

Amphipoda of the Northeast Pacific (Equator to Aleutians, intertidal to abyss): VI.
Corophioidea – a review Donald B. Cadien, LACSD
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Preface

The purpose of this review is to bring together information on all of the species reported to occur in the NEP fauna. It is not a straight path to the identification of your unknown animal. It is a resource guide to assist you in making the required identification in full knowledge of what the possibilities are. Never forget that there are other, as yet unreported species from the coverage area; some described, some new to science. The natural world is wonderfully diverse, and we have just scratched its surface.

Introduction to the Corophioidea

Placing the corophioids among the amphipods, and determining the relationships between members of the group have been a preoccupation of many workers for years. The group was quite an interesting problem for J. L. Barnard, who published a large paper revising it (J. L. Barnard 1973). His interpretations of various corophioids changed often over the years, and his final vision of them was presented in J. L. Barnard & Karaman 1991. What interested and frustrated him was the lack of clear dividing lines between the related families of this group. Every time a new genus was found, it was intermediate in some character states, blurring the lines between closely related families. This led him to combine all of these families into a united Corophiidae *s.l.*. Most other workers were not pleased with this arrangement, which discarded family concepts long used and useful. They were more willing to tolerate the exception and to see clearly defined families within established boundaries. Myers & Lowry (2003) codified the slightly revised concepts of the group member families and their interrelations, restored to full status all those families synonymized by Barnard, and added some new families based on elevation of previous subfamily level taxa, or reevaluation of some character states as of elevated importance.

Diagnosis of the Corophioidea

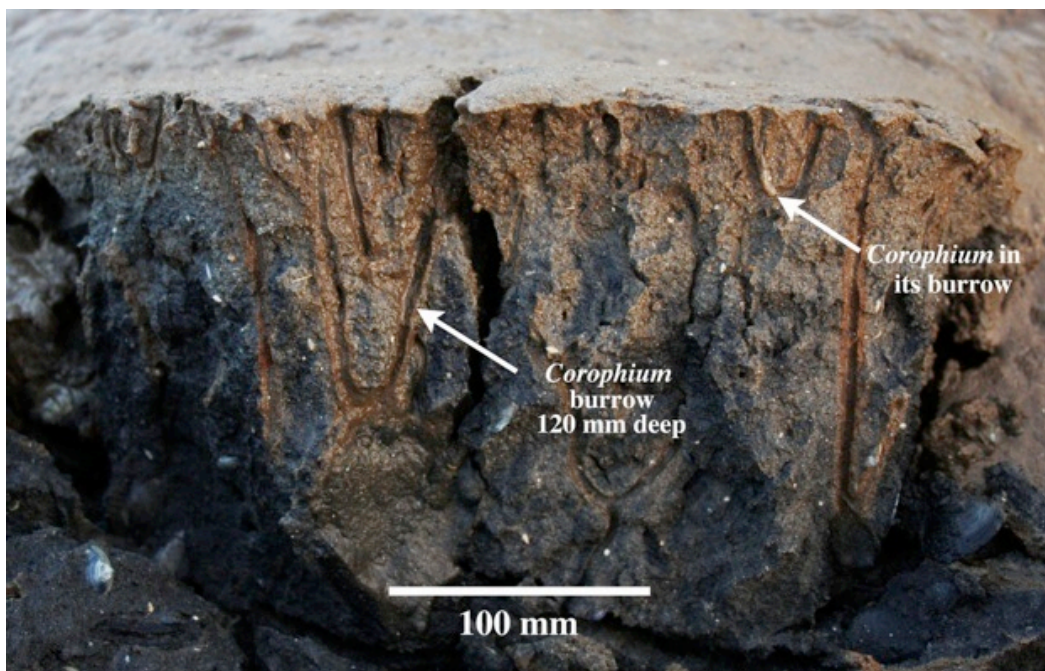
“Head lateral cephalic lobe weakly extended, eye, if present, situated proximal to lobe; anteroventral margin not recessed, weakly recessed and weakly to moderately excavate, or strongly recessed and strongly excavate. Mandible palp with 0, 2, or 3 articles, article 3, when present, asymmetrical and distally rounded with setae extending along most of posterodistal margin, or approximately parallel-sided with distal setae only. Gnathopod 1 enlarged or not; coxa1 usually enlarged. Gnathopod 2 in male not larger, slightly larger, or much larger, than gnathopod 1. Gnathopod 2 merus not enlarged, or broadened and free, or broadened and fused along its entire length with posterior margin of carpus. Pereopods 5-7 without accessory spines on anterior margin. Pereopod 7 a little longer or much longer than pereopod 6. Urosomites free, or 1 and 2 coalesced or 1-3 coalesced. Uropods 1 and 2 with or without dense array of robust setae. Uropod 3 peduncle short or long, parallel sided; biramous or uniramous with or without recurved spines. Telson without hooks or denticles.” (Myers and Lowry 2003).

Ecological Commentary

Corophiids are usually protected in structures of some kind. Some are burrowers in sandy or muddy substrates, constructing unlined burrows. Others construct tubes of amphipod-silk within crevices of biological substrates such as kelp holdfasts (Shillaker & Moore 1987a) or among the kelp fronds (McDonald & Bingham 2010). Some build tubes on the sediment surface, using only the amphipod-silk they spin, without addition

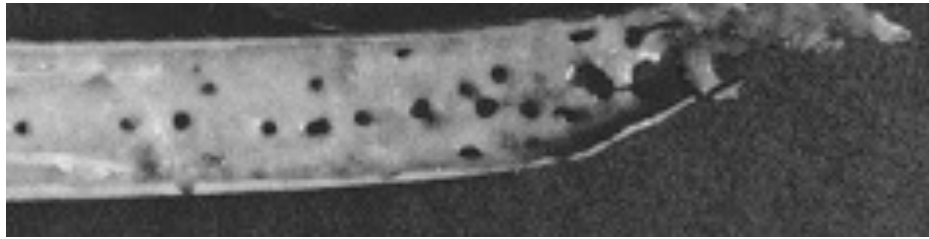


Corophium volutator and their burrow openings in an estuarine sand-flat
(from <http://www.aquatronics.com/waderprey.html>)



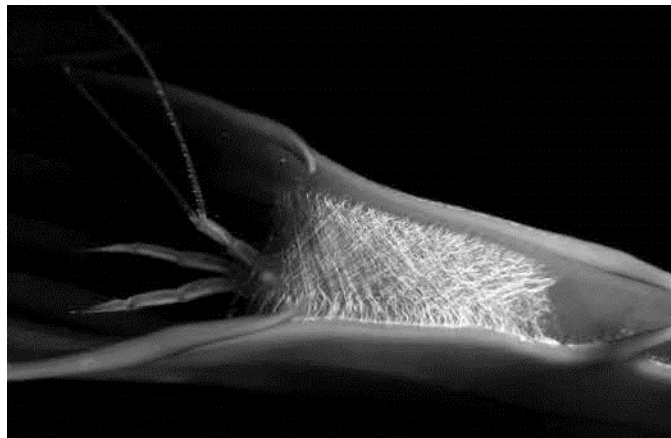
Sediment cross-section to show *Corophium* burrows in estuarine sand-flat (from staff.web.isligo.ie)

of external materials (J. L. Barnard et al 1988). If they choose, however, the animals can build tubes incorporating local building materials. On sand flats sand grains may be bound together with amphipod silk to form sand tubes. There appears to be behavioral plasticity within a species, with some members building amphipod silk tubes, and others tubes of agglutinated bottom materials, or unlined burrows. J. L. Barnard (1958) in an investigation of fouling organisms, found *Monocorophium acherusicum* and *M. insidiosum* to be among the first to settle on experimental wood blocks, rapidly constructing tubes of amphipod silk and silt on the exposed hard surface rather than on the bottom sediments. Similarly Dixon & Moore (1997) report *Crassikorophium bonellii* to build tubes anchored to hard substrate, but often free for much of their length.



Peramphithoe bore holes through the stipe of the kelp *Laminaria setchellii* (from Chess 1993)

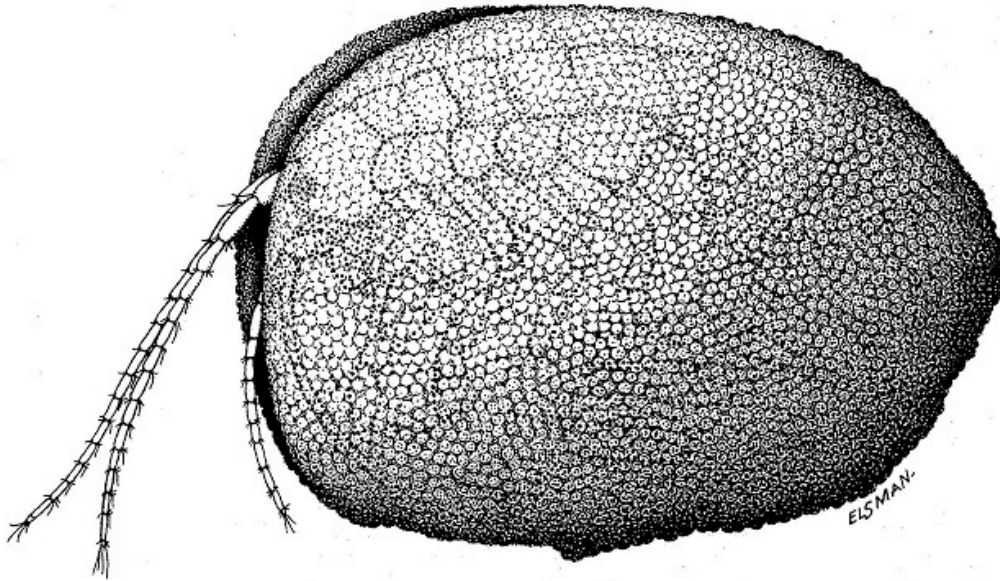
Myers (1974) reports an amphithoid borer in the genus *Amphitholina*, which bores into and utilizes as food the alga *Alaria esculenta*. Within the Amphithoidae the genus *Peramphithoe* is particularly versatile. Some species bore into kelp, and use the internal space within the plant as their “burrow” (Chess 1993); while others modify plants or plant pieces using the amphipod silk they spin. The kelp curlers, so evident in local kelp-beds (Jones 1971), use their silk to shape a protected furrow by folding a *Macrocystis* frond around their bodies (Cerda et al 2010).



