and somewhat unequal in length, the 1st pair being the longer. The antepenultimate pair (fig. 7) are considerably shorter than the 2 succeeding pairs, and have the basal joint of an irregular oval form, with the infero-posteal corner slightly produced. The last 2 pairs are about equal in length, but differ in the shape of the basal joint, which in the last pair (fig. 8) is somewhat larger than in the penultimate pair, though not very much expanded, exhibiting an oblong quadrangular form, and having the posterior edge, as in the 2 preceding pairs, distinctly serrate.

The 2 anterior pairs of uropoda (figs. 9 and 10) are of the usual structure, the rami being linear in form and nearly equal-sized. They are edged with a number of coarse spinules and have each at the tip a fascicle of somewhat unequal spines.

The last pair of uropoda (fig. 11) considerably project beyond the others, and have the basal part armed at the end below with 4 strong juxtaposed spines. The inner ramus is very small and scale-like, carrying a single small spine at the tip and another still smaller on the inner edge. The outer ramus is well developed and nearly 3 times as long as the basal part. It is comparatively narrow, slightly tapering distally, and is provided at the tip with a very small terminal joint. The ramus is round about edged with long ciliated setæ, and besides exhibits a few fascicles of short spines, 2 of which issue from the tip, on either side of the terminal joint.

The telson (fig. 12) is not very large, and scarcely extends beyond the basal part of the last pair of uropoda. It is divided by a deep cleft into two halves, each slightly narrowed distally and carrying at the somewhat obliquely truncated tip 2 small spines and a few fine hairs.

The adult male (fig. 13), as usual, grows to a somewhat larger size than the female, the largest specimens measuring about 16 mm. in length.

In its general form the body does not differ much from that in the female, being only a little more slender and compressed, and having the coxal plates comparatively smaller.

The antennæ appear somewhat less unequal, the inferior ones being comparatively more fully developed than in the female and also more densely setiferous. The accessory appendage of the superior ones (see fig. 14) is a little more elongated than in the female, though exhibiting the same number of articulations.

The gnathopoda (figs. 16 and 17) are much stronger than in the female and, as in the latter, rather unequal in size, the posterior ones (fig. 17) being considerably more powerful than the anterior. In both pairs the propodos exhibits a similar oval quadrangular form to that in the female, but is much larger, especially that of the posterior pair. The palm is nearly straight and somewhat oblique, being defined below by an obtuse angle carrying 2 strong spines, between which the dactylus impinges, when closed; besides the palm has on the outer side, about in the middle, a strong spine, not occurring in the female.

The pereiopoda (see fig. 13) appear somewhat more slender than in the female, and the basal joint of the 3 posterior pairs is also comparatively narrower.

The last pair of uropoda (fig. 18) are a little more elongated than in the female, nearly equalling in length the urosome, but otherwise are of a much similar structure.

Colour. — In none of the specimens examined any colouring marks could be detected, the whole body exhibiting a uniform whitish hue.

Occurrence. — This form was collected rather abundantly by Mr. Warpachowsky in the North Caspian Sea, and has been noted from no less than 16 different Stations. Of these one (St. 2) is located off the Tschistyi-Bank, another (St. 12) in the inner part of the Bai Agrachansky, a third (St. 31) about midway between the peninsula Mangyschlak and the opposite western coast, the others in the tract north of the said peninsula, 2 of them (St. 53 and 54) lying at some distance north of the islands Kulaly and Morskay. In some of the Stations, especially in St. 52 (off the island Swjatoj), it would seem to have occurred in great profusion.

Dr. Grimm collected this species in the Bai of Baku, from a depth of 4 feet down to 6 fathoms, furthermore in the Bai Balchansky, 7—12 fms., in the Bai Murrawjew, 10—20 fms., and on the west coast of Sara, among Zostera. A single specimen in the collection was, according to the label, taken by Kessler at Astrachan from *Astacus leptodactylus*. The specimens in the collection of Dr. Grimm are on the whole of much smaller size than those collected by Mr. Warpachowsky in the North Caspian Sea.

According to Eichwald, this form was collected by Pallas in the mouth of «Rhymnus» together with *G. pulex* (= *G. hæmobaphes*).

Out of the Caspian Sea it has not yet been recorded.

7. **Gammarus hæmobaphes**, Eichwald.

(Pl. VIII).

Gammarus hæmobaphes, Eichwald l. c. p. 230, Pl. XXXVII, fig. 7.

Syn.: *Gammarus pulex*, Pallas (not Fabr.).

Specific Characteristic. — Body resembling in form that in the more typical Gammari (e. g. *G. locusta*), being rather slender and compressed, with the mesosome and metasome perfectly smooth throughout. The 2 anterior segments of urosome each having a small, conical dorsal tubercle tipped by 2 minute juxtaposed spines; 1st segment besides provided, on each side of the dorsal face, with a single small spinule, and last segment with 2 such spinules. Cephalon with the lateral lobes rather broad and somewhat obliquely truncated at the tip, the inferior corner being more prominent than the superior. Coxal plates of moderate size, 4th pair rather broad in their outer part, and angularly produced below the posterior emargination. Last pair of epimeral plates of metasome but very little produced at the lateral corners. Eyes well developed, reniform, pigment dark. Superior antennæ rather slender and longer than the inferior, with the accessory appendage rather fully developed, and composed of 7—9 articulations. Gnathopoda in

both sexes, very unequal in size, the posterior ones being much stronger than the anterior, and in male very powerful, with the propodos exceedingly large and swollen. The 2 anterior pairs of pereiopoda normal, the 3 posterior pairs rather stout, with their outer part edged with fascicles of strong spines and scattered bristles, basal joint of antepenultimate pair having the infero-posteal corner slightly produced, that of last pair much larger than in the preceding pairs, and subquadrangular in form, being broader in female than in male and in both sexes produced at the infero-posteal corner to a short, narrowly rounded lobe, posterior edge distinctly serrate. Last pair of uropoda reaching considerably beyond the others, and having the inner ramus small, scale-like, the outer elongated and densely fringed with ciliated setæ. Telson comparatively small, each half having at the tip one or two small spinules. Length of adult female 15 mm., of male 16 mm.

Remarks. — In all essential points the description and figures given by Eichwald of his *G. hæmobaphes* would seem to accord with the species above characterised, though they certainly are not detailed enough to give full evidence of the identity of both. The description of Eichwald, it is true, was made out from specimens collected in the Black Sea, but he believe that the same species also occurs in the Caspian Sea and that the form recorded by Pallas as *G. pulex* is most probably the same. As indeed several species both of *Mysidæ*, *Cumacea* and *Amphipoda* have been stated to be common to the two Seas, I cannot see any reason, why not the same could be the case with the present species. In every case there is but little chance of believing that the name proposed by Eichwald should be restored by other authors, and it may thus be properly applied to the form in question. The species may be best distinguished from the earlier known forms by the armature of the urosome and the rudimentary condition of the inner ramus of the last pair of uropoda, as also by the structure of the gnathopoda in the two sexes.

