



Revision of Corophiidae and  
Related Families (Amphipoda)

J. LAURENS BARNARD

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*J. Laurens Barnard*



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## ABSTRACT

Barnard, J. Laurens. Revision of Corophiidae and Related Families (Amphipoda). *Smithsonian Contributions to Zoology*, number 151, 27 pages, 1 figure, 1973.—A superfamily Corophioidea is revived to include Corophiidae, Ampithoidae, Ischyroceridae, Podoceridae, Biancolinidae, and Cheluridae. The Podoceridae are presumed ancestors of Caprogammaridae and the suborder Caprellidea. The Photidae, Aoridae, and Isaeidae are abolished and absorbed into the Corophiidae. Axial reversal of dominance in gnathopods 1–2 is now overruled as a fundamental evolutionary feature of familial impact; instead, axial reversal is seen to have occurred several times and possibly itself has been reversed at least once. Dorsoventral flattening of the urosome is also discarded as of no conservative evolutionary content within the old Photidae and Corophiidae. The loss of web spinning glands has occurred at least thrice in the superfamily within the Podoceridae, Cheluridae, and Isaeidae, but in the latter family the loss is unconnected to any other morphological revolution and therefore Isaeidae are synonymized with Corophiidae. Podoceridae, Ampithoidae, and Cheluridae are strictly definable clusters of genera descended from various corophiids, whereas Ischyroceridae are possibly polyphyletic but can be easily recognized and defined. Within the highly diverse Corophiidae at least 16 clusters within the 50 genera are loosely defined. Though few of the clusters can be interconnected by visualizing a few simple morphological changes in evolution, the nomenclatural recognition of these clusters as subfamilies is pointless because of the multifactorial diagnoses and long discussion of exceptional cases necessary for their definition.

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# Revision of Corophiidae and Related Families (Amphipoda)

*J. Laurens Barnard*

## Introduction

The families Corophiidae, Photidae, Isaeidae, Aoridae, Ampithoidae, Ischyroceridae, Podoceridae, and Cheluridae were extant until about 1962, when J. L. Barnard synonymized Isaeidae and Photidae. Recently, Barnard (1970) described *Aloiloi*, a new genus of Aoridae appearing to confirm the polyphyletic descent of aorids from various photids and isaeids by reversal of dominance in gnathopods. In a compendium of genera, Barnard (1969a) pointed out the unsatisfactory arrangement of Corophiidae, Aoridae, and Isaeidae and offered a suggestion made by Dr. E. L. Bousfield that *Erichthonius* of the Corophiidae belongs to the Ischyroceridae. The former arrangements of these families have been unsatisfactory not only because certain pairs and triads of genera with apparent affinities have been segregated in different families but because the routine taxonomic practices of identifying these genera were largely unworkable or very tedious. Keys and identificatory schemes of earlier days often focused on characters of quantitative value on which systematic judgments might be highly erratic: for example, the degree of dorsoventral flattening of the urosome to mark Corophiidae from other families.

This paper attempts to reorganize the taxonomic concepts of corophiids by reestablishing a superfamily Corophioidea and suppressing or extinguishing the old concepts of Corophiidae, Photidae, Aoridae, and Isaeidae as based mainly on depressed

urosome and axial reversal of dominance in gnathopods, or selective loss of tube-spinning glands in pereopods, and removes several genera of those four families to the Ischyroceridae, which is also to be maintained in the Corophioidea. The Ampithoidae, Podoceridae, and Cheluridae remain unmodified except for their assignment to the Corophioidea; however, *Amphitholina* Ruffo is returned to the Ampithoidae from its former assignment to the Eopliantidae.

The redefined Corophiidae are to include the Isaeidae, Photidae, and Aoridae but no subfamilies are recognized, though several flocks of genera are arranged in Figure 1. For example, two genera of aorids have merochelate first gnathopods, and several genera similar to *Microdeutopus* have carpochelate first gnathopods.

The Corophiidae, Photidae, and Aoridae are three of the most familiar names in Amphipoda, but as taxonomic and evolutionary devices they have been highly inappropriate and unfortunate. The establishment of these family names and their original contents and the subsequent expansion of their conceptual limits over the last century have stretched good order to the breaking point. The name Corophiidae, based on *Corophium* Latreille, concerns one of the most specialized and advanced genera in Amphipoda; Aoridae, based on *Aora* Krøyer, took another advanced but peculiar genus as its type; and Photidae as based on *Photis* Krøyer, are poorly representative of generalized members in the group, as hindsight now demonstrates. The orderly development of classification and the naming of groups would probably have been enhanced had a more generalized genus such as *Gammaropsis*

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Liljeborg been the first type-genus of a family in this group. If a family Corophiidae had subsequently been considered necessary, it would then have been restricted to a very few genera rather than having embraced a host of genera inextricably confounded with the Photidae and Aoridae. A greater stability in names would undoubtedly have ensued, the conceptual limits these names encompassed would have been steadier, and, perhaps, more attention would have been paid to fine structure and the evolutionary impact of characters in the group. This might have permitted more rapid biological investigation of an extremely important group of amphipods of which only *Corophium* has had much attention.

One must appreciate the difficulty of the taxonomist in propounding a classification in which *Corophium* stands at one end of a family and *Gammaropsis* at the other, but the vast array of more than 50 genera displaying a wide variety of character variables softens this extraordinary morphological distance. The special straining apparatus on gnathopod 2 of *Corophium* and *Paracorophium* Stebbing is apparently facilitated by a merochelate development similar to that seen in *Aora* Krøyer and *Aoroidea* Walker, but in *Corophium* the chelation is joined immovably together. No straight line evolutionary pattern can be seen in merochelation because *Paracorophium* appears to be far more primitive than *Corophium* in terms of uropod 3, coxae, and antenna 2. Hence there is no value in retaining a subfamily Corophiinae for a single genus since the unique combination of corophiine characters is no more unusual than other unique patterns within the Corophioidea.

The loss of web-spinning glands in the pereopods of *Isaea* Milne Edwards and the development of prehensibility on pereopods 3-5, though unique as a combination of characters in Corophiidae, is probably matched in the Ischyroceridae by *Isaeopsis* K. H. Barnard. Presumably *Isaea* and *Isaeopsis* are commensals of other orders of animals rather than tube dwellers, but this remarkable change in behavior and morphology is not always accorded value at family level as one may see in the Dexaminidae and Lysianassidae where some genera are commensals and others are free nestlers.

The general evolutionary progress in Corophiidae, as now constituted, includes pygidization (rigidification or loss of structure on the urosome)

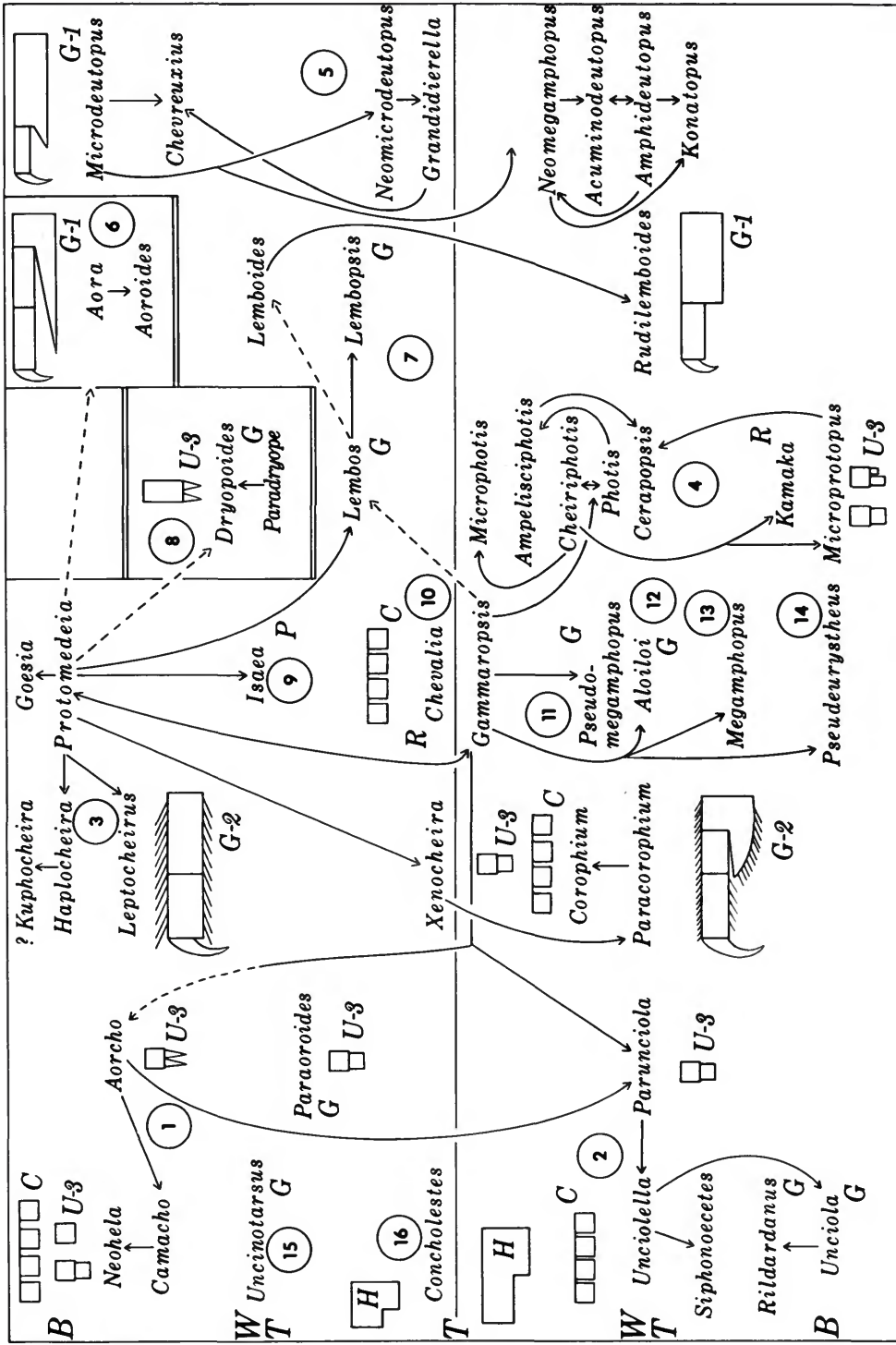
and coxal reduction, and some of the morphological, if not behavioristic, results of this evolution are as highly valued as loss of spinning glands. These glands have also been lost in the Podoceridae (as far as is known) and Cheluridae, both families yet retained in the Corophioidea because of the fleshy telson and the uniformly basic mouthparts. Pygidization and coxal reduction in podocerids apparently anticipate the evolution and radiation of the suborder Caprellidea; the connection between the two groups is well seen in the Caprogammaridae (Kudrjaschov and Vassilenko, 1966) and if any more such links are discovered, taxonomists may necessarily evaluate the Caprellidea as a superfamily and not a suborder, or make some other nomenclatural union between the two groups.

Since pygidization is so generally characteristic of amphipod advancement in many evolutionary lines (Barnard, 1969a), one presumes that an early mark of this process is the coalescence of the telsonic lobes into a solid flap. The main characteristic of Corophioidea is the inflated and fleshy telson. In practical taxonomy this character is the main distinction of many corophiids (photids) from generalized gammarids (Gammaridae). Barnard (1969a) has suggested that the basic gammaridean can be conceptualized as a primitive corophiid such as *Gammaropsis* as easily as can primitive members of Gammaridae, but the descent of the vast majority of other amphipods then requires stages of evolution in which the telson

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FIGURE 1.—Pattern of relationships in Corophiidae. Genera in upper half carry normal heads, genera in lower half carry recessed heads. Column 1 is characterized by small coxae (squares) and reduced uropod 3; column 7 by enlarged carpochelate gnathopod 1 (males). *Gammaropsis* in mid-column 4 is the basic genus but immediately connected to *Protomedea*, another basic genus. Parts of other columns are characterized by symbols concerning coxae, gnathopod 1, and uropod 3. Numbers in circles refer to generic clusters. G = gnathopod 1 enlarged, H = head, P = pereopods prehensile, R = urosomites coalesced, U = uropod. Arrows suggest possible lines of descent. Genera in top and bottom halves are fitted to 3 thermal regimes, tropical (T), warm-temperate (WT) and boreal-arctic, antiboreal-antarctic (B). Following genera omitted, similar to *Gammaropsis* (= *Eurystheus*): *Kermystheus*, *Podoceroopsis*, *Segamphopus*, *Audulla* (valid subgenus); following omitted genus similar to *Microdeutopus*: *Hansenella*.





becomes flat and split into two lobes; in the most advanced members of noncorophiid amphipods the telson then returns to an unsplit condition though it does not again become fleshy except in rare cases (thaumatelsonins). Though it may not be truthful, the simplest pattern is to derive corophiids from hypothetical protogammarids already progressing in an evolutionary sequence toward an inflated and solid telson.

In the early and middle morphological evolution of corophiids, pygidization is presumably associated with the domicolous habit. But clearly the opposite to pygidization also occurs in corophioideans, such as ampithoids, and, ultimately, in the Podoceridae and Caprellidea, the domicolous habit is surrendered in favor of nestling in anastomoses, the hypothetical primitive state. One can visualize a sequence emerging from *Gammaropsis*, which, morphologically, is scarcely distinct from the basic gammaridean but which dwells in a tube formed out of web-spinning glands. On one phyletic line through the Corophioidea the coxae become smaller, and the urosome becomes reduced by flattening and by loss of various uropodal structures. But a side branch, the Ampithoidae, have uropod 3 especially enlarged and provided with hooks; ampithoids are also strong tube dwellers but the coxae generally are larger than in the primitive corophiid, *Gammaropsis*. In the Ischyroceridae, also tube dwellers, the coxae are variously sized and uropod 3 remains fully formed but has a hook morphology distinct from that of ampithoids. Within the Corophiidae the tendency to evolve a hooked uropod 3 is seen in *Photis*, so that one judges that both evolutionary directions provide adaptations for domicoly. The Podoceridae can scarcely be cast out of the Corophioidea on their loss of web-spinning glands as they have the fleshy telson and stable mouthpart morphology of other corophiids, and yet Podoceridae have more advanced cases of coxal reduction and loss of uropodal structure than do the majority of other corophioideans. The values of natural selection in the functional morphology of these events are highly intriguing, as domicoly and nestling are both well served by superficially similar advancements.