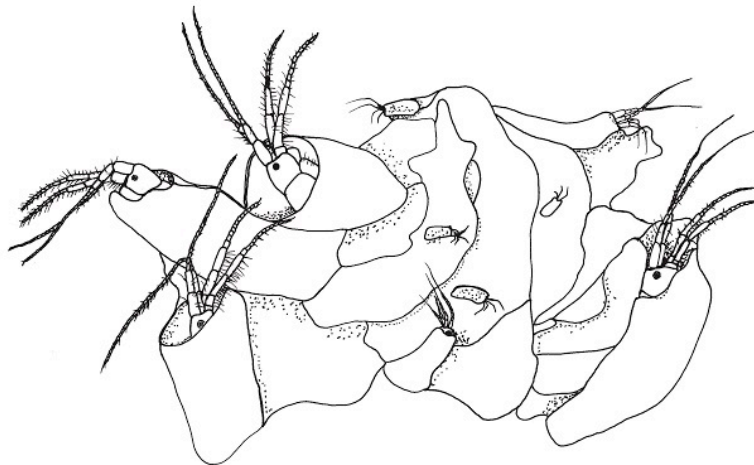
Detail of the amphipod-silk stitching which holds together a folded algal frond. The *Peramphithoe femorata* is visible below this mesh. (from Cerda et al 2010)

Another species, *Pseudamphithoides incurvaria*, in a related genus from the tropical West Atlantic, cuts pieces from algal fronds and then stitches two together with amphipod silk into a pod, in which the animal lives. These pods are motile, as the legs of the amphipod can be protruded and it can scramble awkwardly on the bottom or among algal masses. The alga is not random, but a particular species that the amphipod feeds on

and otherwise uses, *Dictyota bartayresii*. Choice experiments demonstrate this specificity (Lewis & Kensley 1982). The alga chosen may have anti-grazing chemicals within its tissues, produced to repel potential grazers. If so, being in such a pod would seem likely to provide protection from at least fish predation on the amphipod. If not, it would seem merely to present the possibility of a well-balanced meal for a foraging fish. The issue was examined by Hay et al (1990) who found that indeed, chemicals produced by the select host plant deter feeding by fishes. They found that the same compounds, dictyoterpenes, were also produced by another related alga, with deterrent effects on fish feeding, but no effect on amphipod grazers. (Hay et al 1989)

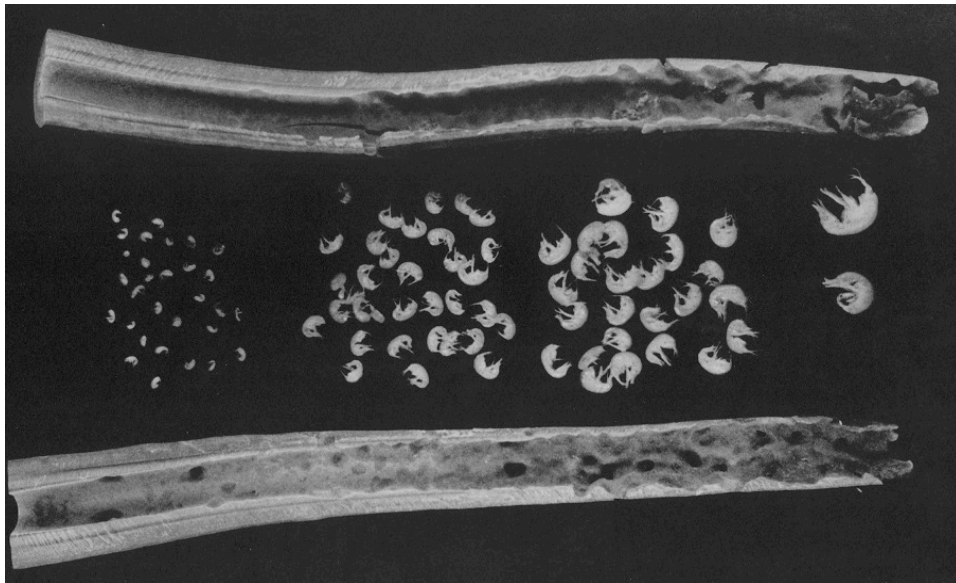


Pseudamphithoides incurvaria inside its pod constructed of pieces cut from algae. The position of the animal in the pod is indicated, but the sides are opaque in life, so it cannot normally be seen. Scale = 1mm (from Just 1977)



Cymadusa filosa living in tubes constructed by the roll and stitch of *Ulva* thalli
Scale bar = 5mm (from Appadoo & Myers 2003)

Other algae are also utilized in addition to the *Macrocystis*, *Alaria*, *Dictyota*, and *Laminaria* mentioned above. The amphipoid *Cymadusa filosa* has been observed to utilize *Ulva lactuca* as rolling papers for tube construction. Cerda et al (2010) review amphipod domicily based on previous reports, and found use of *Sargassum*, *Zonaria*, *Pelvetia*, *Ecklonia*, *Egregia*, *Eisenia*, filamentous red and brown algae and sea-grasses as host to various amphipods. Where host plants are widely separated they can serve as habitat islands (Gunnill 1982)



Two adult *Peramphithoe stypotrumpetes* and their three cohorts of young.
The bored stipe frames them (from Conlan & Chess 1992)

Such constructed domiciles and burrows allow the retention and protection of brood during reproduction. In the kelp-boring species *Peramphithoe stypotrumpetes* several broods may be produced and retained within the bored kelp stipe before the continued grazing on the internal tissues by the amphipod forces the large family to move or disband (Conlan & Chess 1992).

The kelp-curlers use their self-constructed furrow nests for extended parental care as well, with the first few molts of the juveniles spent within the nest after they leave the mothers marsupium. In this case, continued grazing by the inhabitants usually causes loss of integrity of the kelp itself, and the entire amphipod group must move to a new position on the kelp frond and establish a new nest. In the northern hemisphere this is usually seen in *Peramphithoe humeralis* nesting on *Macrocystis*, while it is *P. femorata* on the same algal genus below the equator. Nest construction and amphipod behavior seem identical in the two species.

Kelp-curlers can graze giant kelp so heavily that entire fronds, and sometimes entire plants are compromised and disintegrate (Tegner & Dayton 1987). The kelp plants attempt to alter their growth patterns to avoid this (Cerda et al 2009), but are often unsuccessful. The impacts of feeding by the non-curler *Ampithoe longimana* also had a significant community level impact, particularly when control of its density by fish predation was reduced (Duffy and Hay 2000). Earlier investigations (Duffy and Hay 1991a, b) had established that these amphipods tended to feed on and frequent algae that

produced chemical deterrents to fish feeding. During their review of host/amphipod relationships in algae, Cerda et al (2010) found the majority of reported associations involved feeding of the amphipod exclusively on the host plant. The few exceptions included the filamentous algae, which were used as domicile construction sites while feeding was done elsewhere, and *Pseudamphithoides incurvaria*. This species can forage from within its pod on other algae (usually of the same species used in pod construction), or it can nibble directly on its dwelling. Lewis & Kensley (1982) record the amphipods carefully detaching a thin margin of a pod-half and stripping it off toward the head, rolling it and passing it to the mouthparts.



Female *Peramphithoe femorata* and her brood in the nest on *Macrocyctis* (from Cerda et al 2010)

While it appears that all amphipods are herbivorous, the corophiids are mostly, if not entirely, selective surface deposit feeders. Enequist (1949) summarized the observations of himself and others on *Corophium volutator* and *C. bonelli* in European waters. Both species were surface deposit feeders, manipulating the surface sediments to bring organic matter together into aggregates with the second antennae which were then selectively sampled by the gnathopods which passed food particles to the mouthparts. Some corophiids may be able to switch between suspension feeding and deposit feeding (Miller 1984, Gerdol & Hughes 1994). Riisgård & Schotge (2007) experimentally determined that filter feeding is the preferred mode for *C. volutator* when the loads of phytoplankton are high enough in the surrounding waters. If they fell below a critical level, however, the animals switched to surface-deposit feeding (see also Møller & Riisgård 2006).

Hay et al (1990) demonstrated by choice experiments that the amphipod *Pseudamphithoides incurvaria* was protected from fish predation by its construction of a

domicile from dictyoterpene containing algae. Removed from this protective cover, the amphipods were rapidly consumed by foraging fish. Turbidity was suggested as a possible protection from fish predators on colonies of tubicolous amphipods on experimental blocks. The amphipods were early arrivers to the blocks, forming extensive stands of soft tubes. These would offer no protection from fish predation, and were probably heavily grazed. In areas of heightened turbidity, visual predation rates probably declined, allowing some escape from fish predation for the amphipods (J. L. Barnard 1958). In suitable areas population density in such aggregations exceeded 10,000/m². *Americorophium salmonis* are apparently a major dietary staple of salmonids, with large numbers being recovered from guts in several areas (Bradley 1908). Presence of this species was important in recovery of food webs from anthropogenic damage (Arvai et al 2002).