A form very nearly allied to the one here treated of has been collected by Dr. Grimm in great profusion in the southern and middle part of the Caspian Sea, partly from very considerable depths. This form, which has been named by that naturalist *Gammarus robustus* [1]), may perhaps turn out to be only a variety of the present species, though it differs markedly by its larger size, the more slender form of the several appendage, and by the shape of the dorsal tubercles of the urosome, which are developed nearly in a similar manner to that in *G. caspius*.

1) This name has been preoccupied in the year 1875 by Prof. S. Smith for a North-American species.

Description of the female.

The largest female specimens in the collection of Mr. Warpachowsky reach a length of 15 mm., but there are also fully adult ovigerous specimens of much inferior size.

In its general appearance (see fig. 1) the animal looks very like the well known typical species, *G. marinus*, *locusta* and *pulex*. As in the latter, the body appears rather slender and compressed, with the mesosome and metasome quite smooth throughout and the back evenly rounded, without any trace of keel or projections. The urosome (see also fig. 3) is of moderate size, and has the 2 anterior segments each elevated dorsally to a small conical tubercle carrying at the tip 2 minute, juxtaposed spinules accompanied by a pair of fine hairs. Besides the 1st segment has on each side of the dorsal face a single spinule, and 2 such spinules occur on the same place in the last segment.

The cephalon (fig. 2) about equals in length the first 2 segments of mesosome combined, and appears almost transversely truncated at the tip, the rostral projection being extremely small. The lateral lobes are rather broad and somewhat obliquely truncated, with the inferior corner the more prominent. They are defined form the postantennal corners by a very deep, nearly angular emargination encircling the greatly swollen basal joint of the inferior antennæ.

The 4 anterior pairs of coxal plates are of moderate size, being somewhat deeper than the corresponding segments, and successively increase in size posteriorly. The 3 anterior pairs are nearly quadrangular in shape, whereas the 4th pair exhibit a rather irregular form, having their outer part considerably expanded and angularly produced below the posterior emargination.

The 3 posterior pairs of coxal plates are comparatively small and of the usual shape.

The epimeral plates of the metasome are well developed, the 2 posterior pairs being, as usual, larger than the anterior pair and both but very slightly produced at the lateral corners.

The eyes (see fig. 2) are of moderate size and of a pronouncedly reniform shape, with well developed visual elements and dark pigment.

The superior antennæ (see fig. 1) nearly attain half the length of the body, and are rather slender and but very sparingly setiferous. The joints of the peduncle successively diminish in size, the 1st being much the largest and equalling in length the other 2 combined. The flagellum is nearly twice as long as the peduncle, and composed of numerous short articulations. The

accessory appendage (fig. 5) is rather fully developed, equalling half the length of the peduncle, and is composed of about 7 articulations.

The inferior antennæ, as in most of the typical Gammari, are shorter than the superior and somewhat more densely setiferous. The last 2 joints of the peduncle are nearly equal-sized and combined somewhat longer than the flagellum, which is composed of about 8 articulations.

The gnathopoda (figs. 6 and 7) are rather unequal in size, the posterior ones (fig. 7) being much stronger than the anterior. In structure they agree rather closely with those in the female of the preceding species, the carpus being in both pairs comparatively short and expanded distally, with a rounded setiferous lobe below. The propodos in both pairs considerably exceeds in length the 3 preceding joints combined, and in the posterior pair is much larger and more tumid than in the anterior. The palm is somewhat oblique and defined below by an obtuse angle carrying a strong spine followed by a few much shorter ones. The hind margin of the propodos in both pairs is provided with numerous small tufts of bristles.

Of the pereiopoda, the 2 anterior pairs (fig. 8) exhibit the usual slender form. The 3 posterior pairs are, on the other hand, rather stout and have their outer part edged with fascicles of strong spines and scattered bristles. As usual, the antepenultimate pair (fig. 9) are considerably shorter than the 2 succeding ones, and have the basal joint of a somewhat irregular quadrangular form, with the infero-posteal corner nearly rectangular. In the penultimate pair (fig. 10) the basal joint is somewhat larger and more expanded in its proximal part, the posterior edge being boldly curved above and not all produced at the infero-posteal corner. The last pair (fig. 11) about equal in length the penultimate pair, and have the basal joint much larger than in any of the preceding pairs and of a rounded quadrangular shape, forming posteriorly a broad laminar expansion, which terminates below in a short, narrowly rounded lobe. The posterior edge of the expansion is slightly curved and, as in the 2 preceding pairs, exhibits a number of distinct serrations, each carrying a small hair.

The 2 anterior pairs of uropoda (figs. 12 and 19) are normal in structure, though less coarsely spinous than in the preceding species, their inner ramus having only a single lateral spine and the outer no lateral spines at all.

The last pair of uropoda (fig. 13) considerably project beyond the others, and on the whole agree in their structure with those in the preceding species; the inner ramus being very small and scale-like, whereas the outer is rather elongated and densely edged with long ciliated setæ, and having besides a few fascicles of short spines. The terminal joint of the ramus is very small

and nearly hidden between the spines issuing from the tip of the proximal joint.

The telson (fig. 14) is comparatively small, being scarcely as long as it is broad at the base. It is, as usual, divided by a deep cleft into 2 halves, each of which is somewhat narrowed in its outer part and armed with a single small apical spine accompanied by a pair of simple hairs.

The adult male (fig. 15) is generally somewhat larger than the female, reaching a length of about 16 mm. The body does not differ much in its general form from that in the female, except in being somewhat more compressed, and having the coxal plates less deep.

The antennæ are, as usual, somewhat more fully developed than in the female, and especially the inferior ones more strongly built and generally also more densely setiferous. The accessory appendage of the superior ones (fig. 16) appears more elongated and is composed of a greater number of articulations amounting to 9 in all.

The gnathopoda are still more unequally developed than in the female, the anterior ones (fig. 17) chiefly differing from those in the latter by the propodos being somewhat more elongated. The posterior gnathopoda (fig. 18), on the other hand, are of quite an unusual size, the propodos being exceedingly large, nearly occupying the half length of the leg. It is of a somewhat obpyriform shape, being not fully twice as long as it is broad, and, as in the female, has the palm rather oblique and quite straight, without any lateral spine in the middle. The hind margin is in some specimens very densely setous, and the dactylus is strong and curved.

The pereiopoda are perhaps a little more slender than in the female, and the basal joint of the 3 posterior pairs somewhat narrower.

The last pair of uropoda (see fig. 15) are, as usual, more fully developed than in the female, attaining about the length of the urosome, and have the marginal setæ of the outer ramus longer and more coarsely ciliated.