The fine structure of uropod 3 contains the presently most valuable set of characters distinguishing families in Corophioidea. The Podoceridae are discounted from this statement as they are recog-

nized mainly through their elongate urosomite 1 and flexion of abdomen under the thorax (requiring more study as this situation is possibly not universal). Uropod 3 is often so degenerate that it can not be used in a classificatory frame of reference. In two genera of corophiids this is also true and casts doubt on the true phylogeny of those two genera (whether or not they are Corophiidae or Ischyroceridae). Although several genera of Ischyroceridae have obvious phyletic connections, a high probability exists that others now placed there according to morphological precepts have had diverse origins from various primitive corophiids; eventually, Ischyroceridae may have to fall to Corophiidae but such a move is not now supportable by any direct evidence.

Certain indirect evidence in this problem involves similarities between pairs and triads of genera, now partially in Corophiidae and partially in Ischyroceridae, which share similarities in carpochelelation of gnathopods and loss of structure on uropod 2. For example, *Ericthonius* Milne Edwards of Ischyroceridae and several genera of Corophiidae in the *Microdeutopus* group have a similarly carpochelelate gnathopod, though in *Ericthonius* the gnathopod is number 2 and in the *Microdeutopus* group the gnathopod is number 1. The reversal of gnathopod dominance does not now seem to be a character of high conservation in corophiids as formerly believed, but, as evidenced by the genera *Aloiloi* Barnard (1970) and perhaps by *Pseudomegamphopus* Myers (1968), this axial reversal is a direct evolutionary step occurring diversely. The return of dominance from gnathopod 1 to gnathopod 2 should therefore be of no greater moment in the evolution of *Ericthonius* from a member of *Microdeutopus* group than the step from *Gammaropsis* to *Aloiloi*.

With one exception, the relative elongation of the peduncle of uropod 3 and the relative shortening of the rami have no obvious intergrades between corophiids and ischyrocerids or between corophiids and ampithoids, but such evolutionary changes may also, like gnathopodal reversal, have no long line of increments necessary or even viable. The thin, nonsetose rami of ischyrocerids could have their origins in ampithoids because the latter already have the elongate peduncle and short rami; again intergradation among known genera is absent. This conclusion discounts

the reduction of rami in *Dryopoides* Stebbing, as the outer ramus of uropod 3 otherwise lacks uncination and the genus has other specializations not characteristic of ischyrocerids, such as an evanescent pleonite 6, falcate article 3 of the mandibular palp, and short article 3 of antenna 1. Except for thin pereopods, *Paradryope* Stebbing is a good intergrade between corophiids and ischyrocerids, as the outer ramus of uropod 3 is slightly uncinata and gnathopod 2 has teeth resembling those in ischyrocerids. Uropod 3 of amphithoids is unmistakable and fairly uniform; it is composed of a large, elongate, subcylindrical peduncle bearing 2 short fleshy, ovate padlike rami, the inner with apical setae, the outer with 1 or 2 very large spines pointing and curving dorsolaterally as hooks.

Uropod 3 of ischyrocerids is less definable and, indeed, 4-5 genera of this family have been placed in Corophiidae for many decades. To some extent this error occurred because Corophiidae were defined as a group containing members with flattened urosome and therefore *Erichthonius* and *Cerapus* Say were seen to be corophiids. Uropod 3 of ischyrocerids is now restricted to those having an elongate, subcylindrical peduncle with a short outer ramus bearing some kind of apical hook dissimilar to that of Ampithoidae. The body of the ramus may be apically hooked or may bear one small hookspine; the ramus is rarely pad shaped as in Ampithoidae but is usually thin and tapering. An inner ramus is usually present, but unlike uropod 3 of Ampithoidae it is thin and tapering and lacks apical setae except perhaps for one weak spinule.

The exceptional genera to be placed in Ischyroceridae are *Cerapus*, *Runanga* J. L. Barnard, and *Erichthonius*, all of which have only one hooked ramus on uropod 3, the inner ramus presumably being lost. The hook on *Erichthonius* is unmistakable and unlike any member of Corophiidae. But *Cerapus* and *Runanga* have a short, padlike ramus, almost vestigial, bearing a strong apical hook (articulate or not). The padlike appearance of the ramus recalls the Ampithoidae, but otherwise the gnathopodal context of *Cerapus* connects it to *Erichthonius*, and the general body shape of *Runanga* connects it to *Cerapus* so as to exclude both from the Ampithoidae. In the latter family, *Am-*

*phitholina* represents a cylindrioid body form suggesting a link between Ampithoidae and Corophiidae (and by interpretation therefore to *Cerapus* and *Runanga*).

EVOLUTIONARY PRIMITIVITY IN COROPHIOIDEA.—The number of primitive genera in Corophioidea is surprisingly low if one bases this estimate on logical assumptions. Characteristics of the basic gammaridean (Barnard, 1969a) are used to define primitivity. The basic (assume primitive) amphipod characters in the corophioid context are: short article 3 of antenna 1 (or generally short antennae), long accessory flagellum, nonpedunculate ocular lobes, 3-articulate mandibular palp, large coxae, free and unflattened urosomites, large subchelate gnathopod 2 dominant and enlarged in males, simple pereopods, long, equally sized rami of uropod 3, and a telson as long as it is broad. Additional, less important characters are: uniformity in extension and size of coxae 1-5 (or 1-4), and thin and unornamented antenna 2. Because the vast majority of Corophioidea are tube dwellers, one presumes that the modification and specialization of attributes stated above have a relationship to domiciliary habits. These are mainly visualized by assuming that (1) elongate antennae have selective value to a tube dweller in reaching out of the tube without committing the entire body to predatory attack; (2) reduction in coxae modifies the body toward a cylindrical plan well adapted to a tube; the tube may act as a partial substitute for any egg protection afforded by the coxae; (3) loss of uropodal and telsonic structure and depression of the urosome (pygidization) are connected with ability to grasp the inside of the tube and make quick withdrawals into it; (4) the axial reversal of dominance from gnathopod 2 to gnathopod 1 carries the prehensibility forward toward the tube opening; (5) the pedunculate ocular lobes increase the ability of the animal to see by a slight margin as the eyes project farther forward on the head than in the basic amphipod.

These hypothetical examples illustrate, perhaps, why few corophiid genera retain all of the attributes of the general gammaridean. Despite the apparent advantages of domiciliary specialization, one of the most primitive genera in Corophioidea, *Gammaropsis*, remains the most diversely speciated genus confined to the open sea. It is approximated

in diversity only by *Corophium* and *Grandidierella* Coutière, which occur not only in open seas but mainly in brackish waters or in lagoons.

**PATTERN OF RELATIONSHIPS IN COROPHIIDAE.**—The diversity and absence of intermediate stages among certain corophiids are of such degree as to thwart any clear understanding of evolutionary lines in Corophiidae. The pattern of relationship (Figure 1) duplicates the general pattern (Barnard, 1969a) found in Gammaridea as a whole, in which evolution may be characterized as centrifugal. In this concept one finds that basic corophiids, much as protogammaruses, appear to have spun off evolutionary lines in various morphological directions. So-called straight-line evolutionary sequences are therefore very short.

In the pattern of Figure 1 the genera are arranged in two main groups: those above midline with ordinary heads, and those below with the head recessed for the basal attachment of antenna 2. In the Corophiidae this character alternative is of reasonably broad scope and ease of definition. It also provides a good basis on which to erect a strawman, and provides a point of departure and basis of discussion in attempting to deal with possible parallels in evolution among the several groups of genera. In Figure 1 each half of the diagram is also subdivided into geographic zones: tropical (T), warm-temperate (WT) and boreal-arctic (B)<sup>1</sup>; the latter division also contains deep-sea genera. Each genus on the diagram is fitted closest to its center of geographic zonation.

*Gammaropsis* appears to have all of the theoretically basic or primitive conditions necessary for a corophiid in terms of ordinary gnathopods, unmodified urosome and its appendages, mouthparts, and pereopods. But *Gammaropsis* bears an elongate article 3 of antenna 1 and a partially recessed head, which in general terms within the Gammaridea are atypical. One might however theorize that the early tube-dwelling amphipods of the Corophioidea would have necessarily had these mechanisms to extend the first antenna and the eyes toward the opening of the tube. The alternative conditions, unrecessed head and/or unextended ocular lobes, appear just as successful for survival because half or more of the genera of Corophiidae have one or both of these protrusive characteristics in condition

normal to nestling gammarideans. Hence the early evolution of these characters may have been correlative with tube dwelling but may have been selected against because of a relatively neutral value to certain species in which evolved other characteristics of far more value to the tube dweller. In many of the genera with normal head and antenna 1, the first pair of gnathopods (pereopods of thoracic segment 1) is enlarged and often is prehensile, perhaps an adaptation to bring grasping organs nearer to the tube opening. Because the second pair of gnathopods in these "aorids," with enlarged gnathopod 1, appears similar to first gnathopods of related genera, one supposes that enlargement of gnathopod 1 is a simple reversal mutation in the axial genetic systems of the organism. The term "simple" is applied to this case because an alternative development system would call for gradual reduction of gnathopod 2 and gradual enlargement of gnathopod 1 in an evolutionary sequence. There is virtually no evidence for this more complicated system as aorid amphipods simply appear to have gnathopods 1-2 exchanged by direct axial reversal. Reversals appear to have occurred in several diverse generic lines independent from each other. Returned reversals also appear to have occurred in which the enlarged gnathopod 1 may have developed a distinctive marker such as carpochelation and is then axially reversed to segment 2 as appears to be the case in *Erichthonius* (Ischyroceridae). Genera with enlarged gnathopod 1 were formerly placed in the Aoridae, but the polyphyly of this arrangement is now too obvious to merit its continuation. The enlargement of gnathopod 1 is poorly correlated with protrusive cephalic features, as at least 7 genera with normal head have enlarged gnathopod 1. The evolutionary sequences are therefore multifactorial and undoubtedly contain assortive correlations with degrees of pygidization, reduction of coxae, kinds of domiciles formed by the tube spinners of the pereopods, and details of behavior of the several species. Great assistance will be afforded to our understanding of evolution in this group once functional morphologists explain some of these correlatives.

Because *Protomedeia* is the least specialized genus in the upper half of Figure 1, I have connected *Gammaropsis* and *Protomedeia* with reverse arrows to mark *Protomedeia* as a better example of primitivity in head than *Gammaropsis* and to sug-

<sup>1</sup>Antiboreal=antarctic also included.

gest *Protomedeia* as a possible precursor. This would place the hypothetical geographic origins of corophiids in the north boreal zone near the most primitive living members of the Gammaridae, a not unreasonable situation.

There is no conclusive evidence that a single reversible step between normal head and recessed head occurs in the evolutionary sequences between closely related genera but two cases suggest that this is possible. In Figure 1 the two columns at far right contain the *Microdeutopus* and *Lemboidea* groups in which the upper members have normal heads, the lower members recessed heads. The consistent presence of an enlarged and carpochele gnathopod 1 in the *Microdeutopus* line appears to dominate the group so strongly as to negate the probability that the gnathopod evolved twice (in upper and lower genera). Another kind of easily recognizable gnathopod 1 occurs in the *Lemboidea* group. If a normal head is considered more primitive and the recessed head more advanced, one can point to another case, in *Microdeutopus*, where the basic genus is geographically centered in the north boreal, whereas many of its advanced descendants are found in the tropics or farther south. These considerations suggest that the basic corophiid did not have protrusive cephalic features but that these have evolved independently several times.

Arrows drawn between genera in Figure 1 imply possible descent from species similar to the ancestral genus. No other decisions can be implied from these arrows except that the evolutionary sequence could not be reversed because structurally extinct parts of the morphology would have to be reconstructed.

According to Figure 1 at least 16 evolutionary clusters of genera are present in the Corophiidae alone. Some of the clusters are poorly cohesive (e.g., numbers 3 and 7) and some are poorly segregated from others (e.g., numbers 1 and 2; numbers 13 or 14 as derived from *Gammaropsis*). The origins of clusters 5, 6, and 8 are almost completely unknown and the origins of 3, 7, 8, and 10 are very speculative. Only the sequences between *Gammaropsis* and clusters 4, 11, 12, 13, 14, and possibly 1 and 2 are highly reasonable.

The internal cohesiveness of cluster 1 is based on equality of enlarged gnathopods with progress from *Aorchio* to *Camachio* and *Neohela* by a reduc-

tion and loss of the inner ramus of uropod 3 and a reduction in size of coxae. *Parunciola* in cluster 2 could be descendants of *Aorchio* by loss of the inner ramus on uropod 3 and recessment of the head, and *Parunciola* could then progress to its descendants by way of reduction in coxae.

Cluster 3 is based on *Protomedeia*, a possible ancestor or descendant of *Gammaropsis*, but which is cold-adapted and may have radiated into the "cheira" genera with heavily setose gnathopod 2 (and often gnathopod 1). *Paracorophium* and *Corophium* are also remotely connected to cluster 3 in their heavily setose gnathopod 2 but, in *Paracorophium*, article 4 of gnathopod 2 is formed into a setose lobe which in *Corophium* is joined to article 5. *Corophium* is highly remote from *Paracorophium* because of the reduction in or loss of structure in coxae, mandibular palp, and uropod 3.