Corophium spp. (actually now multiple genera lumped under that name) are also very important in the nutrition of the White Sturgeon (LeBreton et al 2006), particularly

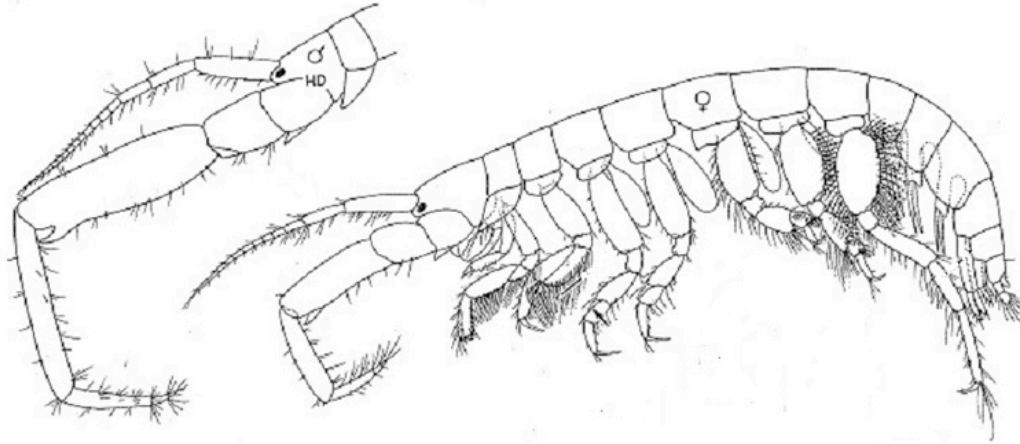


Trace on the mudflat of fish feeding on *Corophium volutator* (from McCurdy et al 2005)

the juveniles (Muir et al 2000). *Corophium volutator* were heavily predated by several species of fishes (McCurdy et al 2005), but exclusion experiments also showed significant predation by shorebirds in the Bay of Fundy (Wilson 1989, Wilson & Parker 1986). Bird predation is so intense there that behavioral adaptations in amphipod burrowing have been generated (MacDonald et al 2014) and the structure of the population may be modified (Matthews et al 1992). Predation by both fish and birds is also recorded (Grosse et al 1986) for *Americorophium salmonis* in Washington. Even whales feed on corophiid aggregations during migration, although not as heavily as they do ampeliscid amphipods (Nerini et al 1980).

In European estuaries, fish also heavily predate *C. volutator* (Stevens et al MS). Such predation is a primary structuring force on the density and composition of estuarine benthos there (Mattila and Bonsdorff 1989). The invasive fresh-water *Chelicorophium*

curvispinum has become so abundant in the Rhine River (densities over 100,000/m²) that it is now an essential part of the riverine food-web, and is consumed heavily by a number of fishes (Marguillier et al 1998). While vertebrates are the primary predators of corophioids, a few invertebrates also have this function. McDermott (1988) reports on feeding relationships of nemertean worms on the amphipods associated with the sea-grass beds in which they occur. All the hoplonemertean species investigated fed on amphithoid amphipods as well as several species of *Monocorophium*. More of the latter found the encounter fatal. Amphipods may also die as a result of parasitic infection by trematodes (Meißner & Bick 1999b).



Marine Model Animal – *Corophium volutator* ♂ head and ♀ whole body (from Bousfield 1973)

The corophiid *Corophium volutator*, due to a conjunction of circumstances has become a “model organism” which has been investigated by numerous workers. Aspects of its aut- and synecology have been discussed at length. The animal occurs widely in the North Atlantic, and maintains huge populations on the extensive mud and sand flats of the Bay of Fundy. Its intertidal accessibility, ecological importance, and proximity to university laboratories have been important in it achieving this status. Studies of its predation by fish and birds were mentioned above, and this predation places it in the middle of a parasite transmission chain leading to birds. It is parasitized by both platyhelminthes (as larval trematodes – Bick 1994; Bick et al 1997; Damsgaard et al 2005; Meißner & Bick 1997, 1999a,b; Mouritsen et al 1997, Mouritsen & Jensen 1997), and by nematodes (McCurdy et al 1999, Wong & Anderson 2000). In both cases the final host is the semi-palmated sand-piper, which utilizes this area as a major feeding site on its annual migration. Both the trematode and nematode parasites modify the behavior of the parasitized animals to make them more available to bird predation, and increase parasite transmission (McCurdy et al 1999, Damsgaard et al 2005). These modifications include enhanced crawling, and alteration of diel tube-emergence patterns. The amphipods have, in turn, modified their behavior to maximize reproductive efficiency prior to being forced by the parasites to achieve transmission rather than to attend to their own needs (McCurdy, Forbes and Boates 2000; McCurdy, Boates and Forbes 2000, 2001).

Many other aspects of the ecology of *C. volutator* are also documented, including general behavior [burrowing, swimming, etc.](Meadows & Reid 1966), annual

population cycle (Watkin 1941), substrate selection (Meadows 1964), salinity response (McLusky 1968a,b, 1969), effects of hypoxia and anoxia (Dobrzycka-Krahel & Szaniawska 2005, Gamble 1970), light biology (Gidney 1971), thermal biology (Meadows & Ruagh 1981), male mate searching (Forbes et al 1996), reproduction (Fish & Mills 1979), sex ratio and sex imbalance (Schneider et al 1994, Forbes et al 2006), intersexuality (Barbeau & Grecian 2003, McCurdy et al 2004), growth and secondary production (Gratto et al 1983), control of cyclic behavior (Harris & Morgan 1984), factors affecting small scale distribution (Lawrie et al 2000), energetic analysis of filter-feeding (Riisgård 2007), invasion history in the Western North Atlantic (Einfeldt & Addison 2015), population genetics (Wilson et al 1997) and more (Boates and Smith 1979, 1996).

Conlan (1991) characterized both Ampithoidae and Corophiidae as being mate guarding attenders. The males do not physically carry the females, as do some other groups, but remain in proximity awaiting her molt. In the ampithoids this may mean joint occupancy of a nest, but in corophiids usually does not involve joint occupancy of a tube or burrow. Although this is not demonstrated, it is assumed here that males are alerted to the female's molting by release of a pheromone. Physical examination may also take place because males increase their tube emergence and surface crawling as a prelude to reproduction. Tubes or burrows are normally not home to a pair, but the male may also occupy the female's tube briefly during copulation. Sexual dimorphism is most evident in the structure of the first and second antennae. While nearly all reports are of dioecy, one species has been repeatedly characterized as parthenogenetic, *Crassikorophium bonelli* (Moore 1981). Convincing evidence of parthenogenesis (Shillaker & Moore 1987b), as well as of the presence of males (Myers et al 1989) has been presented, and the resolution remains unclear. Perhaps parthenogenicity is the norm, but males are occasionally produced in response to some population challenge.

Corophiids are often the beneficiaries of anthropogenic transport (Chapman 1988), and a number of species, including *Monocorophium acherusicum*, *M. insidiosum*, *Crassikorophium bonelli* and *Laticorophium baconi* have been introduced to the NEP in this fashion (NEMESIS Database - <http://invasions.si.edu/nemesis/browseDB/searchTaxa.jsp>). The latter species continues to expand its range, presumably by anthropogenic agent, appearing recently in Brazil (Valerio-Berardo & De Souza 2009). More natural transport on the feet of migrating waterfowl, is assumed responsible for the introduction of *Apocorophium louisianum* to the Salton Sea in inland Southern California (<http://www.sci.sdsu.edu/salton/ssBenthicInvertsLarge.html>). *Gammarus mucronatus* was also introduced to this waterbody in this manner (J. L. Barnard & Grey 1968, 1969). The two local species of *Sinocorophium*, *S. alienense* and *S. heteroceratum* are both of NWP origin, and have been introduced to the NEP from there (Chapman 2007 – as *Corophium*). A member of the southern hemisphere genus *Paracorophium* has also been introduced into the NEP. It is assumed this introduction was effected in ballast water, and has remained localized in Humboldt Bay (Chapman 2007).

Ampithoids are also subject to anthropogenic transport, but with apparently less frequency due to their relationships with plants. Both *Ampithoe longimana* and *A. valida* appear to have been introduced from the Western North Atlantic into local waters, perhaps in the algal packing of shipped live seafood.

Most regional species of corophiids frequent fully marine waters, or those of slightly reduced salinities off river mouths (Bousfield & Hoover 1997). At least one species, *Americorophium spinicorne*, occurs in fully fresh-water far inland (Lester & Clark 2002). Both that species and *A. stimpsoni* reach up the deltaic portion of the Sacramento River Drainage from San Francisco Bay; forming an increasingly important proportion of the biota in areas of reduced salinity. Eriksen (1968) reports on the condition of a population of *A. spinicorne* residing in Oso Flaco Lake, just north of the SCB, where salinity and other physical conditions of the environment are seasonally variable. Bousfield (1958) refers to this species as being found in “tidal fresh-water” and low salinity brackish waters, frequently at the mouths of freshwater brooks. Regional species of *Monocorophium*, while seemingly preferring fully marine conditions, can also be found in the tidal prism of intermittent or low flow freshwater inputs.

Use of corophioids in bioassay is covered by Reish (1993). Ampithoids are also sensitive to some anthropogenic impacts, particularly eutrophication (Pardal et al 2000).