The telson (fig. 20) is of the very same shape as in the female; but generally 2, instead of a single spine, are found on the tip of each of the terminal lobes.

Colour. — According to Eichwald, the body, in the living state of the animal, exhibits a brownish green colour, the posterior edges of the segments being on each side tinged with pink.

Occurrence. — This form has been collected by Mr. Warpachowsky in 7 different Stations of the North Caspian Sea, but in none of the Stations it would seem to have occurred in any abundance. Of the Stations 2 (St. 16 and 17) are located off the island Swjatoj, a third (St. 24) between the islands Kulaly and Morskoy, 2 others (St. 31 and 32) about midway be-

tween the peninsula Mangyschlak and the opposite western coast, another (St. 40) north of the promontory Kossa Brjanskaja, the last, finally (St. 63), in the eastern part of the North Caspian Sea.

Besides, some specimens preserved in the Museum of St. Petersburgh from older time, and collected by Goebel and v. Baer partly at Baku, partly at the island Sara, would seem to be referable to this species.

Typical specimens of this form have been collected by Dr. Grimm at Baku in comparatively shallow water, as also in the middle part of the Caspian Sea, from the shores down to 40 fathoms.

Distribution. — The Black Sea (Eichwald).

EXPLANATION OF THE PLATES.

Pl. I.

Boeckia spinosa, Grimm.

Fig. 1. Adult female, viewed from left side.
» 2. Same, dorsal view.
» 3. Left superior antenna.
» 4. Left inferior antenna.
» 5. Urosome with its appendages, viewed from left side.
» 6. Telson viewed from above.
» 7. Last uropod.
» 8. Anterior lip.
» 9. Posterior lip.
Fig. 10. Left mandible with palp.
» 11. Right mandible, without the palp.
» 12. First pair of maxillæ.
» 13. Second maxilla.
» 14. Maxillipeds, without the right palp.
» 15. Left anterior gnathopod, with the corresponding coxal plate.
» 16. Left posterior gnathopod, with the corresponding coxal plate, branchial and incubatory lamellæ.

Pl. II.

Boeckia spinosa, Grimm,

(continued).

Fig. 1. Adult male, dorsal view.
» 2. Left anterior gnathopod, with the corresponding coxal plate.
» 3. Left posterior gnathopod, with the corresponding coxal plate and branchial lamella.
» 4. Second pereiopod with the corresponding coxal plate.
Fig. 5. Antepenultimate pereiopod, with coxal plate and branchial lamella.
» 6. Penultimate pereiopod.
» 7. Last pereiopod.
» 8. Second uropod.
» 9. Last uropod.
» 10. A very young specimen, viewed from left side.

Pl. III.

Gmelina costata, Grimm.

Fig. 1. Adult female, viewed from left side.
» 2. Cephalon with the base of the left inferior antenna, lateral view.
» 3. Part of the right superior antenna, showing the accessory appendage and the base of the flagellum.
» 4. Anterior lip.
» 5. Posterior lip.
» 6. Right mandible, without the palp.
» 7. Left mandible with palp.
» 8. First maxilla.
» 9. Second maxilla.
» 10. Maxillipeds, without the right palp.
Fig. 11. Left anterior gnathopod, with the corresponding coxal plate.
» 12. Left posterior gnathopod.
» 13. Last pereiopod.
» 14. Second uropod.
» 15. Last uropod.
» 16. Telson, from above.
» 17. Adult male, viewed from right side.
» 18. Same, dorsal view.
» 19. Right anterior gnathopod.
» 20. Right posterior gnathopod.
» 21. First uropod.
» 22. Last uropod.

Pl. IV.

Gmelina Kusnezowi, (Sowinsky).

Fig. 1. Adult female, viewed from left side.
» 2. Cephalon with the base of the left inferior antenna, lateral view.
» 3. Part of the right superior antenna, showing the accessory appendage and the base of the flagellum.
Fig. 4. Left anterior gnathopod, with part of the corresponding coxal plate.
» 5. Left posterior gnathopod.
» 6. First pereiopod.
» 7. Antepenultimate pereiopod, with coxal plate.

Fig. 8. Last pereiopod.
» 9. Second uropod.
» 10. Last uropod.
» 11. Telson, from above.
» 12. Adult male, viewed from right side.
Fig. 13. Same, dorsal view.
» 14. Right anterior gnathopod.
» 15. Right posterior gnathopod.
» 16. Last uropod.
» 17. Telson, from above.

Pl. V.

Amathillina cristata, Grimm.

Fig. 1. Adult female, viewed from left side.
» 2. Same, dorsal view.
» 3. Part of the left superior antenna, showing the accessory appendage and the base of the flagellum.
» 4. Anterior lip.
» 5. Posterior lip.
» 6 Left mandible, without the palp.
» 7. Right mandible with palp.
» 8. First maxilla.
» 8*a* (not numbered in the plate). Palp of the right maxilla of same pair.
» 9. Second maxilla.
» 10. Maxillipeds, without the right palp.
Fig. 11. Left anterior gnathopod, with the corresponding coxal plate.
» 12. Left posterior gnathopod, with coxal plate, branchial and incubatory lamellæ.
» 13. Second pereiopod with coxal plate.
» 14. Antepenultimate pereiopod.
» 15. Penultimate pereiopod.
» 16. Last pereiopod.
» 17. First uropod.
» 18. Second uropod.
» 19. Last uropod.
» 20. Telson.

Pl. VI.

Amathillina cristata, Grimm,

(continued).

Fig. 1. Adult male, viewed from left side.
» 2. Cephalon with the base of the left inferior antenna, lateral view.
» 3. Left anterior gnathopod with coxal plate.
Fig. 4. Left posterior gnathopod.
» 5. Base of penultimate pereiopod.
» 6. Last pereiopod.
» 7. Last uropod.
» 8. Telson.

Amathillina affinis, G. O. Sars.

Fig. 9. Adult male, viewed from right side.
» 10. Cephalon of a female specimen, lateral view.
» 11. Right anterior gnathopod of female, with the corresponding coxal plate.
» 12. Right posterior gnathopod of same, with coxal plate, branchial and incubatory lamellæ.
Fig. 13. Antepenultimate pereiopod.
» 14. Penultimate pereiopod.
» 15. Last pereiopod.
» 16. Last uropod.
» 17. Telson.
» 18. Right anterior gnathopod of a male specimen.
» 19. Right posterior gnathopod of same.

Pl. VII.

Gammarus caspius, Pallas.