Cluster 4, characterized by *Plotis*, appears close to *Gammaropsis*, but all genera within cluster 4 have a weak to strong degree of reduction in the inner ramus of uropod 1, while otherwise retaining large coxae and dominance of gnathopod 2.

Cluster 5, lacking any visible ancestors, is characterized by axial reversal of gnathopods 1-2, the enlarged gnathopod 1 being carpochele. High setosity of gnathopod 2 and loss of the inner ramus of uropod 3 are internal advancements within the cluster.

The *Aora* cluster (6) contains two genera with merochelate and enlarged gnathopod 1 from unknown ancestors. The merochelate gnathopod 1 resembles the merochelate and setose gnathopod 2 of *Paracorophium*, but little else between the genera has similarity.

*Lembos* (cluster 7) can be characterized as a *Protomedeia* with axial reversal of gnathopods. *Lembopsis* has a tooth on article 5 of gnathopod 1 but is not to be considered truly carpochele. *Lemboidea* and *Rudilemboidea* have article 5 of gnathopod 1 dominant over article 6, the reverse of conditions in *Lembos*. Because this situation occurs in gnathopod 2 of *Protomedeia*, *Lemboidea* appears as a better descendant of *Protomedeia* than of *Lembos*, but no other genus with normal head, other than *Protomedeia*, can be found as a better ancestor of *Lembos*. A dashed arrow from *Gammaropsis* is therefore indicated as a remote possibility of relationship, but *Lembos* differs from

*Gammaropsis* in the short article 3 of antenna 1, the normal head, and the axially reversed gnathopods.

The *Dryopoides* cluster (8) is enigmatic. *Paradryope* differs from *Protomedeia* in the short rami of uropod 3 (in resemblance to ischyrocerids) and in the elongate article 3 of antenna 1, while *Dryopoides* has the short rami of uropod 3, short article 3 of antenna 1, and axially reversed gnathopods.

*Isaea* (9) resembles *Protomedeia* but has prehensile pereopods 3-5 and apparently has no web-spinning glands. The species of *Isaea* are commensals on decapods.

*Chevalia* (10), with elongate article 3 of antenna 1, small coxae and fused pleonites 4-5, has no close relative.

Clusters 11-14, composed of *Pseudomegamphopus*, *Aloiloi*, *Megamphopus*, and *Pseudeurystheus*, appear simply to be products of *Gammaropsis*, the first two characterized by axially reversed gnathopods from distinct ancestors within the *Gammaropsis* pool, *Megamphopus* characterized by diversity in anterior coxae, and *Pseudeurystheus* by elongation of article 5 on gnathopod 1. Such unlisted genera as *Segamphopus*, *Kermystheus*, and *Podoceropsis* are advanced products of the *Gammaropsis* pool as based on reduction or loss of accessory flagella or elongation of article 5 on gnathopod 1. These three genera plus *Megamphopus* and *Pseudeurystheus* actually appear to belong to what should be called a supergenus *Gammaropsis*. Their character differentiations are either so minor or so well-connected by intergradations to good species of *Gammaropsis* that they should be recognized only as subgenera or as marks of species groups within *Gammaropsis*. Much investigation and revision of species assigned to the *Gammaropsis* genera await specialists throughout the world (Barnard, 1962).

Neither *Uncinotarsus* (15) nor *Concholestes* (16) can be integrated with those groups characterized by *Siphonoecetes* or *Camacho*, but *Concholestes* appears closest to *Siphonoecetes*, whereas *Uncinotarsus* may be remotely related to *Unciola*.

Other families of the Corophioidea are not shown on Figure 1 but their relationships can be approximated. The Ischyroceridae all have the head recessed and article 3 of antenna 1 elongate. The normal members appear to be a single evo-

lutionary sequence with ancestors near *Gammaropsis*. The aberrant *Erichthonius* and *Cerapus* have gnathopod 2 carpochele in a fashion similar to gnathopod 1 of the *Microdeutopus* line, but in head and antenna 1 do not resemble the *Grandidierella* group (within the *Microdeutopus* line) to which they correspond in the loss of the inner ramus of uropod 3 or the full reduction of rami on uropod 3, whereas they resemble the *Neomegamphopus* line in head and antenna 1 but have a modified uropod 3. Gnathopod 2 of *Erichthonius* could be an axial reversal of gnathopod 1 in *Neomegamphopus*. The slightly hooked single ramus of uropod 3 in *Erichthonius*, with the peduncle elongate, resembles certain Ischyroceridae sufficiently to suggest that *Erichthonius* is an ischyrocerid lacking an inner ramus of uropod 3 but this condition may have evolved independent of ischyrocerids. In any corophiid with highly reduced or missing rami of uropod 3, the probable ancestry is obfuscated. Though *Cerapus* and *Erichthonius* can be defined as ischyrocerids, their probable ancestry in the *Microdeutopus* line should be revalued continuously.

The Amphithoidae are characterized by poorly recessed head and short article 3 of antenna 1 and therefore are closest to *Protomedeia* in the Corophiidae. Some species of amphithoids have developed prehensile pereopods as in *Isaea* of the Corophiidae but apparently they retain tube-spinning glands.

Podoceridae probably have recessed heads, but the heads and eyes of many species are so oddly modified that a decision is difficult to make on this point. Article 3 of antenna 1 is elongate and thus relates this group to *Gammaropsis* ancestors. The tendency to loss of rami on uropod 3 and reduction in coxae places Podoceridae close to *Unciola* and *Unciolella* of the Corophiidae or to *Neohela* in the group with normal head. *Neohela* is a poor hypothetical ancestor to podocerids because of its incipient blindness and slightly enlarged gnathopod 1 (or equally sized gnathopods 1-2), but its extremely slender body is good basic material for the modifications found in Podoceridae. Urosomite 1 of podocerids is elongate and the abdomen is usually heavily flexed beneath the thorax, and in some podocerids the thorax is broadened laterally. Podocerids clearly appear to be ancestors of Caprogammaridae and the Caprel-

lida, as podocerids show a tendency to reduction of pereopods 1-2, a reduction and pygidization of the urosome, and, in *Dulichia*, a shortening and splitting away from the thorax of pereonite 1, which in caprellids becomes fused with the head.

PROCEDURES.—This paper is written in condensed form; references to old genera and illustrations may be consulted in Barnard (1969a). Two distinct keys offer a choice of characteristics for identification. New diagnoses to genera in the Corophiidae and Ischyroceridae are presented. Diagnoses in the other corophioidean families remain identical to those in Barnard (1969a).

### COROPHIOIDEA

DIAGNOSIS.—Telson fleshy, often pillow shaped but always depressed dorsoventrally, fleshiness not confined to ventral keel only, telson entire though occasionally with weak lobation.

DESCRIPTION.—Except for Biancolinidae mouthparts like those of basic gammaridean with weak exceptions; mandible always bearing incisor, triturative molar, spine row, and palp, latter rarely reduced in number of articles; lower lip with inner lobes, outer lobes occasionally subdivided; palp of maxilla 1 large; inner and outer plates of maxilliped large, palp large but rarely article 4 vestigial; coxa 1 generally as large as coxa 2 except in two genera; coxae 2-3 well developed, or equal to coxa 1, coxa 4 never posteriorly excavate; rostrum rarely present, never hood shaped; peduncle of antenna 1 with elongate articles 1-2, never with telescoped articles 2-3; article 3 of gnathopod 2 not elongate and hand not like Lysianassidae; pereopod 5 longer than 4 but never vastly elongate and fossorial as in Oedicerotidae; telson not elongate; urosomites 2-3 not selectively coalesced together, if fusion occurring either urosomites 1-2 together or 1-3 together.

#### Key to Families of Corophioidea

1. Urosome formed into large, rectangular, flat rigid box much longer than pleonites 1-3 together, uropod 2 heavily flabellate ..... CHELURIDAE  
Urosome not boxlike or if certain segments coalesced not significantly longer than pleonites 1-3 together, uropod 2 not flabellate ..... 2
2. Urosomite 1 more than twice as long as urosomite 2 and always free ..... PODOCERIDAE  
Urosomite 1 not more than 1.5 times as long as urosomite 2 even if coalesced with that segment ..... 3
3. Uropod 3 lacking rami ..... COROPHIIDAE (in part)  
Uropod 3 with 1-2 rami ..... 4
4. Ramus or rami of uropod 3 half or less as long as peduncle ..... 5  
Ramus or rami of uropod 3 as long as or longer than peduncle ..... 6
5. At least one ramus of uropod 3 heavily setose terminally ..... AMPITHOIDAE  
No ramus of uropod 3 heavily setose, maximum of 3 wirelike setae on outer ramus laterally ..... ISCHYROCERIDAE
6. Mandibular palp absent, molar absent or vestigial, palp of maxilla 1 vestigial or absent, palp of maxilliped 3-articulate ..... BIANCOLINIDAE  
Palps of mouthparts present and normal except palp of mandible occasionally 1-2 articulate ..... COROPHIIDAE (in part)

### COROPHIIDAE

(=AORIDAE, ISAEIDAE, PHOTIDAE)

DIAGNOSIS.—Corophioidean with ordinary urosomite 1, if rarely coalesced to other urosomites not elongate; uropod 3 in two configurations: (1) lacking rami, peduncle setose; (2) bearing ramus or rami as long as or longer than peduncle (except *Dryopoides* and *Paradryope*), at least one ramus

with terminal setae, or bare, no hooks; pereopods glandular with rare exception.

Species without rami on uropod 3 can be distinguished from Ampithoidae in the undivided outer lobes of the lower lip but cannot be distinguished from Ischyroceridae. In other words, an ischyrocerid without rami on uropod 3 could not be distinguished from Corophiidae and therefore the two genera of corophioideans in this circumstance must be placed in the Corophiidae.

## Key I to the Genera of Corophiidae

|  |       |
|--|-------|
| 1. Rami of uropod 3 absent .....                               | Key A |
| One or two rami of uropod 3 present .....                      | 2     |
| 2. Uropod 3 with one ramus .....                               | Key B |
| Uropod 3 with two rami .....                                   | 3     |
| 3. Inner ramus of uropod 3 much shorter than outer ramus ..... | Key C |
| Rami of uropod 3 subequal in length to each other .....        | Key D |

## KEY A (a triplet)

|   |                     |
|---|---------------------|
| 1a. Gnathopod 2 larger than gnathopod 1, antenna 2 of medium stoutness, uncuspidate, longer than antenna 1, article 3 of antenna 1 subequal to article 1, coxae 5-7 not acuminate, rami of uropod 1 equal .....       | <i>Concholestes</i> |
| b. Gnathopod 1 larger than gnathopod 2, antenna 2 slender, uncuspidate, shorter than antenna 1, article 3 of antenna 1 shorter than article 1, coxae 5-7 acuminate, rami of uropod 1 equal .....                      | <i>Uncinotarsus</i> |
| c. Gnathopod 1 larger than gnathopod 2, antenna 2 of medium stoutness, cuspidate, shorter than antenna 1, article 3 of antenna 1 shorter than article 1, coxae 5-6 acuminate, inner ramus of uropod 1 vestigial ..... | <i>Rildardanus</i>  |

## KEY B

|  |   |
|--|---|
| 1. Gnathopod 2 with articles 4-5 contiguous in corophiid fashion (see text) .....  | <i>Corophium</i>                                  |
| Gnathopod 2 with articles 4-5 attached in ordinary fashion .....   | 2   |
| 2. Pleonites 4-5 coalesced together .....  | <i>Kamaka</i>                                     |
| Pleonites 4-5 separate .....   | 3   |
| 3. Coxae serially discontinuous and very small .....   | 4   |
| Coxae serially contiguous and usually large .....  | 10  |
| 4. Uropod 2 with one ramus .....   | 5   |
| Uropod 2 with 2 rami .....   | 6   |
| 5. Accessory flagellum absent, mandibular palp 1-articulate, gnathopods weakly subchelate and not subequal to each other, uropod 3 with peduncle medially expanded .....   | <i>Siphonoecetes</i>                              |
| Accessory flagellum 2-articulate, mandibular palp 3-articulate, gnathopod 1 enlarged in male, carpochebate, uropod 3 with normal peduncle .....  | <i>Chevreuxius</i> (Ischyroceridae)               |
| 6. Coxae angular .....   | 7   |
| Coxae softly rounded .....   | 8   |
| 7. Article 6 of gnathopod 2 an elongate rectangle, parachelate, or palm transverse, antennae usually much shorter than body, flagellum of antenna 2 scarcely longer than peduncular article 5, peduncle of uropod 3 often expanded medially very strongly, antenna 2 generally considered stout, often strongly so ..... | <i>Unciola</i>                                    |
| Article 6 of gnathopod 2 ovate or trapezoidal, expanded, palm oblique, antennae usually as long as or longer than body, flagellum of antenna 2 nearly as long as all articles of peduncle, peduncle of uropod 3 rarely expanded medially and usually poorly so, antenna 2 very slender .....                             | <i>Neohela</i>                                    |
| 8. Accessory flagellum only 1-articulate, male gnathopod 1 carpochebate .....  | <i>Neomicrodeutopus</i> and <i>Grandidierella</i> |
| Accessory flagellum rarely 1-articulate, usually multiarticulate, male gnathopod 1 not carpochebate .....  | 9   |
| 9. Inner plate of maxilla 1 with one seta, ramus of uropod 3 about 1.5 times as long as peduncle .....   | <i>Unciolella</i>                                 |
| Inner plate of maxilla 1 with about 10 setae lining medial edge, ramus of uropod 3 about twice as long as peduncle .....   | <i>Parunciola</i>                                 |
| 10. Eyes on extended cephalic peduncles .....  | 11  |
| Eyes on side of head in normal gammaridean fashion .....   | 13  |
| 11. Ramus of uropod 3 basally almost as broad as apex of peduncle .....  | <i>Microphotis</i>                                |
| Ramus of uropod 3 basally half or less as broad as apex of peduncle .....  | 12  |
| 12. Male gnathopod 2 propodochebate .....  | <i>Cerapopsis</i>                                 |
| Male gnathopod 2 subchelate .....  | <i>Ampelisciphotis</i> (= <i>Gaviota</i> )        |