List of NEP corophioids by family based on McLaughlin et al (2005), augmented by other reports from the region. Those reported in the SCAMIT Ed. 9 Taxonomic Listing (Cadien & Lovell 2014) with an asterisk . Valid taxa **bolded, synonyms not.**

Family Ampithoidae

- Ampithoe aptos** (J. L. Barnard 1969) – Central California: 1-5m
- Ampithoe corallina Stout 1912 – *nomen dubium* (see Horton 2015a)
- Ampithoe dalli** Shoemaker 1938 – Aleutian Ids., Alaska to Cape Arago, Oregon: 0-10m
- Ampithoe guaspere** J. L. Barnard 1979 – Galapagos Ids.: 0m
- Ampithoe kussakini** Gurjanova 1955 – Eastern Russia to Vancouver Id., British Columbia, Canada: 0-3m
- ***Ampithoe lacertosa** Bate 1858 – Japan; NEP from Aleutians to Bahia Magdalena, outer coast of Baja California, Mexico: 0-10m
- ***Ampithoe longimana** S. I. Smith 1873 – WNA, SCB: 0-10m
- ***Ampithoe plumulosa** Shoemaker 1938 – British Columbia to Ecuador: 0-15m
- Ampithoe plumulosa tepahue** J. L. Barnard 1979 – Galapagos Ids.: 6-9m
- Ampithoe pollex of J. L. Barnard 1954 non Kunkel 1910 (see *A. sectimana*)
- ***Ampithoe pollex** Kunkel 1910 – Bermuda; NEP from Coos Bay, Oregon, to Ecuador, Galapagos Ids.: 0-5m
- ***Ampithoe ramondi** Audouin 1828 – Circumtropical; NEP from San Mateo Pt., SCB to Ecuador, Galapagos: 0-5m
- Ampithoe rubricatoides** Shoemaker 1938 – Aleutian Ids., Alaska: 10-18m
- ***Ampithoe sectimana** Conlan and Bousfield 1982 – Prince William Sound, Alaska to SCB: 0m
- ***Ampithoe simulans** Alderman 1936 – Aleutian Ids., Alaska to Cannon Beach, Oregon, SCB: 0-4m
- Ampithoe tahue** J. L. Barnard 1979 – Galapagos Ids.: 0m
- Ampithoe vacoregue** J. L. Barnard 1979 – Galapagos Ids.: 0m
- ***Ampithoe valida** Smith 1873 – NWA, Japan: NEP from British Columbia to SCB: 0-30m

- Ampithoe volki** Gurjanova 1938 – Eastern Russia, Sea of Japan, Aleutian Ids., Alaska: 0-3m
- Cymadusa uncinata** (Stout 1912) – Alaska to Laguna Beach, Southern California: 0-3m
- Grubia indentata* Stout 1913 (see *Ampithoe pollex*)
- **Paragrubia uncinata* Stout 1912 (see *Cymadusa uncinata*)
- Peramphithoe eoa* of authors NEP (see *P. mea*)
- ***Peramphithoe humeralis** (Stimpson 1864) – Prince William Sound, Alaska to Isla Guadalupe, off the west coast of Baja California, Mexico: 0-70m
- ***Peramphithoe lindbergi** (Gurjanova 1938) – Sea of Japan, Bering Sea, Sea of Okhotsk; Prince William Sound, Alaska to SCB: 0-18m
- ***Peramphithoe mea** (Gurjanova 1938) – Sea of Japan; Aleutian Ids., Alaska to SCB: 5-60m
- ***Peramphithoe plea** (J. L. Barnard 1965) – Queen Charlotte Ids., British Columbia, Canada to SCB: 0-17m
- Peramphithoe stypotrumpetes** Chess 1993 – SE Alaska to SCB: 0-10m
- ***Peramphithoe tea** (J. L. Barnard 1965) – Prince William Sound, Alaska to Bahia de los Angeles, Gulf of California, Mexico: 0-67m
- Pleonexes aptos* J. L. Barnard 1969 (see *Ampithoe aptos*)
- Family Corophiidae
- Subfamily Corophiinae
- Americorophium brevis** (Shoemaker 1949) – Prince William Sound, Alaska to San Francisco Bay, Northern California: 0-35m
- Americorophium panamense** (Shoemaker 1949) – Pacific Panama: 0m
- ***Americorophium salmonis** (Stimpson 1857) – Kodiak Id., Alaska to Moro Bay, Central California: 0-15m
- Americorophium setosum** (Shoemaker 1949) – Central West Mexico: 0m
- Americorophium spinicorne** (Stimpson 1857) – SE Alaska to Central California: 0-1m
- ***Americorophium stimpsoni** (Shoemaker 1941) – Mendocino Bay to Morro Bay, Central California: 0-5m
- Apocorophium lousianum** (Shoemaker 1934) – Gulf of Mexico; NEP, introduced in the Salton Sea in inland Southern California: 0-2m
- Corophium acherusicum* Costa 1857 (see *Monocorophium acherusicum*)
- Corophium alienense* Chapman 1988 (see *Sinocorophium aliense*)
- Corophium baconi* Shoemaker 1934 (See *Laticorophium baconi*)
- Corophium bonelli* H. Milne Edwards 1830 (see *Crassicorophium bonelli*)
- Corophium bonelli* of Shoemaker 1920 (see *Crassicorophium clarencense*)
- Corophium californicum* Shoemaker 1943 (see *Monocorophium californicum*)
- Corophium clarencense* Shoemaker 1949 (see *Crassicorophium clarencense*)
- Corophium crassicornis* Bruzelius 1859 (see *Crassicorophium crassicornis*)
- Corophium heteroceratum* Yu 1938 (see *Sinocorophium heteroceratum*)
- Corophium insidiosum* Crawford 1937 (see *Monocorophium insidiosum*)
- Corophium lousianum* Shoemaker 1934 (see *Apocorophium lousianum*)
- Corophium oaklandense* Shoemaker 1949 (see *Monocorophium oaklandense*)
- Corophium panamense* Shoemaker 1949 (see *Americorophium panamense*)

- Corophium setosum Shoemaker 1949 (see Americorophium setosum)
 Corophium steinegeri Gurjanova 1951 (see Monocorophium steinegeri)
 Corophium uenoi Stephensen 1932 (see Monocorophium uenoi)
Crassicorophium bonelli (H. Milne Edwards 1830) – North Atlantic, NWP,
 Bering Sea portion of NEP and adjacent boreal and Arctic regions
Crassicorophium clarencense (Shoemaker 1949) – Northern Bering Sea to
 Prince William Sound, Alaska: 0-10m
Crassicorophium crassicornis (Bruzelius 1859) – Sea of Japan; Bering Sea to
 Washington: 0-37m
 ***Laticorophium baconi** (Shoemaker 1934) – China and Japan, Brazil; Aleutian
 Ids. to SCB: 0-451m
 ***Monocorophium acherusicum** (Costa 1857) – Eastern and Western North
 Atlantic, Japan, China; NEP introduced Alaska to SCB: 0.4-41m
 ***Monocorophium californianum** (Shoemaker 1943) – Southern British
 Columbia, Canada to SCB – 30-100m
Monocorophium charlottensis Bousfield and Hoover 1997 – Prince William
 Sound, Alaska to Vancouver Id., British Columbia, Canada: 0-10m
 ***Monocorophium insidiosum** (Crawford 1937) – North Atlantic; NEP
 introduced, British Columbia, Canada to the SCB: 0-10m
Monocorophium oaklandense (Shoemaker 1949) – San Francisco Bay, Central
 California: depth ?
Monocorophium steinegeri (Gurjanova 1951) – NWP; Aleutian Ids. to Queen
 Charlotte Ids., British Columbia, Canada: depth?
 ***Monocorophium uenoi** (Stephensen 1932) – Japan, South China Sea; NEP
 introduced San Francisco Bay, Central California to Bahia de los Angeles,
 Gulf of California, Mexico: 0-2.1m
Paracorophium sp – NEP introduced to Humboldt Bay: 0m
 ***Sinocorophium alienense** (Chapman 1988) – NWP; NEP introduced San
 Francisco Bay to SCB: 0.7-21.3m
 ***Sinocorophium heteroceratum** (Yu 1938) – NWP; NEP introduced SCB: 2.9-
 26m

Subfamily Protomedeiinae

- Cheirimeideia alaskensis (Stebbing 1910) (see Pareurystheus dentatus of Holmes)
Cheirimeideia macrocarpa americana Conlan 1983 – British Columbia, Canada
 to Oregon: 0m
Cheirimeideia macrodactyla Conlan 1983 – Bering Sea: 30m
Cheirimeideia similicarpa Conlan 1983 – Bering Sea to southern British
 Columbia, Canada: 21-67m
Cheirimeideia zotea (J. L. Barnard 1962) – Vancouver Id., British Columbia,
 Canada to Monterey Bay, Central California: 0-113m
 ***Cheiriphotis megacheles** (Giles 1885) – South Africa, India, Indo-Pacific;
 Cayucos to Galapagos Ids., Ecuador: 0-16m
 Eurystheus dentatus Holmes 1908 (see Pareurystheus dentatus)
 Pareurystheus alaskensis (Stebbing 1910) (see Cheirimeideia alaskensis)
Pareurystheus dentatus (Holmes 1908) – Aleutian Ids.: 3.6-90m
 Pareurystheus dentatus Gurjanova 1938 (see Pareurystheus gurjanovae)

- Pareurystheus gurjanovae** Tzvetkova 1977
Pareurystheus tzvetkovae Conlan 1983 – Aleutian Ids.: depth?
Protomedeia articulata J. L. Barnard 1962 – Oregon to SCB: 9-906m
***Protomedeia articulata** CMLPX - SCB: 4.7-305m
Protomedeia fasciata Krøyer '842 – North Atlantic, Arctic and NWP; NEP
 Bering and Okhotsk Seas only: 5-150m
Protomedeia grandimana Brügger 1906 – North Atlantic, Arctic, NWP; NEP
 from Bering Sea to southern British Columbia, Canada: 0-200m
Protomedeia penates J. L. Barnard 1966 – Tomales Bay to Monterey Bay,
 Central California; 15-76m
Protomedeia prudens J. L. Barnard 1966 – Queen Charlotte Ids., British
 Columbia, Canada to La Jolla, southern California:
Protomedeia stephensi Shoemaker 1955 – North and Arctic Atlantic; NEP
 only from Bering Sea: 30m

Comments by Family

Family Ampithoidae – The family was revised by Conlan (1982) using morphological criteria. Divided into two subfamilies, the Ampithoinae and the Exampithoinae, this family contains thirteen genera. Nearly all these are concentrated in the Ampithoinae, with only *Exampithoe* in the second subfamily. All NEP representatives are in the Ampithoinae, with *Ampithoe*, *Cymadusa*, and *Peramphithoe* having regional representatives. Conlan and Bousfield (1982) provide a key to the genera in the family regionally.