Fig. 1. Adult female, viewed from left side.
» 2. Cephalon with the base of the right inferior antenna, lateral view.
» 3. Accessory appendage of a superior antenna.
» 4. Left anterior gnathopod, with coxal plate.
» 5. Left posterior gnathopod, with coxal plate, branchial and incubatory lamellæ.
» 6. Second pereiopod with coxal plate.
» 7. Antepenultimate pereiopod.
» 8. Last pereiopod.
» 9. First uropod.
Fig. 10. Second uropod.
» 11. Last uropod.
» 12. Telson.
» 13. Adult male, viewed from right side.
» 14. Part of the left superior antenna, showing the last peduncular joint, the accessory appendage, and the base of the flagellum.
» 15. Part of the 2 anterior segments of urosome, showing the dorsal tubercles, lateral view.
» 16. Right anterior gnathopod.
» 17. Right posterior gnathopod, without the proximal part of the basal joint.

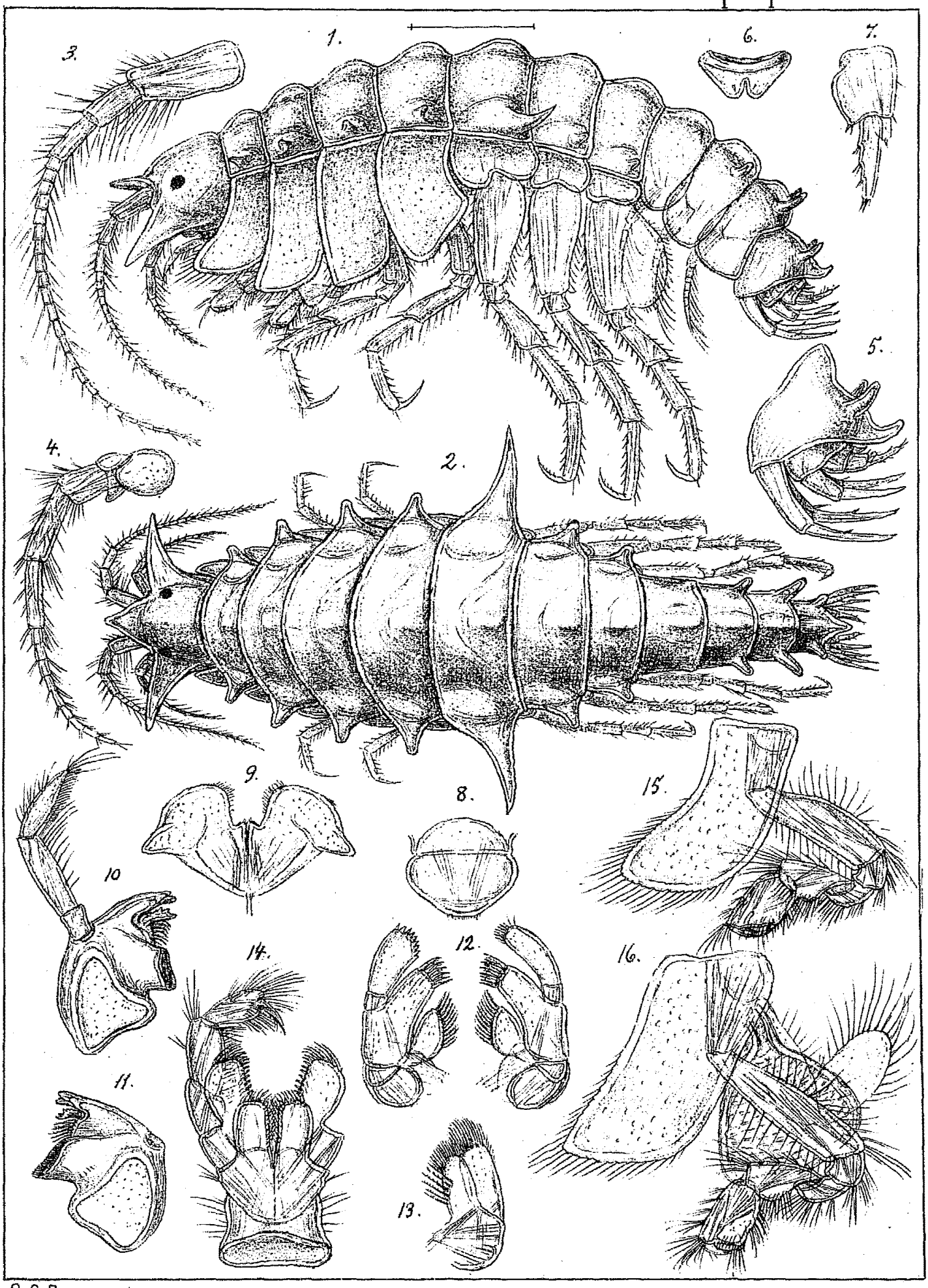
Pl. VIII.

Gammarus hæmobaphes, Eichwald.

Fig. 1. Adult female, viewed from left side.
» 2. Cephalon with the base of left inferior antenna, lateral view.
» 3. Urosome with telson, but without the uropoda, lateral view.
» 4. Lateral corner of last epimeral plate of metasome.
» 5. Accessory appendage of a superior antenna.
» 6. Left anterior gnathopod, with coxal plate.
» 7. Left posterior gnathopod, with coxal plate, branchial and incubatory lamellæ.
» 8. First pereiopod.
Fig. 9. Antepenultimate pereiopod.
» 10. Base of penultimate pereiopod.
» 11. Last pereiopod.
» 12. Second uropod.
» 13. Last uropod.
» 14. Telson.
» 15. Adult male, viewed from right side.
» 16. Accessory appendage of a superior antenna.
» 17. Right anterior gnathopod, with coxal plate.
» 18. Right posterior gnathopod.
» 19. First uropod.
» 20. Telson.

G.O.Sars Crustacea caspia.

Amphipoda. Pl. I.