13. Gnathopods 1-2 simple, both small, gnathopod 2 with vestigial setose dactyl.....*Kuphocheira*  
 Gnathopods 1-2 subchelate, one or the other enlarged, dactyls of gnathopod 2 normal .....14
14. Gnathopod 1 slightly to greatly larger than gnathopod 2 .....15  
 Gnathopod 2 slightly to greatly smaller than gnathopod 1 .....17
15. Ramus of uropod 3 twice as long as peduncle, male gnathopod 1 carpochebate .....16  
 Ramus of uropod 3 only as long as peduncle, male gnathopod 1 not carpochebate .....  
 ..... *Paraoroides*
16. Mandibular palp article 1 elongate ..... *Grandidierella*  
 Mandibular palp article 1 not elongate ..... *Neomicrodeutopus*
17. Accessory flagellum absent ..... *Microphotis*  
 Accessory flagellum present .....18
18. Male coxae 1-4 similar to each other in size and shape ..... *Microprotopus*  
 Male coxae 1-4 of varying sizes and shapes ..... *Cheiriphotis*

## KEY C

1. Gnathopod 2 with articles 4-5 contiguous in corophiid fashion (see text), but article 4 free and projecting during flexion ..... *Paracorophium*  
 Gnathopod 2 with articles 4-5 attached to each other normally ..... 2
2. Coxae very small and discontinuous serially ..... 3  
 Coxae large and touching serially ..... 4
3. Gnathopod 1 scarcely larger than and similar to gnathopod 2, palm smooth, inner ramus of uropod 3 distinct, pleonal epimeron 3 smoothly quadrate ..... *Camacho*  
 Gnathopod 1 much larger than gnathopod 2, palm sculptured, inner ramus of uropod 3 usually represented by large peduncular process, when distinct scarcely shorter than outer ramus, pleonal epimeron 3 bearing posteroventral tooth ..... *Unciola*
4. Coxa 1 smaller than coxa 2 and partially or fully hidden by coxa 2 ..... *Leptocheirus*  
 Coxa 1 not grossly smaller than coxa 2 and not substantially hidden by coxa 2 ..... 5
5. Gnathopods 1-2 simple and small ..... *Haplocheira*  
 Gnathopods subchelate and either gnathopod 1 or gnathopod 2 enlarged in both sexes .. 6
6. Gnathopod 1 larger than gnathopod 2, in male carpochebate, gnathopod 2 small and nearly simple ..... *Acuminodeutopus*  
 Gnathopod 2 larger than gnathopod 1, in male grossly subchelate, gnathopod 1 small and normally subchelate .....7
7. Accessory flagellum absent or formed as vestigial scale ..... *Photis*  
 Accessory flagellum multiarticulate ..... 8
8. Uropod 3 scalelike, peduncle platelike ..... *Cheiriphotis*  
 Uropod 3 cylindrical ..... *Protomedeia* (subgenus *Cheirimedeia*)

## KEY D

1. Anterior coxae small and slightly discontinuous, pleonites 4-5 coalesced together ..... *Chevalia*  
 Anterior coxae small or large but touching serially, pleonites 4-5 free ..... 2
2. Gnathopod 2 distinctly larger than gnathopod 1 in both sexes (or value of this character undecided) ..... 3  
 Gnathopod 1 distinctly larger than gnathopod 2 ..... 8
3. Article 3 of antenna 1 equal to or slightly longer than article 1 ..... 4  
 Article 3 of antenna 1 shorter than article 1 ..... 6
4. Gnathopods 1-2 of medium size and equal to each other, pereopod 3 shorter than articles 1-5 of pereopod 5 together ..... *Aorcho*  
 Gnathopod 2 distinctly larger than gnathopod 1 ..... 5
5. Coxae longer than height of pereonites, pereopods 3-5 subprehensile ..... *Isaea*  
 Coxae equal to or much shorter than height of pereonites, pereopods 3-5 simple .....  
 ..... *Pseudeurytheus*, *Segamphopus*, *Audulla*,  
*Bonnierella* (Ischyroceridae), *Kermystheus*, *Podoceropsis*, *Megamphopus*, *Gammaropsis*
6. Coxa 1 significantly smaller than and covered by coxa 2 ..... *Leptocheirus*  
 Coxa 1 not significantly smaller than nor covered by coxa 2 ..... 7
7. Accessory flagellum absent, inner plate of maxilla 2 heavily setose basomedially, inner plate of maxilla 1 as long as palp, article 4 of maxillipedal palp vestigial ..... *Goesia*

|   |  |
|---|--|
| Accessory flagellum 3+articulate, inner plate of maxilla 2 not setose basomedially, inner plate of maxilla 1 half as long as palp, article 4 of maxillipedal palp ordinary .....        | <i>Protomecia</i>                          |
| 8. Male gnathopod 1 merochelate .....   | 9  |
| Male gnathopod 1 not merochelate .....  | 10   |
| 9. Accessory flagellum absent .....   | <i>Aoroidea</i>                            |
| Accessory flagellum 3+articulate .....  | <i>Aora</i>                                |
| 10. Male gnathopod 1 with article 5 broader and/or longer than article 6 .....  | 11   |
| Male gnathopod 1 with article 6 as broad and as long as article 5 .....   | 18   |
| 11. Male gnathopod 1 not carpochelate .....   | 12   |
| Male gnathopod 1 carpochelate .....   | 14   |
| 12. Both rami of uropod 3 much shorter than peduncle, rami basally disjunct from each other .....   | <i>Dryopoides</i>                          |
| One ramus of uropod 3 as long as or longer than peduncle, rami attached to peduncle contiguously .....  | 13   |
| 13. Gnathopods fully subchelate .....   | <i>Lemboidea</i>                           |
| Gnathopods scarcely subchelate .....  | <i>Rudilemboidea</i>                       |
| 14. Gnathopod 2 of male heavily setose on full anterior margin of article 5 .....   | 15   |
| Gnathopod 2 of male sparsely setose on anterior margin of article 5 or setae compacted into distal bundle .....   | 17   |
| 15. Article 5 of gnathopod 2 longest, female gnathopod 1 simple .....   | <i>Neomegamphopus</i>                      |
| Article 6 of gnathopod 2 longest, female gnathopod 1 subchelate .....   | 16   |
| 16. Head elongate, antenna 2 inserted in head behind level of eyes, gnathopod 2 of male as stout as gnathopod 1, of female weakly setose anteriorly .....                               | <i>Amphideutopus</i>                       |
| Head not elongate, antenna 2 inserted in head on level with eyes or in front of them, gnathopod 2 of male much more slender than gnathopod 1, of female densely setose anteriorly ..... | <i>Microdeutopus (=Coremapus)</i>          |
| 17. Antenna 2 inserted in head behind level of eye, inner plate of maxilla 1 with medial setae, article 3 of mandibular palp stout and clavate .....                                    | <i>Konatopus</i>                           |
| Antenna 2 inserted in head level with eye, inner plate of maxilla 1 lacking medial setae (one apical only), article 3 of mandibular palp elongate and linear but falcate .....          | <i>Microdeutopus</i> and <i>Hansenella</i> |
| 18. Article 3 of antenna 1 as long as article 1 .....   | 19   |
| Article 3 of antenna 1 shorter than article 1 .....   | 20   |
| 19. Gnathopod 2 stout, article 6 two-thirds as broad as article 6 of gnathopod 1 .....  | <i>Aloilo</i>                              |
| Gnathopod 2 slender, article 6 one-third as broad as article 6 of gnathopod 1 .....   | <i>Pseudomegamphopus</i>                   |
| 20. Male gnathopod 1 with long tooth on article 5 .....   | <i>Lembopsis</i>                           |
| Male gnathopod 1 with posterior lobe but not distinct tooth on article 5 .....  | 21   |
| 21. Gnathopod 2 simple, article 5 of gnathopod 1 very bulbous .....   | <i>Xenocheira</i>                          |
| Gnathopod 2 subchelate, article 5 of gnathopod 1 not bulbous .....  | <i>Lembos</i>                              |

### Key II to the Genera of Corophiidae

|   |                      |
|---|----------------------|
| 1. Articles 4-5 of gnathopod 2 contiguous in corophiid fashion (see text) .....   | 2                    |
| Articles 4-5 of gnathopod 2 attached to each other normally .....   | 3                    |
| 2. Uropod 3 with 2 unequal rami, mandibular palp 3-articulate, article 4 of gnathopod 2 detached from article 5 along contiguous margin ..... | <i>Paracorophium</i> |
| Uropod 3 with one ramus, mandibular palp 2-articulate, article 4 of gnathopod 2 fully joined to article 5 .....                               | <i>Corophium</i>     |
| 3. Pleonites 4-5 coalesced together .....   | 4                    |
| Pleonites 4-5 free .....  | 5                    |
| 4. Uropod 3 biramous, antenna 1 longer than antenna 2, anterior coxae all subequal to each other in size, small, discontinuous .....          | <i>Chevalia</i>      |
| Uropod 3 with one ramus, antenna 1 less than half as long as antenna 2, anterior coxae large, touching, coxa 1 enlarged .....                 | <i>Kamaka</i>        |
| 5. Coxa 1 much shorter, smaller than, and covered by coxa 2 .....   | <i>Leptocheirus</i>  |
| Coxa 1 subequal in size and not covered by coxa 2 .....   | 6                    |

|  |  |    |
|--|--|----|
| 6. Pereopods 3-5 prehensile .....  | <i>Isaea</i>   | 7  |
| Pereopods 3-5 simple .....   |  | 7  |
| 7. Anterior coxae serially discontinuous, not deeper than broad .....  |  | 8  |
| Anterior coxae serially overlapping, either long or short .....  |  | 16 |
| 8. Rami of uropod 3 absent .....   | Key A of Key I   | 9  |
| One or two rami of uropod 3 present .....  |  | 9  |
| 9. Accessory flagellum absent, mandibular palp 1-articulate .....  | <i>Siphonocetes</i>  | 10 |
| Accessory flagellum present, mandibular palp 3-articulate .....  |  | 10 |
| 10. Uropod 3 with 2 rami, inner ramus small .....  | <i>Camacho</i>   | 11 |
| Uropod 3 with one ramus .....  |  | 11 |
| 11. Male gnathopod 1 carpocheleate .....   |  | 12 |
| Male gnathopod 1 not carpocheleate .....   |  | 13 |
| 12. Uropod 2 with one ramus .....  | <i>Chevreuxius</i>   | 13 |
| Uropod 2 with 2 rami .....   | <i>Neomicrodeutopus</i> and <i>Grandidierella</i>  | 13 |
| 13. Peduncle of uropod 3 medially expanded .....   | <i>Unciola</i>   | 14 |
| Peduncle of uropod 3 not medially expanded .....   |  | 14 |
| 14. Accessory flagellum 1-articulate, article 3 of antenna 1 equal to or shorter than article 1 .....  | <i>Unciolella</i>  | 15 |
| Accessory flagellum multiarticulate, article 3 of antenna 1 longer than article 1 .....  |  | 15 |
| 15. Coxae angular, inner plate of maxilla 1 with 5 setae .....   | <i>Neohela</i>   | 15 |
| Coxae softly rounded, inner plate of maxilla 1 with 10 setae (coxae actually touching serially) .....  | <i>Parunciola</i>  | 15 |
| 16. Male gnathopod 1 larger than gnathopod 2, article 5 longer and stouter than shortened and slender article 6 .....  | Key E  | 17 |
| Male gnathopod 1, if larger than gnathopod 2, with article 6 equal in size to or dominating article 5 .....  |  | 17 |
| 17. Article 3 of antenna 1 equal to or longer than article 1 .....   |  | 18 |
| Article 3 of antenna 1 shorter than article 1 .....  |  | 27 |
| 18. Uropod 3 with one ramus .....  |  | 19 |
| Uropod 3 with 2 rami .....   |  | 22 |
| 19. Gnathopods simple, dactyl of gnathopod 2 vestigial and setose .....  | <i>Kuphocheira</i> *   | 20 |
| Gnathopods subchelate, dactyl of gnathopod 2 normal .....  |  | 20 |
| 20. Ramus of uropod 3 basally almost as broad as apex of peduncle .....  | <i>Microphotis</i>   | 21 |
| Ramus of uropod 3 basally half or less as broad as apex of peduncle .....  |  | 21 |
| 21. Male gnathopod 2 propodochelate .....  | <i>Cerapopsis</i>  | 23 |
| Male gnathopod 2 subchelate .....  | <i>Ampelisciphotis</i> (= <i>Gaviota</i> )   | 23 |
| 22. Inner ramus of uropod 3 very short .....   | <i>Photis</i>  | 23 |
| Rami of uropod 3 subequal to each other .....  |  | 23 |
| 23. Gnathopod 1 much larger than gnathopod 2 .....   |  | 24 |
| Gnathopod 1 equal to or smaller than gnathopod 2 .....   |  | 25 |
| 24. Gnathopod 2 stout, article 6 over two-thirds as broad as article 6 of gnathopod 1 .....  | <i>Aloiloi</i>   | 25 |
| Gnathopod 2 slender, article 6 one-third as broad as article 6 of gnathopod 1 .....  | <i>Pseudomegamphopus</i>   | 25 |
| 25. Gnathopods 1-2 equal to each other, pereopod 3 shorter than articles 1-4 of pereopod .....   | <i>Aorcho</i>  | 26 |
| Gnathopod 2 larger than gnathopod 1, pereopod 3 longer than articles 1-5 of pereopod .....   |  | 26 |
| 26. Accessory flagellum 3+ articulate .....  | <i>Pseudeurystheus</i> , <i>Gammaropsis</i> †  | 28 |
| Accessory flagellum 0-2 articulate .....   | <i>Bonnierella</i> , <i>Segamphopus</i> , <i>Kermystheus</i> , <i>Podoceropsis</i> , <i>Audulla</i> , <i>Megamphopus</i> † | 28 |
| 27. Uropod 3 with 2 rami equal to each other in size .....   |  | 28 |
| Uropod 3 with less than 2 full rami .....  |  | 34 |
| 28. Gnathopod 2 larger than gnathopod 1 .....  |  | 29 |
| Gnathopod 1 larger than gnathopod 2 .....  |  | 30 |
| 29. Accessory flagellum absent, inner plate of maxilla 2 heavily setose basomedially, inner plate of maxilla 1 as long as palp, article 4 of maxillipedal palp vestigial ..... | <i>Goesia</i>  | 30 |

\* Antenna 1 unknown.