Relationships between ampithoids and their algal substrates are complex and varied, involving interplay between algal morphology, feeding-deterrent chemical content, and fish grazer/predator interactions with both the alga and their amphipod grazers (Cronin & Hay 1996; Cruz-Rivera & Friedlander 2012; Cruz-Rivera & Hay 2000a, b, 2001, 2003; Duffy & Hay 1991; Hay 1992; Hay & Fenical 1992; Holmlund et al 1990; Sotka 2003, 2007; Sotka & Hay 2002).

Description: “**Head** free, not coalesced with peraeonite 1; exposed; as long as deep, or longer than deep, or deeper than long; rostrum present or absent, short; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair; not bulging. Body laterally compressed; cuticle smooth.

Antenna 1 shorter than antenna 2, or subequal to antenna 2, or longer than antenna 2; peduncle with sparse robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2, or subequal to article 2, or longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present, or absent; antenna 1 callynophore absent. Antenna 2 present; short, or medium length; articles not folded in zigzag fashion; without hook-like process; flagellum shorter than peduncle, or as long as peduncle, or longer than peduncle; 5 or more articulate; not clavate; calceoli absent.

Mouthparts well developed. Mandible incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present or absent, medium, triturative; palp present or absent. Maxilla 1 present; inner plate present, weakly setose apically or without setae; palp present or absent, not clavate, 0 -articulate or 2 -

articulate. Maxilla 2 inner plate present; outer plate present. Maxilliped inner and outer plates well developed or reduced, palps present, well developed or reduced; inner plates well developed, separate; outer plates present, large or small; palp 4-articulate, article 3 without rugosities. **Labium notched.**

Peraeon. Peraeonites 1-7 separate; complete; sternal gills absent; pleurae absent.

Coxae 1-7 well developed, none fused with peraeonites. Coxae 1-4 longer than broad or broader than long, overlapping or discontinuous, coxa 1 anteroventrally acuminate or coxae not acuminate. Coxae 1-3 not successively smaller, none vestigial. Coxae 2-4 none immensely broadened.

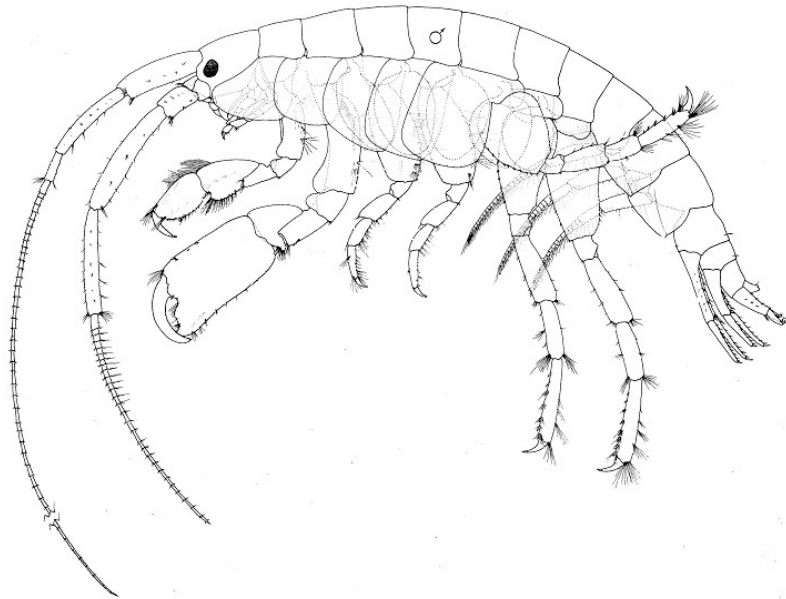
Gnathopod 1 sexually dimorphic, or not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2, or larger (or stouter) than gnathopod 2; smaller than coxa 2, or subequal to coxa 2, or larger than coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus; gnathopod 1 slightly produced along posterior margin of propodus, or not produced along posterior margin of propodus; dactylus large. Gnathopod 2 sexually dimorphic, or not sexually dimorphic; subchelate, or chelate; coxa smaller than but not hidden by coxa 3, or subequal to but not hidden by coxa 3, or larger than coxa 3; ischium short; merus not fused along posterior margin of carpus or produced away from it; carpus/propodus not cantilevered, carpus short or elongate, shorter than propodus or subequal to propodus, strongly produced along posterior margin of propodus or slightly produced along posterior margin of propodus or not produced along posterior margin of propodus.

Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), some or all prehensile or none prehensile. Peraeopod 3 well developed. Peraeopod 4 well developed. 3-4 with glandular basis; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus shorter than propodus or subequal to propodus, not produced; dactylus well developed. Coxa subequal to coxa 3, not acuminate, without posteroventral lobe; carpus not produced. Peraeopods 5-7 with few robust or slender setae; dactyli without slender or robust setae. Peraeopod 5 well developed; shorter than peraeopod 6; coxa subequal to coxa 4 or larger than coxa 4, with posterodorsal lobe or without posterior lobe; basis expanded or slightly expanded, subrectangular or subovate, without posteroventral lobe; merus/carpus free; carpus linear; setae absent. Peraeopod 6 shorter than peraeopod 7, or subequal in length to peraeopod 7; merus/carpus free; dactylus without setae. Peraeopod 7 with 6-7 well developed articles; longer than peraeopod 5; similar in structure to peraeopod 6; with 7 articles; basis expanded or slightly expanded, without dense slender setae; dactylus without setae.

Pleon. Pleonites 1-3 without transverse dorsal serrations, without dorsal carina; without slender or robust dorsal setae. Epimera 1-3 present. Epimeron 1 well developed. Epimeron 2 without setae.

Urosome not dorsoventrally flattened; urosomites 1 to 3 free; urosomite 1 subequal to urosomite 2, or longer than urosomite 2; urosome urosomites not carinate; urosomites 1-2 without transverse dorsal serrations. Uropods 1-2 apices of rami with robust setae. Uropods 1-3 similar in structure and size. Uropod 1 peduncle without long plumose setae, without basofacial robust seta, with ventromedial spur or without

ventromedial spur. Uropod 2 well developed; with ventromedial spur or without ventromedial spur, without dorsal flange; inner ramus subequal to outer ramus, or longer than outer ramus. Uropod 3 not sexually dimorphic; peduncle short or elongate; outer ramus shorter than peduncle, 1-articulate, without recurved spines. Telson thickened dorsoventrally; entire; as long as broad, or broader than long; apical robust setae present, or absent.” (Lowry and Springthorpe 2001).



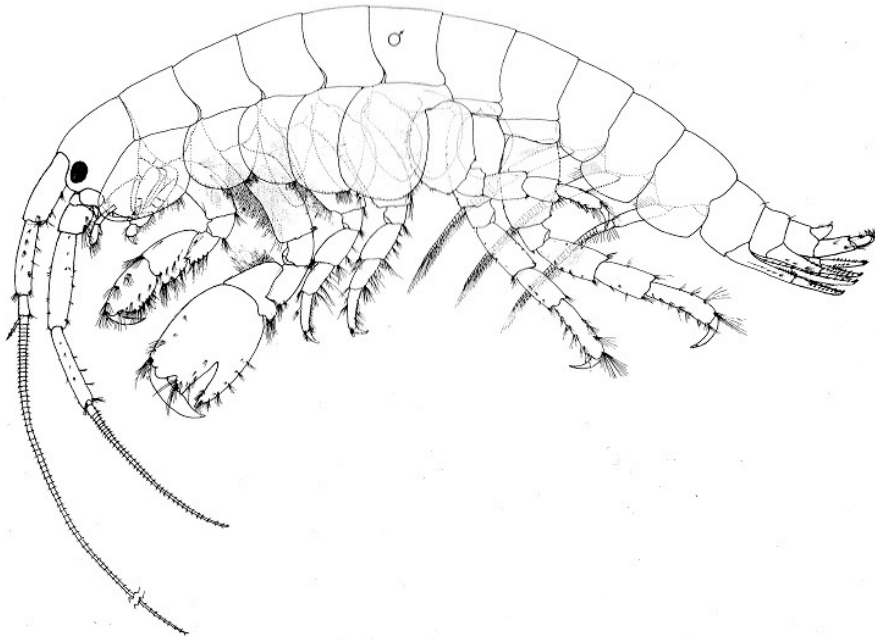
Ampithoe lacertosa (from Conlan & Bousfield 1982)

Ampithoe – A very large genus distributed world-wide, with 83 species currently recognized as valid (Horton 2015a). The genus *Pleonexes* of Barnard has been placed into its synonymy. Sixteen described species occur in the NEP, with no provisionals yet identified. The genus was monographed regionally by Conlan & Bousfield (1982) along with the other regional genera in the family. They provide a key to many regional representatives, but do not include those from subtropical and tropical waters of the NEP. These species, *A. guaspere*, *A. tahue*, *A. vacoregue*, and *A. plumulosa tepahue*, are all described by J. L. Barnard (1979). A series of other species are also omitted from their key, including *A. aptos* (as *Pleonexes* at the time), *A. ramondi*, *A. pollex*, and *A. longimana*. J. L. Barnard (1965) treats the last three species (all introduced), as well as most of those treated by Conlan & Bousfield (1982), but not those described in 1979 or *A. aptos*. Thus no regionally comprehensive key to the genus currently exists.