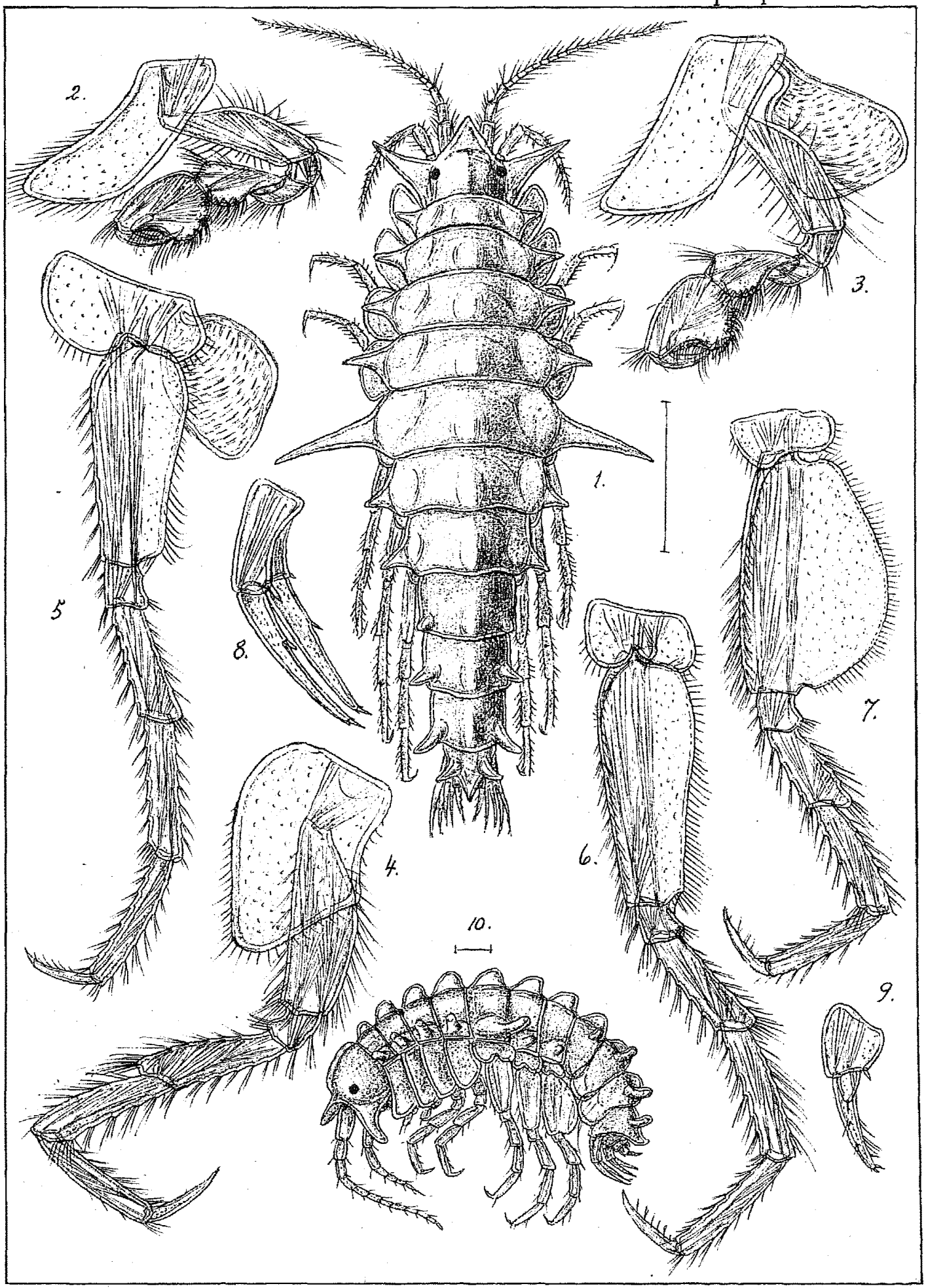


G.O.Sars autogr.

Boeckia spinosa, Grimm.

G.O.Sars Crustacea caspia.

Amphipoda. Pl. II.

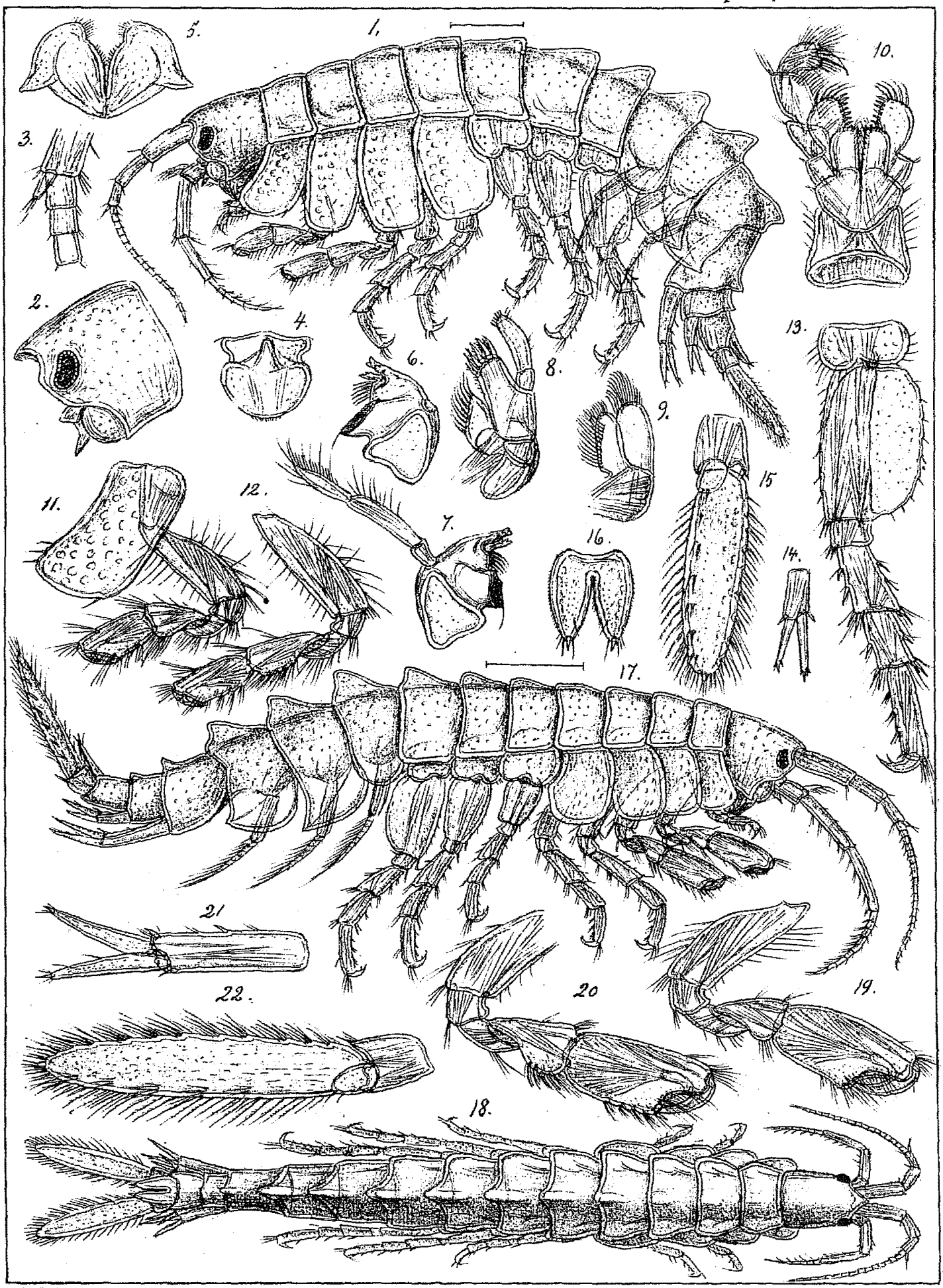


G.O.Sars autogr.

Boeckia spinosa, Grimm. (contin.)

G.O.Sars Crustacea caspia.