† These genera difficult to distinguish at present.

|   |                      |
|---|----------------------|
| Accessory flagellum 3+-articulate, inner plate of maxilla 2 not setose basomedially, inner plate of maxilla 1 half as long as palp, article 4 of maxillipedal palp ordinary ..... | <i>Protomedeia</i>   |
| 30. Article 5 of gnathopod 2 strongly bulbous .....   | <i>Xenocheira</i>    |
| Article 5 of gnathopod 2 not bulbous .....  | 31                   |
| 31. Male gnathopod 1 merochelate .....  | 32                   |
| Male gnathopod 1 not merochelate .....  | 33                   |
| 32. Accessory flagellum absent .....  | <i>Aoroidea</i>      |
| Accessory flagellum present .....   | <i>Aora</i>          |
| 33. Article 5 of male gnathopod 1 with long posterior tooth, anterior margin of article 5 on male gnathopod 2 heavily setose .....  | <i>Lembopsis</i>     |
| Article 5 of male gnathopod 1 lobate but lacking tooth, anterior margin of article 5 on male gnathopod 2 usually poorly setose .....  | <i>Lembos</i>        |
| 34. Uropod 3 with 2 unequally sized rami .....  | 35                   |
| Uropod 3 with one ramus or none .....   | 36                   |
| 35. Gnathopods simple .....   | <i>Haplocheira</i>   |
| Gnathopods subchelate .....   | <i>Cheiriphotis</i>  |
| 36. Gnathopod 1 larger than gnathopod 2 .....   | <i>Paraoroides</i>   |
| Gnathopod 2 larger than gnathopod 1 .....   | 37                   |
| 37. Gnathopods simple, dactyl of gnathopod 2 vestigial and setose .....   | <i>Kuphocheira</i>   |
| Gnathopods subchelate, dactyl of gnathopod 2 normal .....   | 38                   |
| 38. Coxae 1-4 of varying sizes and shapes in male .....   | <i>Cheiriphotis</i>  |
| Coxae 1-4 of similar sizes and shapes among themselves in male .....  | <i>Microdeutopus</i> |

## KEY E (part of Key II)

|  |  |
|--|--|
| 1. Article 5 of male gnathopod 1 lacking processes, softly lobate .....                              | 2  |
| Article 5 of male gnathopod 1 carpochelate or bearing sharp process .....                            | 3  |
| 2. Gnathopods fully subchelate .....   | <i>Lemboides</i>                           |
| Gnathopods poorly subchelate .....   | <i>Rudilemboides</i>                       |
| 3. Antenna 2 attached to head level with eye .....   | 4  |
| Antenna 2 attached to head posterior to level of eye .....   | 8  |
| 4. Uropod 3 with one ramus .....   | 5  |
| Uropod 3 with 2 rami .....   | 6  |
| 5. Mandibular palp article 1 elongate .....  | <i>Grandidierella</i>                      |
| Mandibular palp article 1 not elongate .....   | <i>Neomicrodeutopus</i>                    |
| 6. Rami of uropod 3 much shorter than peduncle .....   | <i>Dryopoides</i>                          |
| Rami of uropod 3 as long as or longer than peduncle .....  | 7  |
| 7. Articles 4-6 of gnathopod 2 poorly setose anteriorly, article 4 short .....                       | <i>Hansenella</i> and <i>Microdeutopus</i> |
| Articles 4-6 of gnathopod 2 heavily setose anteriorly, article 4 elongate .....                      | <i>Microdeutopus</i> (= <i>Coremapus</i> ) |
| 8. Inner ramus of uropod 3 shortened .....   | <i>Acuminodeutopus</i>                     |
| Rami of uropod 3 subequal to each other in length .....  | 9  |
| 9. Articles 5-6 of male gnathopod 2 poorly setose anteriorly .....                                   | <i>Konatopus</i>                           |
| Articles 5-6 of male gnathopod 2 strongly setose anteriorly .....                                    | 10   |
| 10. Male gnathopod 2 with well-defined palm, rami of uropod 3 nearly twice as long as peduncle ..... | <i>Amphideutopus</i>                       |
| Male gnathopod 2 scarcely subchelate, rami of uropod 3 subequally as long as peduncle .....          | <i>Neomegamphopus</i>                      |

## Diagnoses of Genera

PROCEDURES.—Synonymies, type-species, number of species, and distributions are found in Barnard (1969a), except for those genera described since 1965.

The term "ordinary" is used for brevity to describe the following conditions: (1) *coxae*: (mean-

ing coxae 1-4) longer than broad and touching or overlapping; (2) *gnathopods*: small and subchelate; (3) *uropod 3*: peduncle short, about as long as telson, rami longer than peduncle, thin, moderately setose, extending subequally; (4) *telson*: sub-circular, trapezoidal, rectangular, width and length dimensions not extraordinary, telson generally less

than 1.5 times as broad as long or less than 1.5 times as long as broad, posteriorly truncate or weakly concave or convex, with sets of parasagittal (weakly apicolateral) setae, setules, spinules, or nasiform humps.

Extraordinary characters are cited in a second paragraph of pertinent diagnoses. These deviations from a normal condition are of low frequency sufficient to eliminate them from description in every diagnosis, thus contributing to the brevity of the arrangement. The deviant characters are described in the following points: (1) head extremely elongate or eyes placed on pedunculate ocular lobes; (2) mandibular palp article 1 elongate; (3) mandibular palp article 3 clavate; (4) inner plate of maxilla 1 with medial setae; (5) inner plate of maxilla 2 lacking medial setae; (6) palp article 4 of maxilliped not unguiform and bearing single apical nail; (7) anterior male coxae of grossly variable shapes, if of significant taxonomic value; (8) pereopods prehensile; (9) one or more rami of uropods 1–2 shortened or absent; (10) any urosomites coalesced; (11) epimeron 3 bearing large tooth; (12) second antenna especially thickened or toothed.

Certain genera of Ischyroceridae are included in keys and diagnoses because of their similarity to corophiids.

#### *Acuminodeutopus* J. L. Barnard

Article 3 of antenna 1 shorter than article 1; accessory flagellum about 2-articulate; head deeply recessed; coxae short but contiguous; gnathopod 1 enlarged, ordinary on female, on male carpochele, article 6 thin, simple, shorter and narrower than article 5, dactyl elongate, overlapping chela of article 5, gnathopod 2 small but article 5 elongate, scarcely subchelate, poorly setose anteriorly; uropod 3 with short peduncle, outer ramus longer than peduncle, inner ramus short and scalelike or less than half as long as outer ramus; telson ordinary but armaments obsolescent.

Mandibular palp article 1 slightly elongate.

#### *Aloiloi* J. L. Barnard

*Aloiloi* J. L. Barnard, 1970:63–65.

TYPE-SPECIES.—*A. nenu* J. L. Barnard, 1970.

Article 3 of antenna 1 as long as article 1; ac-

cessory flagellum present; head deeply recessed; coxae short but contiguous; gnathopod 1 enlarged, in male subchelate, article 6 strongly broadened and dominating article 5, dactyl fitting palm. gnathopod 2 also enlarged slightly, subchelate, article 6 dominating article 5; uropod 3 ordinary but stout, telson ordinary.

Mandibular palp article 3 clavate; inner plate of maxilla 1 medially setose; palp article 4 of maxilliped subclavate but with long nail; male coxa 1 slightly enlarged.

#### *Ampelisciphotis* Pirlot, new synonymy

*Gaviota* J. L. Barnard, 1958:87.

Article 3 of antenna 1 as long as or longer than article 1; accessory flagellum absent; head deeply recessed; coxae ordinary; gnathopods 1–2 ordinary; uropod 3 uniramous, peduncle elongate, ramus shorter than peduncle; telson ordinary.

Ocular lobes pedunculate.

#### *Amphideutopus* J. L. Barnard

[Article 3 of antenna 1 and accessory flagellum unknown]; head deeply recessed; coxae short but contiguous; gnathopods 1–2 of female of approximately equal size to each other, ordinary, poorly setose anteriorly; gnathopods 1–2 of male both enlarged, gnathopod 1 carpochele, article 6 narrower and much shorter than article 5, poorly subchelate but dactyl elongate and overlapping chela of article 5, posterior margins of articles 4–6 heavily setose, gnathopod 2 with articles 4–5 inflated, article 6 slightly dominating article 5, subchelate, anterior margins of articles 5–6 heavily setose; uropod 3 ordinary; telson ordinary.

Mandibular palp article 3 slightly clavate; inner plate of maxilla 1 with 1 medial seta.

#### *Aora* Krøyer

Article 3 of antenna 1 shorter than article 1; accessory flagellum present; head poorly recessed; coxae ordinary or slightly shortened; gnathopod 1 enlarged, ordinary or scarcely subchelate in female, merochelate in male, articles 5–6 linear, palm absent, dactyl elongate, gnathopod 2 subchelate, moderately setose anteriorly; uropod 3 ordinary; telson ordinary.

Male coxa 1 enlarged or projecting askew.

***Aorcho* J. L. Barnard**

Article 3 of antenna 1 as long as article 1; accessory flagellum multiarticulate; head poorly to moderately recessed; coxae very short but contiguous; gnathopods 1-2 slightly enlarged together, equal to each other in size, ordinary and subchelate, article 6 weakly dominating article 5; uropod 3 ordinary but peduncle slightly flattened; telson ordinary.

Urosome depressed.

***Aoroides* Walker**

Like *Aora* but accessory flagellum absent.

***Camacho* Stebbing**

Article 3 of antenna 1 much shorter than article 1; accessory flagellum multiarticulate; head poorly recessed; coxae very small, discontinuous; gnathopods 1-2 small, subequal in size to each other but gnathopod 1 slightly the larger, ordinary, subchelate; peduncle of uropod 3 short, outer ramus elongate and slender, inner ramus very short and scalelike; telson ordinary.

***Cerapopsis* Della Valle**

Article 3 of antenna 1 as long as article 1; accessory flagellum absent; head deeply recessed; coxae ordinary to elongate; female gnathopod 1 ordinary but poorly subchelate, dactyl elongate, female gnathopod 2 ordinary and slightly enlarged, article 6 dominating article 5; male gnathopod 1 highly elongate, almost simple, gnathopod 2 enlarged, weakly to strongly propodochelate, chela multifid, article 6 dominating article 5, dactyl slightly overlapping protuberant palm; uropod 3 uniramous, peduncle elongate, ramus as long as peduncle; telson ordinary.

Mandibular palp article 3 weakly clavate; ocular lobes elongate; urosome depressed.

***Cheiriphotis* Walker**

Article 3 of antenna 1 shorter than article 1; accessory flagellum multiarticulate; head deeply recessed; coxae ordinary but anterior coxae of male of varying sizes and shapes; gnathopod 1

ordinary, gnathopod 2 enlarged especially in male, article 6 heavily dominating article 5, palm sculptured, dactyl fitting palm, female gnathopod 2 scarcely enlarged, palm distinct; uropod 3 short, peduncle flattened, rami shorter than peduncle, inner ramus vestigial or absent; telson ordinary.

Mandibular palp article 3 weakly clavate; inner plate of maxilla 1 medially setose; palp article 4 of maxilliped subclavate.

***Chevalia* Walker**

Article 3 of antenna 1 slightly shorter than article 1; accessory flagellum 2-articulate; head poorly recessed; coxae short, discontinuous; gnathopod 1 ordinary, gnathopod 2 enlarged in both sexes, subchelate, article 6 enlarged and dominating article 5, dactyl scarcely fitting palm, latter transverse to oblique; uropod 3 short, rami scarcely as long as peduncle but extending equally; telson ordinary.

Urosomites 1-2 coalesced; inner plate of maxilla 1 medially setose; palp article 4 of maxilliped clavate.

***Chevreuxius* Bonnier (Ischyroceridae)**

Article 3 of antenna 1 elongate but slightly shorter than article 1; accessory flagellum 2-articulate; head poorly recessed; coxae very short and discontinuous; male gnathopod 1 enlarged and carpochele, article 6 very short and narrower than article 5, sculptured but subchelate, dactyl overlapping palm; gnathopod 2 ordinary, small, moderately setose; uropod 3 uniramous, peduncle flattened and expanded, ramus subequal to peduncle in length; telson ordinary.

Palp article 4 of maxilliped slightly shortened; uropod 2 uniramous.

***Concholestes* Giles**

Article 3 of antenna 1 subequally as long as article 1; accessory flagellum absent; head poorly recessed; coxae very short, discontinuous; gnathopod 1 ordinary, poorly subchelate, gnathopod 2 slightly enlarged, article 6 dominating article 5, subchelate, palm sculptured; uropod 3 composed only of setose peduncle; telson apparently coalesced with urosomite 3, thus telson enlarged, armaments obso-

lete [but Giles describes 6 pleonites and telson as short, squamous and semilunar].