Ampithoe ramondi is a very wide ranging species or possibly species complex. It was treated as being primarily European by Krapp-Schickel (1982), but she had earlier accepted records from the NEP as valid for the species (Krapp-Schickel 1978). It continues to expand its range, recently arriving in the Persian Gulf (Kasmi & Bano 2003)

Diagnosis: “*Body smooth, little compressed. Pair of short setae on the dorsum of urosomites 1 and 2. Head, rostrum lacking, anterior lobe short and blunt, inferior antennal sinus shallow; eyes lateral, rounded, medium to small. Antennae medium to large. Antenna 1 peduncular segment 3 short, accessory flagellum short, vestigial or lacking. Antenna 2 peduncle strong. Buccal mass directed below the head. Upper lip*

rounded below. Mandible, molar strong, palp slender or lacking. Left lacinia mobilis with 5 or more cusps. Lower lip, outer lobes with characteristic medial notch or emargination. Maxilla 1, inner plate small, outer plate with 10 (rarely less or more) apical spine-teeth. Maxilla 2, plates apically and medially setose, outer plate somewhat broadened. Maxilliped plates large, palp slender and dactylate. Coxae 1-4 overlapping, deep, smooth or lightly setose below. Gnathopods usually strongly subchelate, 2 larger and sexually dimorphic. Peraeopods 3 and 4 glandular, segment 2 expanded, distal segments short, dactyls with gland duct. Peraeopods 5-7 dissimilar, distal segments may be reversed, segment 6 may expand and form a weak subchela with the dactyl; coxae 5, 6 and sometimes 7 strongly anterolobate, coxa 5 often as deep as coxa 4. Pleopods normal, retinacula more than 2. Urosome segments separate, not shortened. Uropods 1 and 2 normally biramous. Uropod 3 biramous, rami very short, quadrate, inner setose, outer with 2 (occasionally 1) strong apical uncini. Telson short, apex usually with cusps. Brood plates with hook-tipped marginal setae (on peraeopods 2-5). Gills laminar, plate-like, short pedunculate on peraeopods 2-6.” (from Conlan & Bousfield 1982)

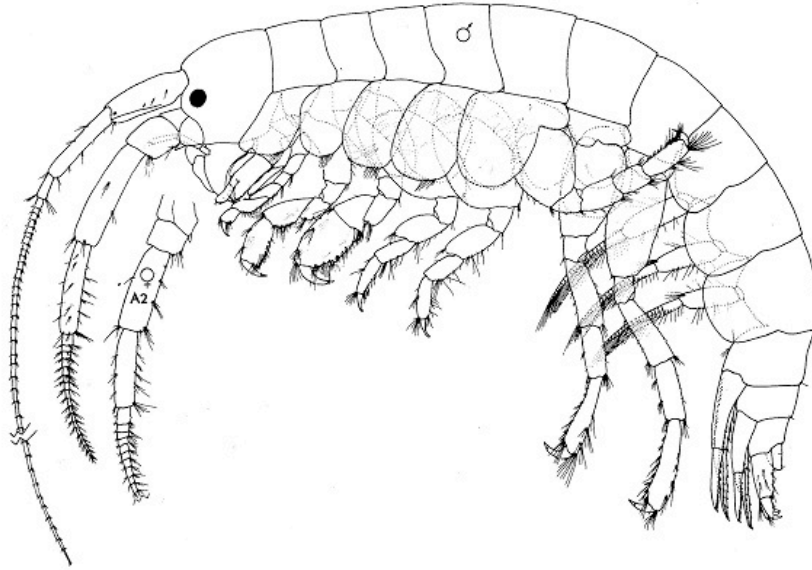


Cymadusa uncinata (from Conlan & Bousfield 1982)

Cymadusa – Horton & Lowry (2015b) report 38 valid species in this genus, but only *C. uncinata* occurs in the NEP. That species is a large kelp curler, which forms nests in macrophytes as does *Peramphithoe humeralis*. It can be separated from other NEP amphipods using the generic key to the regional family provided by Conlan & Bousfield (1982)

Diagnosis: “Head lobe produced, inferior antennal sinus moderate. Antenna 1, accessory flagellum with 11/2 to 61/2 segments. Mandibular palp moderately strong. Maxilla 1 palp broad. Gnathopod 1, palm oblique, coxa 1 produced forward; gnathopod 2 subchelate, equal to or larger than 1. Peraeopods 3 and 4, segment 2 moderately inflated. Peraeopods 5-7, segment 6 not strongly widened apically, spines not restricted

to the antero-distal region. Uropod 1, peduncle extended postero-distally into a long spinous process between the rami. Uropod 3, outer ramus with two hooked uncini. Telson with two small apical cusps.” (from Conlan & Bousfield 1982)



Peramphithoe mea, showing ♀ second antenna (from Conlan & Bousfield 1982)

Peramphithoe – A good sized genus of 18 species (Horton & Lowry 2015a). Regionally there are reports of nine of these, but one, *P. femorata*, seems to be erroneous. McLaughlin et al (2005) list this as occurring on the Pacific coast of the United States, but it is restricted to South American waters, and has not been detected as an introduction (see discussion in Conlan & Bousfield 1982). It may have inadvertently been included because of the discussion in the latter work, although no NEP records were provided there. Another record, that of *P. eoa* from the NEP was questioned by Chapman (2007), who suggested that NEP records of this animal may actually refer to *P. mea*. If he is correct, *P. eoa* is known only from the NWP, and does not occur in the coverage area. Alternatively, if as Chapman also suggests, the distinctions between *P. eoa* and *P. mea* are insufficient and the two are synonymous, *P. eoa* has precedence. Both are currently viewed as valid (Horton & Lowry 2015a), so we view *P. mea* as the form observed in the NEP, and restrict *P. eoa* to the NWP. The record of it from the NEP in McLaughlin et al (2005) was indicated as questionable initially, and this has proven to be the case. Conlan & Bousfield (1982) provide a key to all of the currently recognized members of the genus in the NEP.

Diagnosis: “Head lobe produced, antennal sinus present. Antenna 1 accessory flagellum absent. Mandibular palp moderately weak. Maxilla 1 palp slender. Gnathopod 1, palm transverse, coxa 1 not produced forward. Gnathopod 2 subchelate, equal to or larger than 1. Peraeopods 3 and 4, segment 2 strongly inflated. Peraeopods 5-7, segment 6 not distally expanded, spines usually not restricted to the antero-distal region. Uropod 1 peduncular process well developed. Uropod 3, outer ramus with two hooked uncini. Telson with two small apical cusps.” (from Conlan & Bousfield 1982)

Family Corophiidae – A large family divided into two subfamilies, the Corophiinae and the Protomedeiinae (Horton & De Broyer 2015). The former is separated into three tribes, and two of the three occur in the NEP. Both of the subfamilies are represented in the region. The first tribe in the subfamily Corophiinae, the Corophiini, has six regional genera, containing most of the species in the family found in the NEP. The second tribe, the Paracorophiini, is represented only by a single introduced species of *Paracorophium*. The second subfamily, the Protomedeiinae, contains seven genera, four of which occur in the NEP. The Corophiinae were extensively revised by Bousfield & Hoover (1997), who introduced nearly all of the generic level names currently recognized in this family regionally. Earlier treatments (i.e. Crawford 1937; Shoemaker 1934, 1938, 1949; Otte 1975) placed all species in *Corophium*.

Description: “**Head** free, not coalesced with peraeonite 1; exposed; as long as deep, or longer than deep; anteroventral margin moderately recessed or strongly recessed, anteroventral margin deeply excavate; rostrum present, short or moderate; eyes present, well developed or obsolescent; not coalesced; 1 pair; not bulging. Body laterally compressed, or subcylindrical, or cylindrical; cuticle smooth.

Antenna 1 subequal to antenna 2; peduncle with many robust and slender setae, or with sparse robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2, or subequal to article 2, or longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum absent; antenna 1 calynophore absent. Antenna 2 present; medium length; articles not folded in zigzag fashion; without hook-like process, or article 4 with large posterodistal hook-like process; flagellum shorter than peduncle; 5 or more articulate, or less than 5-articulate; not clavate; calceoli absent.

Mouthparts well developed. Mandible incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, medium, triturative; palp present. Maxilla 1 present; inner plate present, weakly setose apically or without setae; palp present, not clavate, 2-articulate. Maxilla 2 inner plate present; outer plate present. Maxilliped inner and outer plates well developed or reduced, palps present, well developed or reduced; inner plates well developed, separate; outer plates present, large or small; palp 4-articulate, article 3 without rugosities. Labium smooth.

Peraeon. Peraeonites 1-7 separate; complete; sternal gills absent; pleurae absent.

Coxae 1-7 well developed, none fused with peraeonites. Coxae 1-4 longer than broad or as long as broad or broader than long, overlapping or discontinuous, coxa 1 anteroventrally acuminate or coxae not acuminate. Coxae 1-3 not successively smaller, none vestigial. Coxae 2-4 none immensely broadened.

Gnathopod 1 not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2; subequal to coxa 2, or larger than coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; longer than propodus; gnathopod 1 not produced along posterior margin of propodus; dactylus large. Gnathopod 2 not sexually dimorphic; simple, or subchelate; coxa subequal to but not hidden by coxa 3; ischium short; **merus enlarged, heavily setose, fused against posterior margin of carpus, or enlarged, heavily setose, strongly produced away from carpus**; carpus/propodus not cantilevered, carpus short or elongate, shorter than

propodus or subequal to propodus or longer than propodus, not produced along posterior margin of propodus.

Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly) or 3-6 directed posteriorly, 7 directed anteriorly, none prehensile. Peraeopod 3 well developed. Peraeopod 4 well developed. 3-4 with glandular basis; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad or broader than long; carpus shorter than propodus, not produced; dactylus well developed. Coxa subequal to coxa 3, not acuminate, without posteroventral lobe; carpus not produced. Peraeopods 5-7 with few robust or slender setae; dactyli without slender or robust setae. Peraeopod 5 well developed; shorter than peraeopod 6; coxa subequal to coxa 4, with posterodorsal lobe or without posterior lobe; basis expanded or slightly expanded or linear, subrectangular or subquadrate, without posteroventral lobe; merus/carpus free; carpus weakly expanded; setae absent. Peraeopod 6 shorter than peraeopod 7, or subequal in length to peraeopod 7; merus/carpus free; dactylus without setae. Peraeopod 7 with 6-7 well developed articles; longer than peraeopod 5; similar in structure to peraeopod 6, or different in structure to peraeopod 6; with 7 articles; basis expanded or slightly expanded, with long dense slender setae or without dense slender setae; dactylus without setae.