Amphipoda. Pl. III.

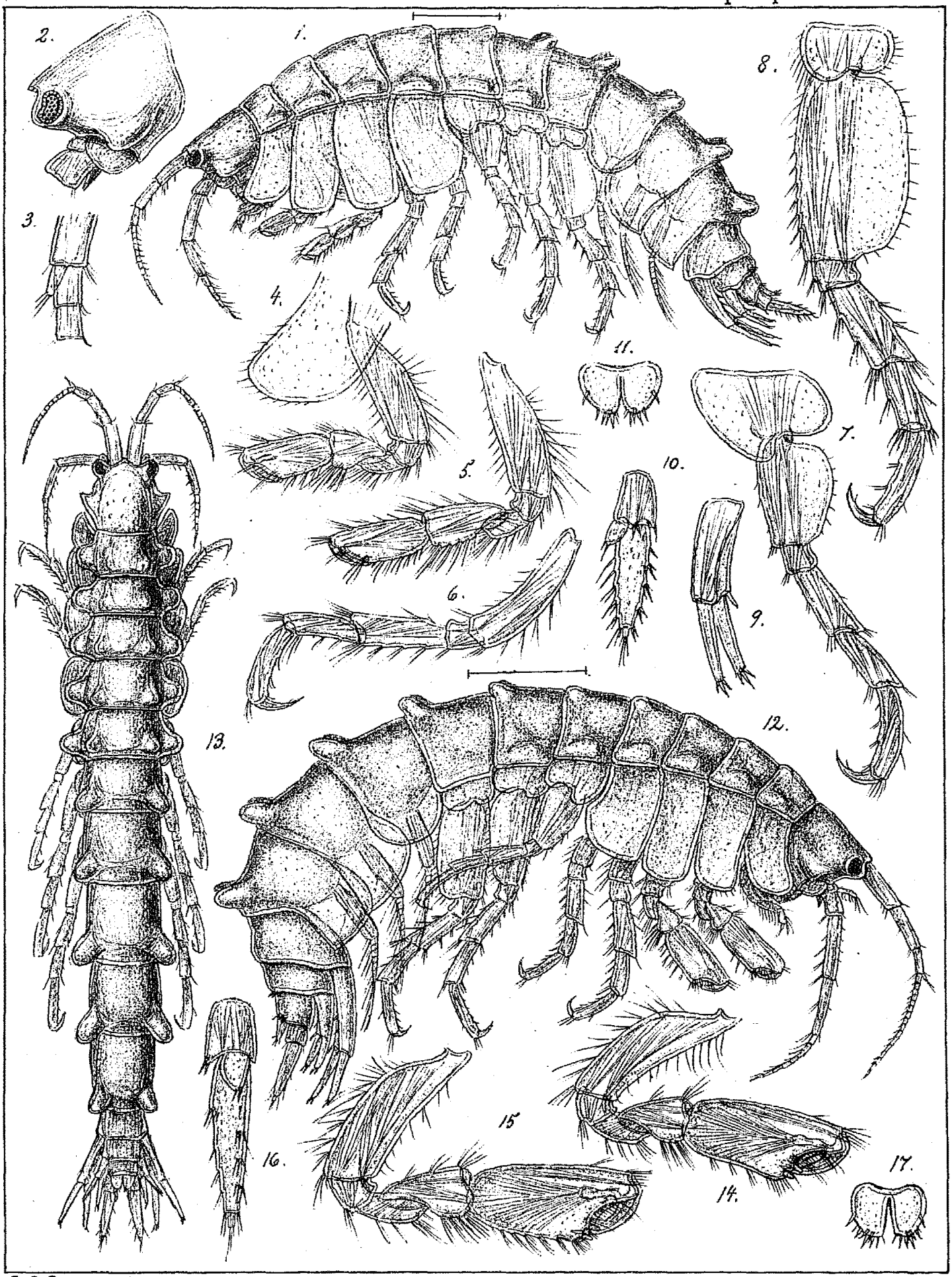


G.O.Sars. autogr.

Gmelina costata, Grimm.

G.O.Sars Crustacea caspia.

Amphipoda. Pl. IV.