?Antenna 2 slightly thickened; ?uropod 2 uniramous; body subcylindrical, urosome depressed.

### *Corophium* Latreille

Article 3 of antenna 1 shorter than article 1; accessory flagellum absent; head deeply recessed; coxae very short, discontinuous; gnathopods alike between the sexes, gnathopod 1 generally ordinary but heavily setose, article 5 elongate, palm transverse, gnathopod 2 scarcely enlarged, article 4 enlarged, inflated, incipiently merchelate but extended and fused distally along posterior edge of article 5, heavily setose posteriorly, article 6 longer than article 5, slender, simple, dactyl elongate; uropod 3 uniramous, short, peduncle and ramus flattened and broad, ramus heavily setose; telson softly triangular, slightly enlarged, armaments obsolescent.

Antenna 2 thickened and elongate but sexually dimorphic, male with weak teeth on articles 4–5; mandibular palp 2-articulate, geniculate between articles 1–2; urosomites depressed, articulate or coalesced; body weakly subcylindrical; ocular lobes weakly pedunculate.

### *Dryopoides* Stebbing

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2-articulate; head poorly recessed; coxae ordinary; gnathopod 1 of female slightly enlarged, gnathopods 1–2 subchelate, gnathopod 2 weakly setose anteriorly, male gnathopods 1–2 enlarged, gnathopod 2 larger and longer than gnathopod 1, both subchelate; uropod 3 with weakly elongate and broadened peduncle, rami extending equally but tiny, half or less as peduncle, rami disjunct from each other on attaching to peduncle; telson enlarged, corresponding with dorsal evanescence of urosomite 3.

Note asynchrony of male and female gnathopods.

### *Gammaropsis* Liljeborg

(Including *Audulla* Chevreux, *Bonnierella* Chevreux (also Ischyroceridae), *Kermystheus* J. L. Barnard, *Megamphopus* Norman, *Podoceropsis* Boeck, *Pseudeurystheus* Schellenberg, *Segamphopus* J. L. Barnard, and unnamed subdivision)

Article 3 of antenna 1 as long as article 1; accessory flagellum multiarticulate (typical) to absent; head deeply recessed but occasionally recessment diminished; coxae ordinary to short but contiguous; gnathopod 1 ordinary or article 5 elongate (*Pseudeurystheus* and *Segamphopus*); gnathopod 2 enlarged especially in male, ordinary, with article 6 dominating article 5 or latter also elongate and enlarged (*Megamphopus*), article 6 occasionally elongate, palm extended along posterior margin and dactyl strongly elongate (*Podoceropsis*); uropod 3 ordinary or with peduncle elongate and rami subequal to peduncle or slightly shorter than peduncle; telson ordinary, but occasional species with deep posterior recessment.

Mandibular palp article 3 often clavate; inner plate of maxilla 1 variable, often with medial setae; palp article 4 of maxilliped variable, ordinary, or in various degrees of clavateness, usually setose apically.

This is the most diverse and perhaps the most primitive genus of Corophiidae. The several genera and subgenera appended to *Gammaropsis* are joined by intergrading species or are characterized by apparently insignificant anomalies. Where one good character might be used to define a subgenus in one cluster of species, this character is found to be variable in a second cluster based on other criteria. The accessory flagellum occurs in all stages from multiarticulate to 3-articulate to 2-articulate, 1-articulate, and absent. Clusters based on the alternatives of accessory flagellum appear definitely to be polyphyletic as based on gnathopods and uropod 3. The elongation of article 5 on gnathopods of *Megamphopus*, of article 5 on gnathopod 1 of *Pseudeurystheus*, or the enlargement and elongation of palm and dactyl on *Podoceropsis* are connected to the central concept of *Gammaropsis* by various intergrades.

The named subdivisions of *Gammaropsis* are briefly diagnosed below but the diagnoses only encompass the central species of those clusters and serve to identify the concepts as stated in earlier years. The writer is impressed, without adequate study of any evolutionary sequence, that the trends to loss of accessory flagellum and modifications of gnathopods occur in parallel within several world biomes and so asynchronously as to defy any application of Linnean didactyly to the several polyphyletic systems.

*Audulla* Chevreux: Like *Gammaropsis* but flagellum of male antenna 2 stout, male gnathopod 2 with thumb on transverse palm.

*Bonnierella* Chevreux: Assignable to Ischyroceridae because of elongate peduncle of uropod 3 and slightly shortened rami but not highly distinct from various species of *Gammaropsis*; accessory flagellum 2-articulate, article 2 of pereopods 3-5 linear, anterior and posterior margins parallel; deep-sea.

*Kermystheus* J. L. Barnard: Like *Gammaropsis* but accessory flagellum composed only of short scale; peduncle of uropod 3 elongate; gnathopods of 2 known species highly diverse, these species probably not closely related. *Podoceroopsis dubia* Shoemaker and *K. ociosus* (J. L. Barnard) more closely related to each other than *K. ociosus* and *K. kermadeci*, yet *P.d.* and *K.o.* presently segregated subgenerically.

*Megamphopus* Norman: Like *Gammaropsis* but accessory flagellum usually 1-2 articulate; male anterior coxae often of varying sizes and shapes but occasionally static; male gnathopod 1 often extraordinary, enlarged nearly to size of gnathopod 2 and bearing other similarities to gnathopod 2; or male gnathopod 2 relatively reduced in size to fit enlarged gnathopod 1; or male gnathopod 2 with article 5 dominating article 6 in length or length plus width. New list of species, others rejected: *cornutus* Norman, *longicornis* Chevreux; (note that *pachypus* Schellenberg keys to *Protomedeia!*).

*Podoceroopsis* Boeck: Like *Gammaropsis* but accessory flagellum absent (typical) or 1-2 articulate; article 6 of male gnathopod 2 dominating short article 5, and palm usually extended along posterior margin of article 6 and dactyl elongate; peduncle of uropod 3 usually elongate. New list of species, other rejected: *angulosa* Chevreux, *dubia* Shoemaker, *elephantis* K. H. Barnard, *inaequistylis* Shoemaker, *insignis* Chilton, *lindahli* Hansen, *longidactylus* Chevreux, *nitida* Stimpson, *pusilla* Chevreux, *sophiae* Boeck. Latter two species with reasonably typical gnathopod of *Gammaropsis*.

*Pseudeurysthens* Schellenberg and *Segamphopus* J. L. Barnard: Like *Gammaropsis* but accessory flagellum 3-articulate or 1-2 articulate, article 5 of male gnathopod 1 at least 1.5 times as long as article 6, article 5 of male gnathopod 2 also elongate.

Unnamed division: Like *Gammaropsis* but tel-

son deeply excavate posteriorly, gnathopod 1 like *Pseudeurysthens*, gnathopod 2 like *Podoceroopsis chiltoni* (Thomson), *haswelli* (Thomson), and possibly *avomalus* Chevreux.

Examples of ordinary *Gammaropsis* with 0-2 articulate accessory flagellum: *ctenurus* Schellenberg, *georgianus* Schellenberg, *kerqueleni* Schellenberg, *longicornis* Walker, *martesia* J. L. Barnard, *palmatus* Stebbing and Robertson, *similis* Schellenberg.

Example of ordinary *Gammaropsis* with gnathopod 2 like *Podoceroopsis lobatus* Chevreux.

Examples of elongate peduncle on uropod 3: *exsertipes* Stebbing, *spinus* Shoemaker.

Unnamed division: *Megamphopus effrenus* J. L. Barnard; keying to vicinity of *Aloiloi* or *Pseudomegamphopus* because of slight enlargement of gnathopod 1, but otherwise with gnathopods resembling certain species of *Megamphopus*; possibly a case of axial reversal of gnathopods from megamphopus ancestor but anterior male coxae static.

### *Goesia* Boeck

Article 3 of antenna 1 shorter than article 1; accessory flagellum absent; head deeply recessed [but genus placed near *Protomedeia* in Figure 1]; coxae ordinary; gnathopod 1 elongate, thin, heavily setose, article 6 slightly dominating article 5 or these articles of equal length, palm transverse and short; gnathopod 2 slightly enlarged, heavily setose, article 5 dominating article 6, palm weak, bearing one enlarged spine; uropod 3 short, rami as long as peduncle, extending equally, heavily setose; telson ordinary.

Palp article 4 of maxilliped very small, short, apically setose; epimeron 3 with posteroventral tooth.

### *Grandidierella* Coutière

Article 3 of antenna 1 shorter than article 1; accessory flagellum 1-2 articulate; head poorly recessed; coxae short, scarcely contiguous or slightly discontinuous; female gnathopods small, ordinary but moderately setose, gnathopod 1 slightly the larger, male gnathopod 1 enlarged, carpocheate, article 6 slender, shorter and narrower than article 5, simple or weakly subchelate and sculptured,



dactyl elongate, gnathopod 2 ordinary, often heavily setose; uropod 3 uniramous, peduncle usually platelike, ramus much longer than peduncle; telson ordinary but occasionally short, armaments possibly obsolescent.

Mandibular palp article 1 elongate on type-species but not necessarily on other species; palp article 4 of maxilliped short, with 2 or more apical nails or setae; urosome depressed.

See *Neomicrodeutopus*.

### *Haplocheira* Haswell

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2+ articulate; recessment of head apparently variable; coxae ordinary; gnathopods simple or with tiny transverse palm, slender, elongate, apparently similar between the sexes, gnathopod 1 slightly the stouter, type-species with weakly falcate article 6, gnathopod 2 the longer, gnathopods heavily setose, dactyls of gnathopods elongate or not, setose or not; uropod 3 short, outer ramus as long as peduncle, inner ramus very short or vestigial; telson ordinary.

Inner plate of maxilla 1 heavily setose medially; palp article 4 of maxilliped blunt or thick and apically setose.

### *Isaea* Milne Edwards

Article 3 of antenna 1 as long as article 1; accessory flagellum multiarticulate; head of moderate recessment (neither deep nor shallow); coxae ordinary; gnathopod 1 ordinary, gnathopod 2 enlarged, article 6 especially enlarged and dominating article 5, palm oblique, weakly sculptured, dactyl fitting palm, female gnathopod 2 ordinary but less enlarged; uropod 3 ordinary but peduncle slightly elongate; telson ordinary.

Mandibular palp article 3 weakly clavate or not; palp article 4 of maxilliped elongate but apically blunt and setose; pereopods 3–5 prehensile; tube-spinning glands of pereopods apparently absent.

### *Kamaka* Derzhavin

Article 3 of antenna 1 slightly shorter than article 1; accessory flagellum absent; head deeply recessed; coxae ordinary but coxa 1 enlarged; gnathopod 1 ordinary, male gnathopod 2 enlarged,

subchelate, article 6 dominating article 5, palm with large excavation and defining tooth; uropod 3 uniramous, peduncle slightly elongate and moderately expanded, ramus equal to or shorter than peduncle, heavily setose apically; telson and urosomite 3 apparently coalesced.

Urosomites 1–2 coalesced but free from telson and urosomite 3; mandibular palp article 1 elongate or not; inner plate of maxilla 2 poorly to strongly setose medially; 3 species, east Asia.

### *Konatopus* J. L. Barnard

*Konatopus* J. L. Barnard, 1970:70–72.

TYPE-SPECIES.—*K. pao* J. L. Barnard, 1970.

Article 3 of antenna 1 as long as article 1; short accessory flagellum present; head deeply recessed; coxae short but contiguous; gnathopod 1 enlarged, of female ordinary, of male carpocheilate and weakly propodocheilate, article 6 shorter and narrower than article 5, dactyl elongate, overlapping chela of article 5; gnathopod 2 ordinary, poorly setose anteriorly; uropod 3 ordinary, rami extending subequally but outer slightly the shorter; telson ordinary.

Mandibular palp article 3 clavate; inner plate of maxilla 1 with medial setae; palp article 4 of maxilliped subclavate, apically setose.

### *Kuphocheira* K. H. Barnard

[Article 3 of antenna 1 unknown]; accessory flagellum absent; head apparently poorly recessed; coxae short but contiguous; gnathopods 1–2 simple, similar between the sexes, heavily setose, small, slender, article 5 longer to much longer than article 6, dactyl of gnathopod 2 reduced and setose; uropod 3 uniramous, ramus shorter than elongate peduncle; telson circular, armaments obsolete.

Inner plate of maxilla 1 medially setose; epimeron 3 with tooth.

### *Lemboides* Stebbing

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2–4 articulate; head poorly recessed; coxae short but contiguous; typical gnathopod 1 of female slightly enlarged, ordinary, of male enlarged, article 5 tumid and dominating article 6,

latter narrower and shorter than article 5, subchelate, dactyl fitting palm; other species with article 6 as long as 5, bearing large thumb and dactyl overlapping palm or gnathopod 1 scarcely larger than gnathopod 2; gnathopod 2 ordinary, strongly setose, in male article 5 usually dominating article 6, in female article 6 elongate and dominating article 5; uropod 3 ordinary, rami elongate, outer slightly the shorter; telson ordinary.

South African species possibly generically distinct because of odd gnathopods.

#### ***Lembopsis* Pearse**

Article 3 of antenna 1 shorter than article 1; accessory flagellum multiarticulate; head poorly recessed; coxae short but contiguous; gnathopod 1 enlarged, weakly carpochele, thus article 5 with 1 or more posterior teeth but article 6 enlarged and dominating article 5, subchelate, palm sculptured, dactyl slightly overlapping palm; gnathopod 2 of medium size, subchelate, heavily setose; female gnathopod 1 slightly enlarged, ordinary; uropod 3 ordinary; telson ordinary.

Mandibular palp article 1 elongate.

#### ***Lembos* Bate**

Article 3 of antenna 1 shorter than article 1; accessory flagellum present; head poorly recessed; coxae short but contiguous; gnathopod 1 enlarged, weakly in female, generally article 6 inflated and dominating article 5, subchelate, palm occasionally sculptured, dactyl fitting or overlapping palm; gnathopod 2 small, subchelate, weakly to strongly setose anteriorly; uropod 3 ordinary; telson ordinary.