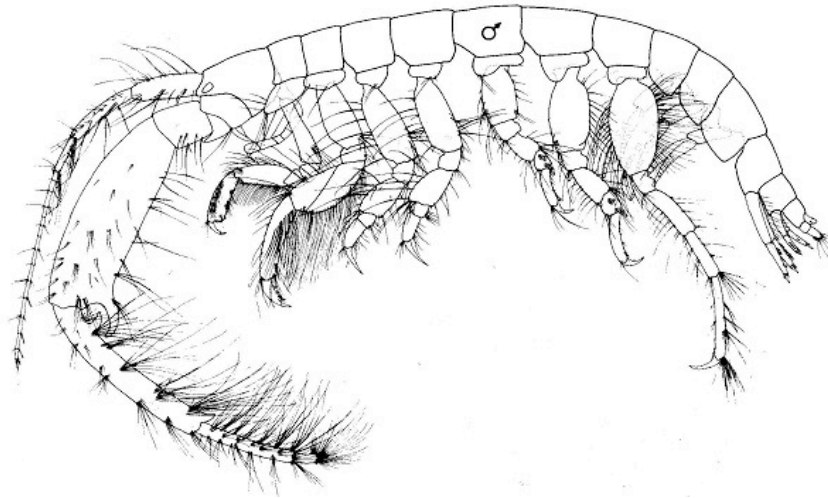
Pleon. Pleonites 1-3 without transverse dorsal serrations, without dorsal carina; without slender or robust dorsal setae. Epimera 1-3 present. Epimeron 1 well developed. Epimeron 2 setose, or without setae.

Urosome dorsoventrally flattened, or not dorsoventrally flattened; urosomites 1 to 3 free, or 1 and 2 coalesced, 3 free, or 1 to 3 coalesced; urosomite 1 longer than urosomite 2; urosome urosomites not carinate; urosomites 1-2 without transverse dorsal serrations. Uropods 1-2 apices of rami with robust setae. Uropods 1-3 similar in structure and size. Uropod 1 peduncle without long plumose setae, without basofacial robust seta, with ventromedial spur or without ventromedial spur. Uropod 2 well developed; without ventromedial spur, without dorsal flange; inner ramus subequal to outer ramus, or longer than outer ramus. Uropod 3 not sexually dimorphic; peduncle short; outer ramus shorter than peduncle or subequal to peduncle or longer than peduncle, 1-articulate, without recurved spines. Telson thickened dorsoventrally; entire; longer than broad, or as long as broad, or broader than long; apical robust setae absent.” (Lowry and Springthorpe 2001).

Subfamily Corophiinae. Species of *Americorophium*, *Apocorophium*, *Crassicorophium*, *Laticorophium*, *Monocorophium*, and *Sinocorophium* are placed in this subfamily, as is the paracorophiian *Paracorophium*. Seven additional genera are reported from this subfamily in other regions. Bousfield & Hoover (1997) provide a key to genera within the family which may assist location of the appropriate genus for a specimen in hand.

Americorophium – Of the nine currently accepted genus members, seven occur within the NEP. The remaining two are from the Western Atlantic (Heard & Sikora 1972), and Indian Oceans (Shyamasundari 1973). Regional species are the abundant corophiids endemic to the NEP, and are significant members of climax communities in salinity interface zones between fresh and marine waters. These are frequently in bays,

and estuaries, but also occur at stream mouth sites along the open coast. The genus was created by Bousfield & Hoover (1997), who provide a key to the species.



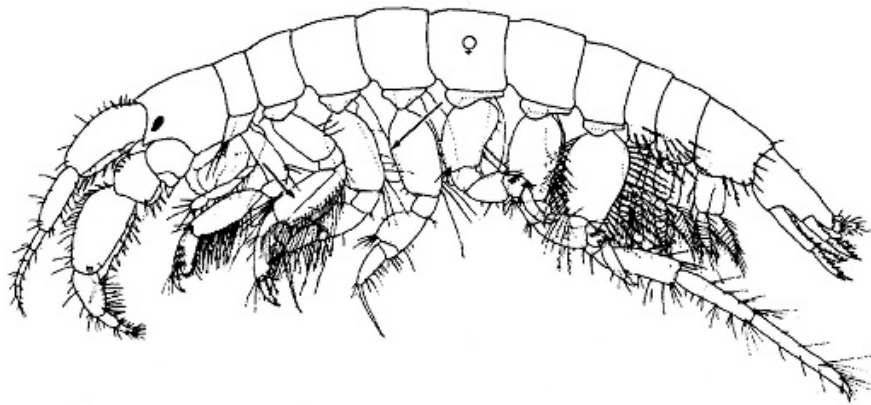
Americorophium spinicorne (from Bousfield & Hoover 1997)

Diagnosis: “Generally medium to large corophiins. Urosome segments unfused. Head, rostrum flat, rounded, or weakly produced; inferior antennal sinus large, regressed. Antenna 1, peduncular segment 3 variously shortened. Antenna 2, large, pediform, variously sexually dimorphic, often strongly setose posteriorly; gland cone short; segment 4 with bidentate posterodistal process; segment 5, posteromedian tooth and distal process variously developed; flagellum 2(3)-segmented, distal segments very short. Lower lip, mandibular lobes pronounced. Mandibular palp basic (type PI of Hirayama, 1987b). Maxilla 1, palp little (or not) exceeding outer plate. Maxilla 2, plates large, inner margins fully setose. Maxilliped, inner plate straight, setose apico-medially; outerplate regular, inner margin fully setose; palp segment 2 medium to short. Gnathopod 1 regularly weakly subchelate; dactyl slightly exceeding palm. Gnathopod 2 strong; merus not occluding postero-distal free margin of carpus; dactyl moderately strong, spinose or toothed behind. Peraeopods 3 & 4, bases broadened, glandular; segment 4 broadened distally, variously overhanging shortened segment 5. Peraeopods 5 & 6, bases broadened, that of peraeopod 6 setose behind; segment 5 shortened, with short posterodistal hook spines; segment 6 and dactyl reversed. Peraeopod 7; segment 5 not longer than 4; dactyl moderate. Pleon plate 3, hind corner obtuse. Pleopod peduncles strongly broadened medially. Uropods 1 & 2 stout, peduncles broadened distally; outer ramus shorter than inner ramus; lateral margins of rami spinose, apices acute, curved outward. Uropod 3, ramus medium broad, slightly longer than peduncle. Telson broad, narrowing distally, apex subtruncate. Brood plates large, strap-like, marginal setae long, numerous (>40). Coxal gills large, sac-like, on peraeopods 3-6.” (from Bousfield & Hoover 1997)

Apocorophium – A relatively small genus, with only five constituent species. Only one of these occurs regionally, *A. louisianum* which was introduced to, and has become established in, the Salton Sea. This body, while saline, is isolated from the marine waters of the region, and it is unclear if the species will be able to spread to other

locations. At present, it does not seem to occur outside its inland reservoir. Bousfield and Hoover (1997) provide a key to the genus.

Diagnosis: “Urosome segments fused; uropods arising ventrally on urosome. Head, rostrum distinct, interior antennal sinus large, recessed. Antenna 1, peduncular segment 3 short. Antenna 2 short-pediform, sexually unlike (except in simile); distal process of segment 4 bidentate; segment 5, median tooth and distal process variously developed; flagellum short, 3-segmented; gland cone short (except in *A. louisianum*). Upper lip; epistome not produced. Lower lip, mandibular lobes strong. Mandibular palp of moderately advanced form (type P4 of Hirayama, 1987b). Maxilla 1, palp short, not exceeding outer plate. Maxilla 2, inner plate slender. Maxilliped, inner plate short; outer plate slender, inner margin setose distally; palp segment 2 short. Gnathopod 1, dactyl with weak posteriorly marginal tooth, tip little exceeding palm. Gnathopod 2, merus not occluding posterodistal (free) margin of short carpus (- 1/2 propod); dactyl short, tri- or quadridentate. Peraeopods 3 & 4, basis broadened, glandular; segment 4 moderately broadened distally, overhanging short segment 5. Peraeopods 5 & 6, segment 4 short; segment 5 short, posterodistal hook spines short, stout; segment 6 and dactyls reversed; basis of peraeopod 6, hind margin setose. Peraeopod 7 not markedly elongate; dactyl short. Pleon plate 3, hind corner obtuse or rounded. Pleopod peduncles very broad distally. Uropods 1 & 2, peduncless stout, broad; rami short, subequal, spinose on outer margin and apically, apex acute, curved outwards. Uropod 3, ramus short, broad, apex rounded, setose. Telson regular, with dorsal hook spines, apex rounded.” (from Bousfield & Hoover 1997)

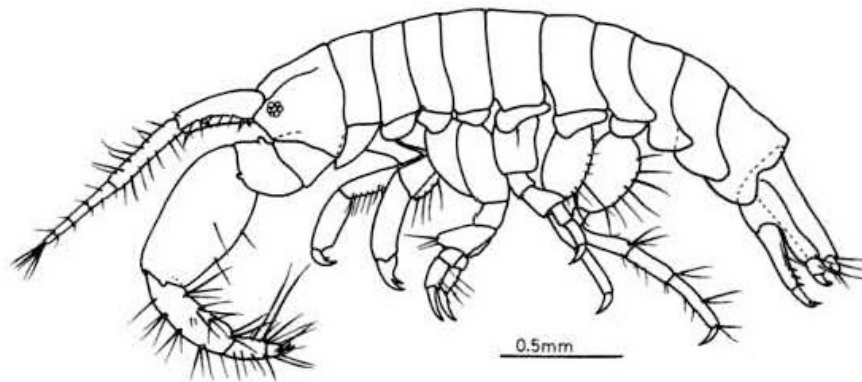


Crassikorophium crassicornis (from Bousfield & Hoover 1997)

Crassikorophium – All three members of the genus occur in the NEP, although two of them are introduced from the North Atlantic. These can be separated using the key provided by Bousfield & Hoover (1997).