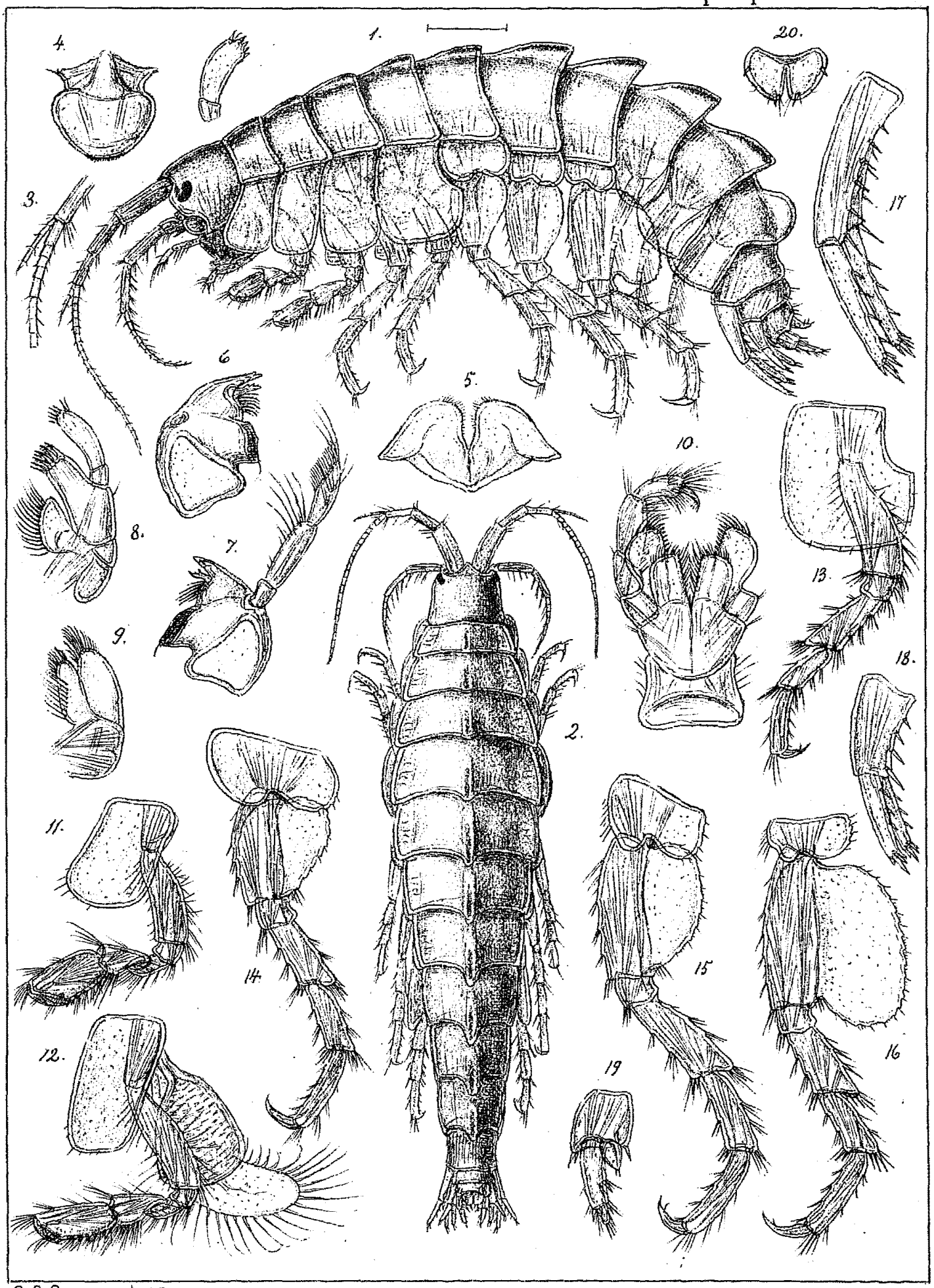


G.O.Sars. autogr.

Gmelina Kusnezowi, (Sowinsky)

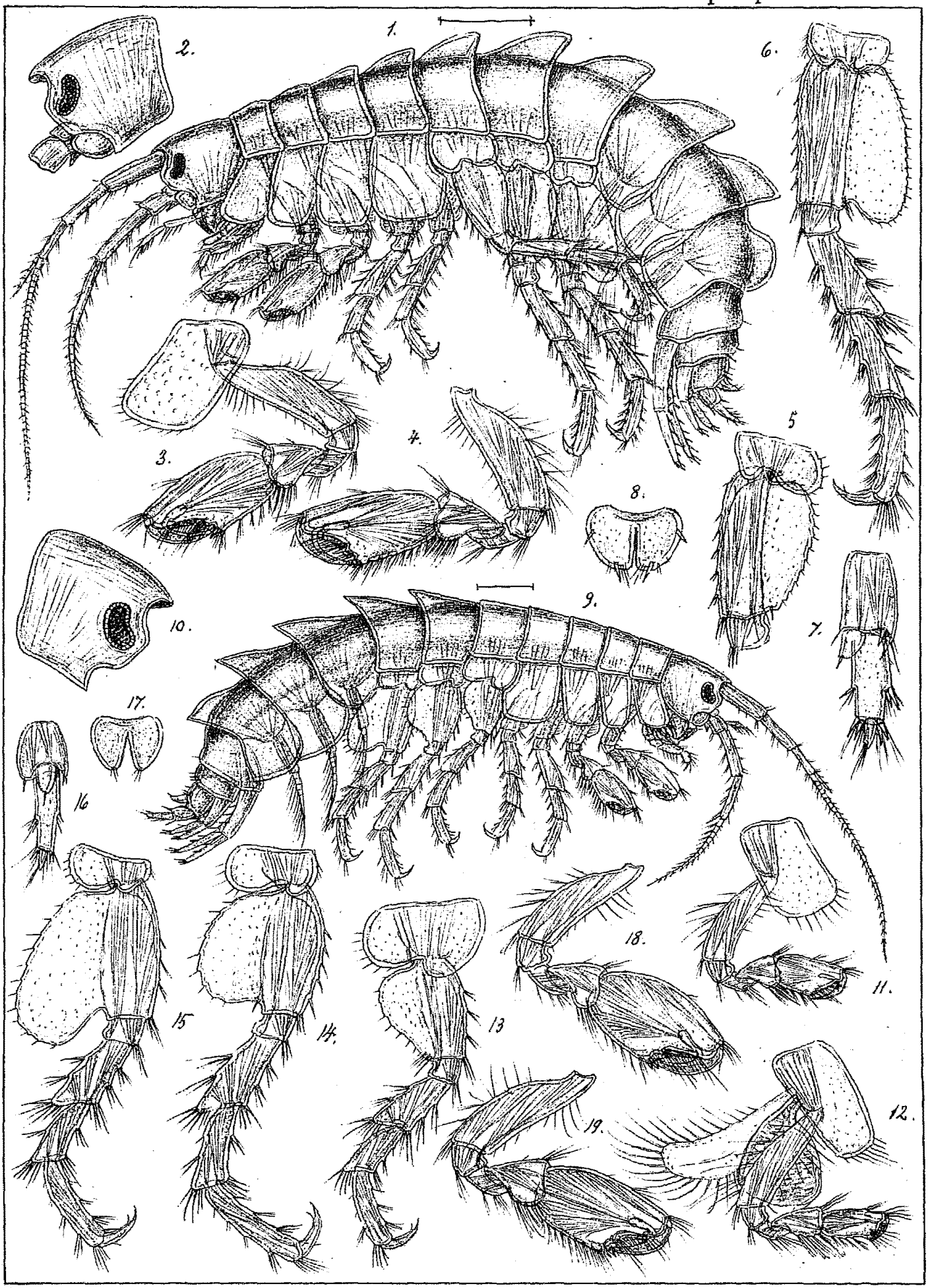
G.O.Sars Crustacea caspia.

Amphipoda. Pl. V.



G.O.Sars. autogr.

Amathillina cristata, Grimm.