Male coxa 1 often enlarged or askew.

#### ***Leptocheirus* Zaddach**

Article 3 of antenna 1 shorter than article 1; accessory flagellum multiarticulate; head moderately or occasionally deeply recessed [but placed near *Protomedeia* in Figure 1]; coxae 2-5 very long and overlapping, coxa 1 variable, usually very small and hidden by enlarged coxa 2 but occasionally coxa 1 slightly enlarged and partially visible; gnathopods 1-2 subequal to each other in size, not

enlarged but heavily setose, gnathopod 1 ordinary but with inflated article 3 and heavily setose posteriorly, gnathopod 2 slender, article 5 elongate and dominating article 6, latter narrow but short, palm obsolescent, dactyl short; uropod 3 short, peduncle flattened, rami longer than peduncle and extending equally; telson ordinary.

Mandibular palp article 1 slightly elongate.

#### ***Microphotis* Ruffo**

Article 3 of antenna 1 as long as article 1; accessory flagellum absent; head probably deeply recessed; coxae ordinary to shortened; gnathopod 1 ordinary; male gnathopod 2 slightly enlarged, article 6 dominating article 5, palm with small thumb, dactyl overlapping thumb; uropod 3 uniramous, peduncle slightly elongate, ramus shorter than peduncle, apically setose; telson ordinary.

Mandibular palp article 3 clavate.

#### ***Microdeutopus* Costa**

(Including *Hansenella* Chevreux and *Coremapus* Norman—see Myers, 1969:96)

Article 3 of antenna 1 shorter than article 1; accessory flagellum present; head poorly recessed; coxae short but contiguous, male or female coxa 1 often elongate and pointed; gnathopod 1 enlarged, male member strongly carpochele, article 5 thin to inflated and with one or more teeth, article 6 narrow and shorter than article 5, poorly subchelate or simple, occasionally sculptured, dactyl elongate, overlapping chela of article 5, gnathopod 2 ordinary or occasionally enlarged and thickened, subchelate or palm sculptured, weakly to moderately setose anteriorly, female gnathopod 1 ordinary but slightly enlarged; uropod 3 ordinary but peduncle slightly elongate; telson ordinary.

*Hansenella* Chevreux: Like *Microdeutopus* but female gnathopods like those of male. *Coremapus* Norman: Synonym of *Microdeutopus*, article 4 of gnathopod 2 highly elongate and heavily setose.

#### ***Microprotopus* Norman**

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2-articulate; head deeply to moderately recessed; coxae elongate; gnathopod 1

ordinary; gnathopod 2 enlarged, ordinary in female, especially enlarged in male, article 6 strongly dominating article 5, palm and posterior margin of article 6 largely confluent, sculptured, dactyl elongate but fitting enlarged palmer margin; uropod 3 uniramous, peduncle of medium elongation, ramus longer than peduncle; telson ordinary.

Mandibular palp article 3 subclavate; inner plate of maxilla 1 medially setose.

#### ***Neohela* Smith**

Article 3 of antenna 1 as long as article 1; accessory flagellum multiarticulate; head poorly recessed; coxae very short, discontinuous; gnathopods similar between the sexes, both pairs enlarged, gnathopod 1 slightly the larger, both ordinary, subchelate, palm of gnathopod 1 weakly sculptured; uropod 3 uniramous, peduncle short, ramus elongate, weakly setose; telson enlarged, irregularly triangular, armaments obsolete.

Body thin, cylindrical, urosome depressed.

#### ***Neomegamphopus* Shoemaker**

Article 3 of antenna 1 as long as article 1; accessory flagellum 2-articulate; head deeply recessed; coxae ordinary; female gnathopods 1-2 small, ordinary, similar to each other; male gnathopod 1 enlarged, heavily setose, carpochele, article 6 thin, shorter and narrower than article 5, simple but sculptured, dactyl elongate, overlapping chela of article 5, gnathopod 2 heavily setose, highly elongate and slender, simple; uropod 3 ordinary but subequally extending rami scarcely longer than peduncle; telson ordinary.

Mandibular palp article 3 subclavate; inner plate of maxilla 1 with 2 medial setae; palp article 4 of maxilliped apically setose.

#### ***Neomicrodeutopus* Schellenberg**

Article 3 of antenna 1 shorter than article 1; accessory flagellum 1- (?2-) articulate; head poorly recessed; coxae short, discontinuous; [female unknown]; male gnathopod 1 enlarged, carpochele, article 6 slender, shorter and narrower than article 5, weakly sculptured, dactyl elongate and reaching base of chela on article 5, gnathopod 2 stout, mod-

erately setose, article 5 dominating article 6, palm transverse, dactyl fitting palm; uropod 3 uniramous, peduncle expanded, ramus much longer than peduncle; telson ordinary.

Palp article 4 of maxilliped stubby and apically setose.

Probably synonymous with *Grandidierella* as some species of latter bearing short mandibular palp article 1.

#### ***Paracorophium* Stebbing**

Article 3 of antenna 1 shorter than article 1; accessory flagellum absent; head deeply recessed; coxae ordinary; gnathopod 1 ordinary but heavily setose, gnathopod 2 of male enlarged slightly, freely merochelate but article 6 also enlarged and either chelate or subchelate, appendage heavily setose, female article 6 narrow, poorly subchelate; uropod 3 short, outer ramus subequally as long as peduncle, inner ramus half as long as outer ramus, both apically setose; telson small, broad, smooth.

Male antenna 2 slightly thickened basally, occasionally with weak distal peduncular tooth; mandibular palp article 1 slightly elongate, article 3 weakly clavate; inner plate of maxilla 1 finely setose distally; palp article 4 of maxilliped long or short, apically blunt and setose; urosome depressed.

#### ***Paraoroides* Stebbing**

Article 3 of antenna 1 shorter than article 1; accessory flagellum vestigial; head recessment unknown; coxae ordinary; gnathopods 1-2 of female equal to each other in size, weakly subchelate, poorly setose anteriorly, male gnathopods 1-2 slightly enlarged, gnathopod 1 the larger, subchelate, palm with thumb, dactyl fitting palm, gnathopod 2 subchelate, moderately setose anteriorly; uropod 3 uniramous, short, ramus subequally as long as peduncle; telson ordinary.

#### ***Parunciola* Chevreux**

Article 3 of antenna 1 longer than article 1; accessory flagellum multiarticulate; head deeply recessed; coxae short but contiguous; male unknown; female gnathopods 1-2 subequal in size to each other, gnathopod 1 slightly the larger, otherwise

ordinary; uropod 3 uniramous, ramus much longer than peduncle; telson ordinary.

Mandibular palp article 3 clavate; inner plate of maxilla 1 medially setose, urosome depressed.

***Photis* Krøyer and *Cedrophotis* J. L. Barnard**

Article 3 of antenna 1 as long as article 1; accessory flagellum absent or vestigial; head deeply recessed; coxae ordinary, often strongly elongate; gnathopod 1 ordinary; gnathopod 2 enlarged, weakly so in female and with weakly differentiated palm, strongly so in male, article 6 large and dominating article 5, palm often heavily sculptured, transverse or oblique, dactyl fitting or weakly overlapping palm; uropod 3 with elongate peduncle, outer ramus as long as peduncle, inner ramus half or less as long as peduncle; telson ordinary.

Mandibular palp article 3 clavate.

*Cedrophotis* Barnard, 1967: Like *Photis* but inner ramus of uropod 3 half (as against one-third or less) as long as outer ramus; inner lobes of lower lip partially fused together; upper lip with deep incision.

***Protomeideia* Krøyer and *Cheirimeideia*  
J. L. Barnard**

Article 3 of antenna 1 shorter than article 1; accessory flagellum multiarticulate; head poorly to moderately recessed; coxae ordinary to short, occasionally partly discontinuous; gnathopod 1 ordinary, gnathopod 2 of female ordinary, subequal in size to gnathopod 1, of male enlarged, article 5 usually as long or longer than and dominating article 6, or articles 5-6 inflated, palm ordinary or sculptured and narrowed or transverse, dactyl fitting palm or strongly overlapping; uropod 3 ordinary but peduncle slightly elongate and rami equal to or longer than peduncle; telson ordinary.

Inner plate of maxilla 1 with medial setae; inner plate of maxilla 2 lacking medial setae.

*Cheirimeideia* J. L. Barnard: Like *Protomeideia* but inner ramus of uropod 3 half as long as outer ramus.

***Pseudomegamphopus* Myers**

*Pseudomegamphopus* Myers, 1968:527.

TYPE-SPECIES.—*P. barnardi* Myers, 1968.

Article 3 of antenna 1 as long as article 1; ac-

cessory flagellum 2-articulate; head deeply recessed; coxae ordinary; gnathopod 1 enlarged, article 6 heavily dominating article 5, palm oblique, dactyl fitting palm, gnathopod 2 ordinary but slender and poorly subchelate; female unknown; peduncle of uropod 3 slightly elongate, rami extending equally and about as long as or slightly longer than peduncle; telson ordinary.

***Rildardanus* J. L. Barnard, revised**

*Rildardanus* Barnard, 1969b:197.

TYPE-SPECIES.—*R. tros* Barnard, 1969b.

Article 3 of antenna 1 shorter than article 1; accessory flagellum 1-articulate, scalelike; head deeply recessed; coxae very short, discontinuous; female unknown; male gnathopod 1 enlarged, article 6 dominating article 5, palm very oblique and defined by thumb, dactyl overlapping thumb, gnathopod 2 slender, parachelate, moderately setose anteriorly; uropod 3 composed only of setose peduncle, or bearing vestigial ramus, peduncle unexpanded; telson enlarged, suborbicular, armaments ordinary.

Antenna 2 thickened and heavily sculptured; inner rami of uropods 1-2 vestigial; epimeron 3 with tooth; urosome depressed.

Diagnosis revised to include *Unciola laminosa* Pearse, uropod 3 bearing vestigial ramus; this species bridges *Rildardanus* and *Unciola*, differing from *Unciola* in vestigial accessory flagellum, unexpanded peduncle of uropod 3, vestigial ramus, heavily toothed antenna 2, shortened inner rami of uropods 1-2.

***Rudilemboides* J. L. Barnard**

Article 3 of antenna 1 shorter than article 1; accessory flagellum multiarticulate; head deeply recessed; coxae short but contiguous; gnathopods 1-2 of female approximately equal to each other in size, gnathopod 1 ordinary, gnathopod 2 scarcely subchelate, moderately setose anteriorly, male gnathopod 1 enlarged, article 5 elongate and inflated, article 6 shorter and more slender than article 5, scarcely subchelate, dactyl short but overlapping imaginary palm, gnathopod 2 slightly thicker than but similar to gnathopod 2 of female, anterior setae poorly developed; uropod 3 ordinary; telson ordinary.

Inner plate of maxilla 1 medially setose.

***Siphonoecetes* Krøyer**

Article 3 of antenna 1 as long as article 1; accessory flagellum absent; head deeply recessed; coxae short and discontinuous; gnathopod 1 ordinary, gnathopod 2 ordinary, slightly enlarged, article 5 dominating article 6, palm very oblique, dactyl fitting or slightly overlapping palm; uropod 3 short, uniramous, peduncle flattened, ramus shorter than peduncle, apically setose; telson enlarged, subcircular, armaments obsolescent.

Ocular lobes weakly pedunculate; antenna 2 slightly or strongly thickened in male; mandibular palp 1-articulate; uropod 2 with 1-2 rami; body thin and cylindrical, urosome depressed.

***Uncinotarsus* L'Hardy and Truchot**

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2-articulate; head poorly recessed; coxae very short, discontinuous; gnathopod 1 enlarged, article 6 heavily dominating article 5, subchelate, dactyl fitting palm, gnathopod 2 smaller but similar, both gnathopods poorly setose anteriorly; uropod 3 lacking rami; telson ordinary.

Mandibular palp article 1 elongate; outer plates of lower lip weakly incised; inner plate of maxilla 2 naked medially; palp article 4 of maxilliped short, blunt, apically setose; uropod 2 with one ramus; epimeron 3 with tooth.

***Unciola* Say, revised**

Article 3 of antenna 1 as long as article 1; accessory flagellum multiarticulate; head deeply recessed; coxae very short, discontinuous; gnathopods similar between the sexes, gnathopod 1 enlarged, article 6 inflated and dominating article 5, subchelate, palm strongly oblique, often with thumb, dactyl fitting palm; gnathopod 2 of ordinary small form, moderately setose anteriorly, subchelate or simple or weakly parachelate, occasionally article 5 elongate; uropod 3 uniramous, small, peduncle flattened and expanded medially and extending distally alongside ramus, latter shorter than peduncle, apically setose; telson enlarged, subcircular, armaments generally present.

Body thin, subcylindrical, urosome depressed; antenna 2 slightly to strongly thickened, epimeron 3 with posteroventral tooth.

*Unciola laminosa* Pearse transferred to *Rildardanus*.

***Unciolella* Chevreux**

Article 3 of antenna 1 as long as article 1; accessory flagellum 2-articulate; head deeply recessed; coxae very short, discontinuous; gnathopod 1 slightly enlarged, ordinary, gnathopod 2 ordinary [subadult]; uropod 3 uniramous, peduncle slightly flattened, ramus slightly longer than peduncle; telson ordinary.

Palp article 4 of maxilliped slightly blunted and apically setose.

***Xenocheira* Chevreux**

Article 3 of antenna 1 shorter than article 1; accessory flagellum 2-articulate; head moderately recessed; coxae ordinary; gnathopod 1 slightly enlarged, ordinary but heavily setose, gnathopod 2 with articles 4-5 inflated and heavily setose, article 6 slender, elongate, poorly subchelate; uropod 3 ordinary but peduncle slightly elongate; telson ordinary.