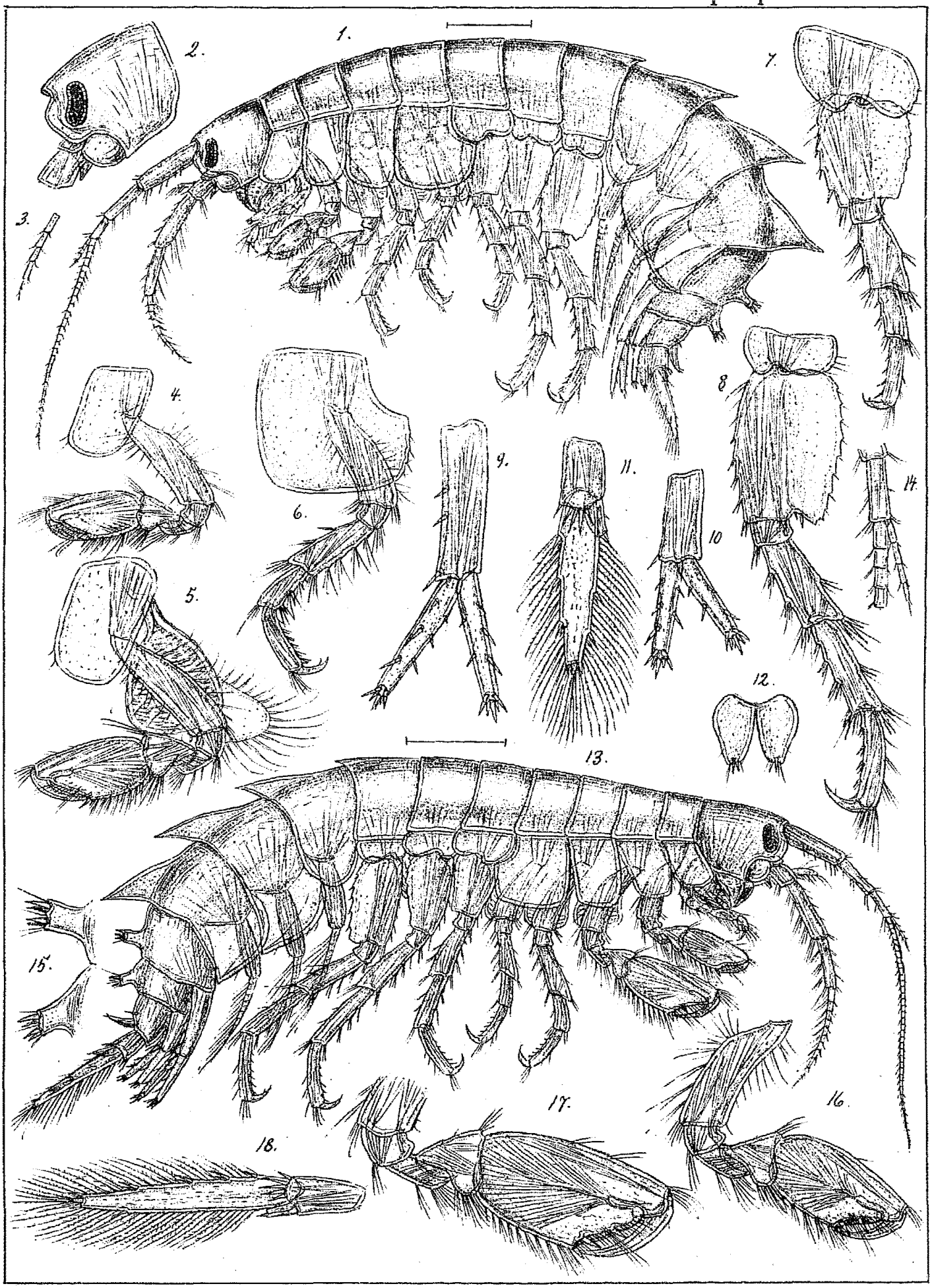


G.O.Sars autogr.

Figs. 1-8. Amathillina cristata, Grimm, (contin.)
Figs. 9-19 Amathillina affinis, n. sp.

G.O.Sars Crustacea caspia.

Amphipoda. Pl. VII.

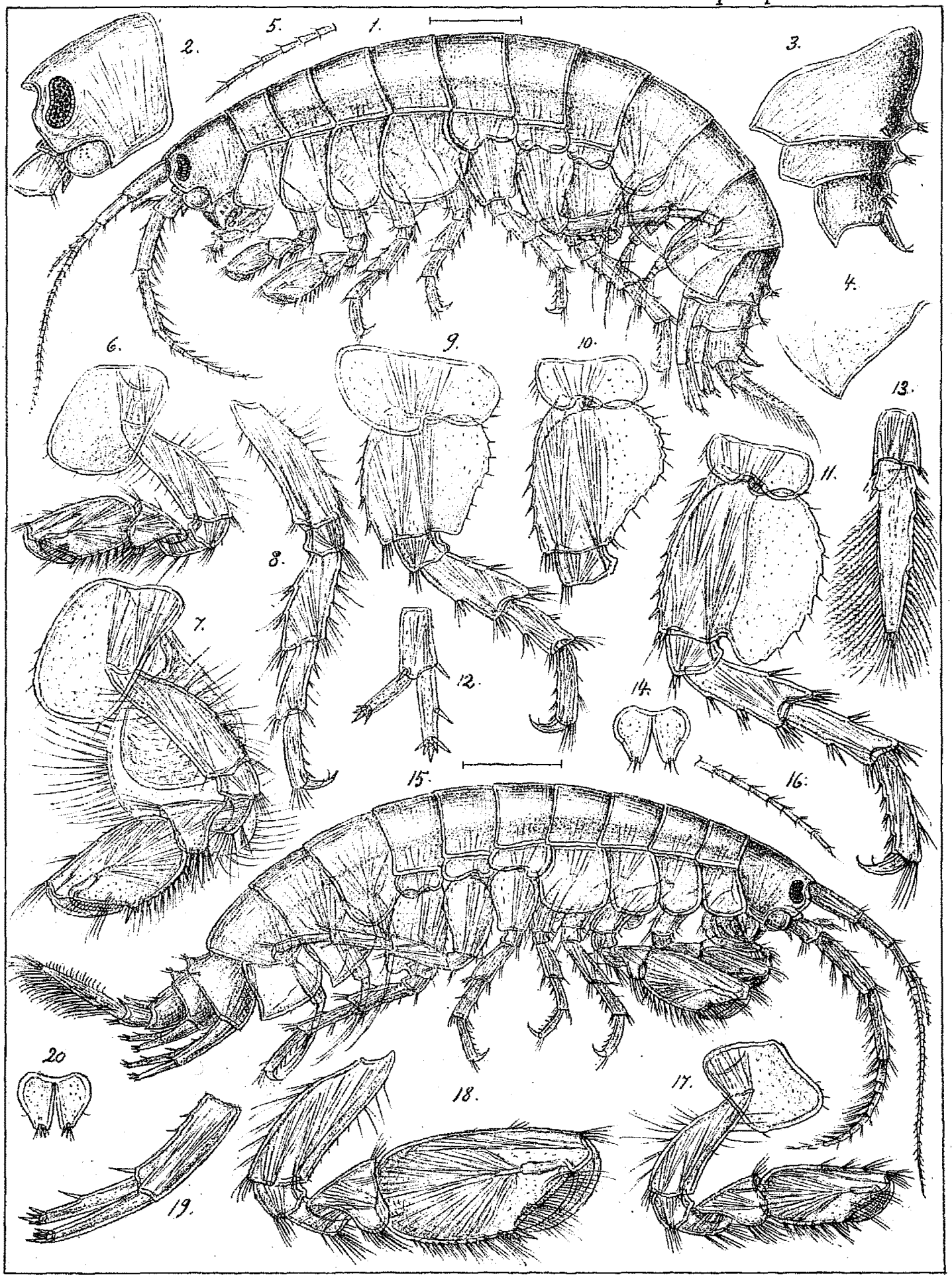


G.O.Sars autogr.

Gammarus caspius, Pallas.

G.O.Sars Crustacea caspia.

Amphipoda. Pl. VIII.



G.O.Sars autogr.

Gammarus hæmobaphes, Eichwald.