**ISCHYROCERIDAE**

DIAGNOSIS.—Corophioidean with ordinary urosomite 1; peduncle of uropod 3 elongate relative to shortened rami, inner ramus, if present, not apically setose, bearing one small apical spine or not, when uropod 3 bearing only one ramus that ramus also not setose; outer ramus lacking terminal setae, bearing apical spine or not, apicolateral margin often with small denticles; pereopods glandular.

**Diagnoses of Genera**

The term "ordinary" is used for gnathopod 2 when this appendage is larger than gnathopod 1, subchelate, with article 6 dominating article 5.

***Bathyphotis* Stephensen**

Accessory flagellum multiarticulate; article 5 of gnathopod 1 longer than article 6; coxa 1 more than three-fourths as long as coxa 2, coxa 5 subequal in length to coxa 6, coxa 4 excavate pos-

## Key to the Genera of Ischyroceridae

(Note that *Dryopoides* and *Paradryope* are included here for comparisons)

1. Uropod 3 with one ramus or rami highly vestigial ..... 2  
Uropod 3 with 2 rami ..... 6
2. Uropod 2 with one ramus ..... 3  
Uropod 2 with 2 rami ..... 5
3. Male gnathopod 1 carpochebate, ramus of uropod 3 as long as peduncle ..... *Chevreuxius*  
Male gnathopod 1 subchelate, ramus or rami of uropod 3 much shorter than peduncle ..... 4
4. Pleopod 3 with one ramus ..... *Runanga*  
Pleopod 3 with 2 rami ..... *Cerapus*
5. Inner rami of uropods 1-2 less than half as long as outer rami ..... *Pseuderichthonius*  
Rami of uropods 1-2 subequal to each other ..... *Ericthonius*
6. Coxae minute, serially discontinuous ..... *Bogenfelsia*  
Coxae sufficiently large to be serially contiguous ..... 7
7. Gnathopod 1 larger than gnathopod 2 ..... 8  
Gnathopod 2 larger than gnathopod 1 or gnathopods of similar size ..... 9
8. Pleonite 6 evanescent dorsally, article 3 of antenna 1 shorter than article 1, accessory flagellum vestigial ..... *Dryopoides*  
Pleonite 6 visible dorsally, article 3 of antenna 1 longer than article 1, accessory flagellum 2-articulate ..... *Paradryope*
9. Article 2 of pereopods 3-5 linear, article 4 maxillipedal palp clawlike, longer than article 3 ..... *Bonnierella*  
Article 2 of pereopods 3-5 subovate or broadly rectangular, article 4 of maxillipedal palp shorter than article 3, blunt or subconical (setose) ..... 10
10. Article 5 of gnathopod 1 much longer than article 6 ..... 11  
Article 5 of gnathopod 1 as long as or shorter than article 6 ..... 13
11. Spines on outer plate of maxilla 1 reduced to four, article 4 of pereopod 3 twice as wide as on pereopods 4-5 ..... *Bathypotis*  
Spines on outer plate of maxilla 1 nine or more, article 4 of pereopod 3 not wider than on pereopods 4-5 ..... 12
12. Outer ramus of uropod 3 with 1-3 wirelike marginal setae ..... *Ventojassa*  
Outer ramus of uropod 3 lacking marginal setae ..... *Pseudischyrocerus*
13. Accessory flagellum a small scale, articulate or not ..... *Parajassa*  
Accessory flagellum elongate ..... 14
14. Coxa 5 subequal to coxa 6 in length, coxa 1 half as long as coxa 2 ..... *Microjassa*\*  
Coxa 5 much longer than coxa 6, coxa 1 three-fourths as long as coxa 2 ..... 15
15. Pereopods subchelate ..... *Isaeopsis*  
Pereopods simple ..... 16
16. Outer ramus of uropod 3 with basally immersed, hooked terminal spine, distolateral margin of ramus with one to three large, reverted, sharp scales or several denticles, male gnathopod 2 usually with large tooth on proximal part of palm and with tooth on distal part of palm ..... *Jassa*  
Outer ramus of uropod 3 with or without basally immersed terminal spine, never hooked, distolateral margin of ramus with 0-7+ perpendicular, blunt, usually extremely small denticles, male gnathopod 2 lacking proximal palmar tooth but often with distal palmar process ..... *Ischyrocerus*

\**Dryopoides* male of Stebbing (1910) fits near this couplet but various characters are unknown. Male gnathopod 2 is not like that of ischyrocerids.

teriorly; uropod 3 with elongate peduncle, rami short, weakly spinose on margins, outer ramus hooked apically.

Outer plate of maxilla 1 with 4 spines (compare *Pseudischyrocerus*); article 4 of pereopod 3 twice

as broad as on pereopods 4-5; urosomite 1 with dorsal teeth.

*Bogenfelsia* J. L. Barnard

[Accessory flagellum unknown]; article 5 of gna-

thopod 1 longer than article 6; gnathopod 2 ordinary; coxae minute, serially discontinuous; rami of uropod 3 much shorter than peduncle [apices unknown microscopically].

***Bonnierella* Chevreux**

Accessory flagellum 2-articulate, elongate; article 6 of gnathopod 1 equal to or longer than article 5; gnathopod 2 ordinary; coxa 1 as long as coxa 2, coxa 5 slightly longer than coxa 6; rami of uropod 3 shorter than peduncle, each with weak, immersed apical spinule.

Article 2 of pereopods 3–5 narrow and linear; article 4 of maxillipedal palp unguiform, longer than article 3.

***Cerapus* Say**

Accessory flagellum absent; article 6 of gnathopod 1 equal to or shorter than article 5; gnathopod 2 very large in male, carpochele, article 5 multicuspidate, article 6 simple, shorter and more slender than article 5, dactyl large and overlapping half length of article 5; coxae short, discontinuous serially; uropod 3 small, with one tiny vestigial ramus bearing hook, inner ramus possibly present on one species.

Rostrum thornlike; uropod 2 with 1 ramus; telson very broad and short, often with 2 humps bearing thorn spines or short scales; body cylindrical, urosome depressed.

***Chevreuxius* Bonnier**

Accessory flagellum 2-articulate; male gnathopod 1 enlarged, carpochele, article 6 stout and subchelate or sculptured but narrower and shorter than article 5; gnathopod 2 small, article 6 longer than article 5; coxae short, discontinuous serially; uropod 3 short, bearing 1 ramus as long as peduncle and with 2 apical setae.

Uropod 2 with 1 ramus; body subcylindrical, urosome depressed.

***Dryopoides* Stebbing**

See Coroppiidae.

***Erichthonius* Milne Edwards**

Accessory flagellum absent; article 6 of gnathopod 1 shorter than article 5; male gnathopod 2 enlarged, carpochele, article 6 simple or sculptured but narrower and shorter than article 5, dactyl overlapping carpal thumb; coxae short, scarcely or fully discontinuous serially; uropod 3 elongate, single ramus shorter than peduncle and weakly hooked apically.

Telson broad, short, bearing 2 knobs covered with thorn spines or scales; body subcylindrical, urosome depressed.

***Isaeopsis* K. H. Barnard**

Accessory flagellum 1-articulate; article 6 of gnathopod 1 longer than article 5; gnathopod 2 ordinary; coxa 1 "small," coxa 5 longer than coxa 6; uropod 3 with elongate peduncle, rami very short, thin, outer apically hooked and weakly toothed.

Pereopods prehensile.

***Ischyrocerus* Krøyer**

Accessory flagellum 2-articulate, elongate; article 6 of gnathopod 1 longer than article 5; gnathopod 2 ordinary, article 6 of male lacking large postero-proximal tooth (compare *Jassa*) but often with distal tooth near base of dactyl; coxa 1 more than three-fourths as long as coxa 2, coxa 5 longer than coxa 6; uropod 3 slightly to fully elongate, rami slightly shorter than peduncle, outer with apical hook or not, small lateral denticles, no apical immersed spine.

***Jassa* Leach**

Accessory flagellum 2-articulate, elongate; article 6 of gnathopod 1 longer than article 5; gnathopod 2 ordinary, article 6 of male bearing large postero-proximal tooth (compare *Ischyrocerus*); coxa 1 more than three-fourths as long as coxa 2, coxa 5 longer than coxa 6; uropod 3 slightly to fully elongate, outer ramus with immersed and hooked apical spine, distolateral margin with 1–3 large, sharp reverted scales or denticles.

***Microjassa* Stebbing**

Accessory flagellum 1-articulate, very small; article 6 of gnathopod 1 longer than article 5; gnathopod 2 ordinary or propodochelate in male; coxa 1 half or less as long as coxa 2, coxa 5 variable, longer or not longer than coxa 6; uropod 3 elongate, rami short, inner ramus occasionally shorter than outer, latter with weak apical hook and tiny apicolateral denticles.

***Paradryope* Stebbing**

Accessory flagellum 2-articulate; gnathopod 1 larger than gnathopod 2, otherwise ordinary; gnathopod 2 subchelate, articles 5–6 subequal in length; coxae short but contiguous, coxa 1 as long as coxa 2, coxa 6 as long as coxa 5; uropod 3 small, rami minute but extending equally, outer weakly hooked.

***Parajassa* Stebbing**

Accessory flagellum composed of small tubercle; article 6 of gnathopod 1 longer than or subequal to article 5; gnathopod 2 ordinary or in male with large posteroproximal tooth on article 6; coxa 1 as long as coxa 2, coxa 5 longer than coxa 6; uropod 3 small, stubby, with shortened outer ramus (type) or ordinarily elongate with short rami, outer with hooked apical spine.

Uropods 1–2 often with large lateral setae on peduncles. *Parajassa georgiana* Schellenberg transferred to *Ventojassa*.

***Pseuderichthonius* Schellenberg**

Accessory flagellum uniarticulate, forming a scale; article 6 of gnathopod 1 longer than article 5; male unknown, female gnathopod 2 similar to and scarcely larger than gnathopod 1; coxae short, serially discontinuous; uropod 3 with single ramus slightly shorter than elongate peduncle, apically uncinat.

Uropods 1–2 with inner rami much shorter than outer rami; body cylindrical, urosome depressed.

***Pseudischyrocerus* Schellenberg**

Accessory flagellum multiarticulate, elongate; article 5 of gnathopod 1 longer than article 6;

gnathopod 2 ordinary; coxa 1 as long as coxa 2, coxa 5 probably longer than coxa 6; peduncle of uropod 3 elongate, rami elongate but slightly shorter than peduncle, outer with 2–3 accessory teeth near apex and several marginal spines.

Outer plate of maxilla 1 with 9 spines (compare *Bathyphtotis*); article 4 of pereopod 3 wider than on pereopods 4–5 in male.

***Runanga* J. L. Barnard**

Accessory flagellum formed of uniarticulate scale; article 5 of gnathopod 1 slightly longer than article 6; gnathopod 2 ordinary; coxae short, discontinuous serially, coxa 5 foliaceous and setose; uropod 3 with 2 vestigial rami, one ramus with hook.

Uropod 2 with 1 ramus; pleopod 3 with 1 ramus; body cylindrical, urosome depressed.

***Ventojassa* J. L. Barnard**

*Ventojassa* Barnard, 1970: 204–205.

TYPE-SPECIES.—*Eurystheus ventosa* J. L. Barnard, 1962.

Accessory flagellum vestigial (type) or 2-articulate (*V. georgiana* [Schellenberg]); article 5 of gnathopod 1 longer than article 6; gnathopod 2 ordinary; coxa 1 as long as coxa 2, coxa 5 longer than coxa 6; uropod 3 slightly elongate, rami shorter than peduncle, outer with apical hook and several spinules or setules, lateral margin with 1–3 wire-like setae (unique in family).

**AMPITHOIDAE**

DIAGNOSIS.—Corophioidean with ordinary urosomite 1; peduncle of uropod 3 elongate relative to shortened padlike rami, inner ramus apically setose, outer ramus with one or two large reverted hook-spines, often with facial scales and other setae; pereopods glandular; outer lobes of lower lip usually subdivided partially (unique to Ampithoidae). See J. L. Barnard (1969a) for key, and diagnoses.

*Amphitholina* Ruffo is returned to this family from the Eophliantidae.

**BIANCOLINIDAE**

DIAGNOSIS.—Corophioidean with ordinary uroso-



mite 1; uropod 3 short, rami equally long and as long as peduncle, outer ramus not uncinatate, with 2 straight apical spines, inner ramus with 1–2 spines or setae apically, never heavily setose; outer lobes of lower lip undivided; mouthparts partially degenerate, palps of mandible and maxilla 1 absent or vestigial, palp of maxilliped reduced to 3 articles, mandibular molar evanescent or absent; pereopods probably lacking spinning glands.

The attribution of this family to Corophioidea is problematical. The genus *Biancolina* formerly was placed in Eophliantidae but uropod 3 of *Biancolina* is entirely distinctive. Assignment to Corophioidea is based on similarities of cephalic appearance to corophiids, the heavily setose peduncle of uropod 1 (rare in Amphipoda but occasionally present in corophioideans), the fleshy telson and prehensile pereopods similar to those of various amphipods and *Isaea*.

#### PODOCERIDAE

DIAGNOSIS.—Corophioidean with elongate and free urosomite 1, usually more than twice as long as next segment; uropod 3 variable, generally vestigial or absent; pereopods not glandular; abdomen generally capable of flexion beneath thorax (unique). See Barnard (1969a) for key and diagnoses.

#### CHELURIDAE

DIAGNOSIS.—Corophioidean with urosomite 1 elongate but coalesced with other urosomites into large rigid box; uropod 3 large and flabellate, ramus longer than peduncle, inner ramus, if present, scalelike, main ramus setose strongly or weakly; pereopods not glandular; uropod 2 flabellate (unique). See Barnard (1969a) for key and diagnoses.

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