Diagnosis: “Urosome segments fused. Uropods 1 & 2 arising from distinct lateral notches. Head, rostrum short, acute, slightly sexually dimorphic; inferior antennal sinus strongly regressed. Antenna 1, peduncular segment 1 variously inflated and medially spinose (female); segment 3 short. Antenna 2 sexually dimorphic; gland cone medium; peduncular segment 4 (male), posterodistal process weakly bidentate, thickened and strongly spinose (female); segment 5 with weak median and distal processes; flagellum short, with apical spines. Upper Lip, epistome produced. Lower lip, mandibular lobes weak to medium. Mandibular palp, proximal segment distally produced

(type P5 of Hirayama, 1987b); spine row with several (4-5) slender blades Maxilla 1, palp slender, slightly exceeding outer plate. Maxilliped, inner plate with 4 strong setae; outer plate large; palp segment 2 medium. Gnathopod 1, dactyl weakly bidentate, exceeding oblique palm. Gnathopod 2, merus fused with medium-long carpus except for short posterodistal portion; propod narrowing, with minute palm and posterodistal cusp; dactyl strong, weakly bidentate, finely crenulate behind. Peraeopods 3 & 4 short; basis broad, glandular; segment 4 moderately broadened distally, partly overhanging short segment 5; dactyls elongate. Peraeopods 5 & 6, medium; bases unequal in size, setose behind; segment 5 short, with 2 posterolateral clusters of short hook spines; segment 6 and dactyls reversed. Peraeopod 7 moderately long; basis regular; segments 4 & 5 subequal in length; dactyl short. Pleon plate 3, hind corner sharply rounded. Pleopod peduncles narrow basally, broadened distally. Uropod 1, peduncle medium, outer margin proximally setose; rami subequal, nearly straight, apices acute, slightly (or not) curved outwards, one apical spine elongate. Uropod 2, rami straight, subequal, as long as peduncle. Uropod 3 little broadened; ramus medium, longer than unmodified peduncle. Telson short, wider than long, apex rounded. Coxal gills slender sac-like, on peraeopods 3-6; brood plates elongate, strap-like, marginal setae numerous (30-40).” (from Bousfield & Hoover 1997)

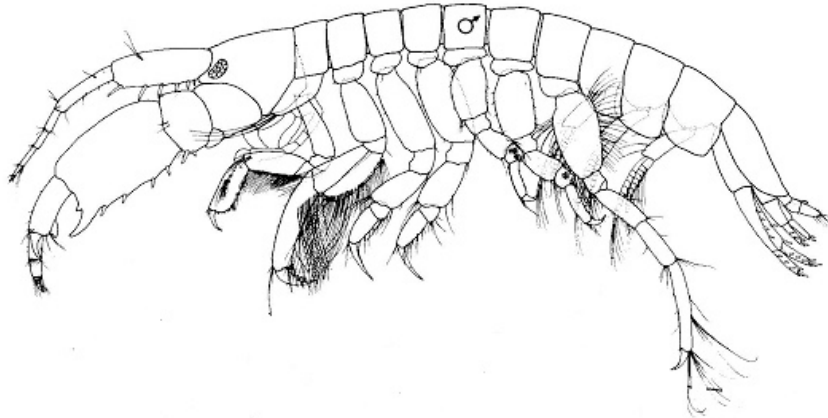


Laticorophium baconi (from Hirayama 1986)

Laticorophium – A monotypic genus consisting only of *L. baconi*. The structure of the telson, with a raised margin forming a bowl shape, makes it relatively easy to spot in a large mixed group of corophiids. It can also be separated using the generic key provided by Bousfield & Hoover (1997).

Diagnosis.: “Urosome segments fused, lateral margins notched. Uropods inserted ventrally. Head, rostrum short, little sexually dimorphic; inferior antennal sinus strongly regressed. Antenna 1, peduncular segments 1 & 2 long, 3 short. Antenna 2 markedly sexually dimorphic, strongly pediform (male); gland cone short; peduncular segment 4, posterodistal process bifid; segment 5 with strong medial and distal processes; flagellum short, with apical spines. Upper lip, epistome produced anteriorly. Lower lip, mandibular lobes medium. Mandibular palp, basal segment with notched shelf (type P4 of Hirayama, 1987b); blades few (2-3), stout. Maxilla 1, palp slender, slightly exceeding outer plate. Maxilliped, inner and outer plates short; palp segment 2 short. Gnathopod 1, dactyl bifid, tip exceeding short, oblique palm.. Gnathopod 2, carpus short, deep, posterodistal setose free margin not occluded by short merus; propod lacking palm; dactyl short, typically bidentate. Peraeopods 3 & 4 short; basis broad, glandular; segment 4 broadened distally,

slightly overhanging short segment 5. Peraeopods 5 & 6 short, similar in form but bases markedly unequal in size; segment 5 short, with 2 posterolateral clusters of short hook spines; segment 6 and dactyl reversed. Peraeopod 7 not elongate; basis medium broad; dactyl short. Pleon plate 3, hind corner rounded. Pleopod bases strongly broader than deep, proximo-medial margin strongly convex; rami short. Uropod 1, peduncle stout, outer ramus the shorter, outer margins spinose, apices acute, curved outwards. Uropod 2 relatively small, outer margin of rami setose. Uropod 3; peduncle with distinct lateral lobe; ramus short, broad, subtriangular. Telson not broader than long, apex rounded. Coxal gills narrow, sac-like, on peraeopods 3-6. Brood lamellae linear, margins moderately setose «20), on peraeopods 3-5.» (from Bousfield & Hoover 1997)

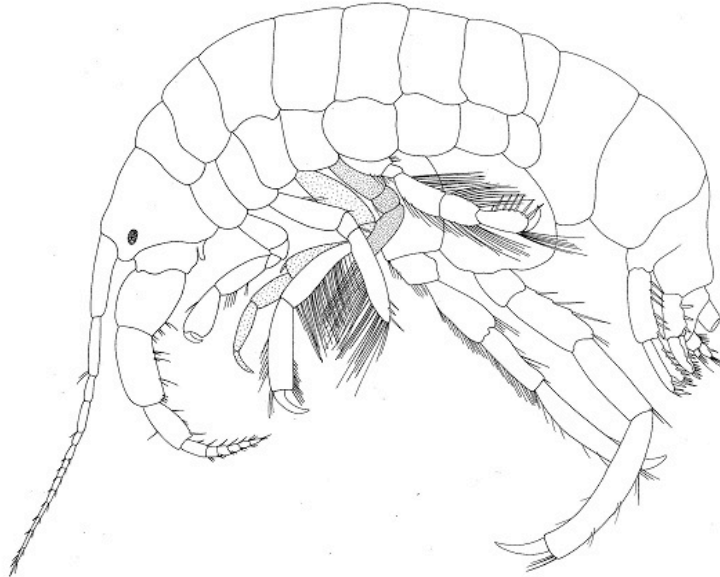


Monocorophium californianum (from Bousfield & Hoover 1997)

Monocorophium – A medium sized genus of eleven species (Lowry 2015g), seven of which are reported to occur in the NEP. Three of these are introduced: *M. acherusicum*, *M. insidiosum*, and *M. uenoi*. The first two are Atlantic in origin, while the latter came initially from the Western Pacific. All three are generally much more abundant when found than any of the native members of the genus, although this is less true of *M. uenoi*. Bousfield & Hoover (1997) provide a nearly comprehensive generic key, lacking only *M. josei* from Brazil (Valério-Berardo & Thiago de Souza 2009).

Diagnosis: “Urosome segments fused; uropods arising from lateral notches. Head, rostrum distinct; anterior margin sexually dimorphic. Antenna 1, segment 3 short. Antenna 2 strongly pediform, variously (or not) sexually dimorphic; segment 4 (male), with bidentate distal process; segment 5 usually with proximomedial tooth; distal process weak or lacking; gland cone short, relatively inconspicuous; flagellum short, 3-segmented, with apical paired spines. Upper lip, epistome little (or not) produced. Lower lip, mandibular lobes strong. Mandible: spine row moderate (35 blades; palp of intermediate form [type P4 of Hirayama (1987b)]). Maxilliped, inner plate short to medium, apex subacute; outer plate slender, medial margin setose throughout; palp segment 2 medium to short. Gnathopod 1 medium subchelate; dactyl denticulate behind. or tip weakly bidentate, exceeding short oblique palm. Gnathopod 2, merus not covering small anterodistal portion of carpus; dactyl short, tri- or quadridentate. Peraeopods 3&4 short, bases broad (glandular); segment 4 expanded, often setose anteriorly; segment 5 short, overhung by segment 4. Peraeopods 5& 6 short, segments 4 and 5 short, the latter with 2 clusters of short strong hook spines; segment 6 and dactyl reversed. Peraeopod 7

not elongate, basis medium broad; dactyl medium. Pleon plate 3, hind corner rounded. Pleopod peduncles stout, wider than deep. Uropods 1 and 2, peduncle stout, widening distally; rami short, spinose laterally and apically, apices curved, acute. Uropod 3, ramus short, broad. Telson short, wide, with dorsal hooks. Coxal gills slender, sac-like, on peraeopods 3-6. Brood lamellae relatively large, broad, margins with few setae.”
(from Bousfield & Hoover 1997)



Paracorophium excavatum (from J. L. Barnard & Karaman 1991)

Paracorophium – A single species of the genus occurs in the NEP. All of the seven described species in the genus (Lowry 2015a) are from the southern hemisphere. An eighth species has just been described from slightly above the equator in southeast Asia (Wongkamhaeng et al 2015). The character which most easily identifies this genus, the attachment of the female G2 carpus to the merus near its base, and the development of a setal sieve on the dorsal and ventral margins of those articles is clearly visible below. The NEP species has been introduced into Humboldt Bay, where it has become very numerous on the mudflats in the northwestern portion of the bay near Samoa. Chapman (2007) provides a whole-body illustration of this species, as well as of the mandible and urosome. The identity of the species is unclear, but the closest source for any *Paracorophium* seems to be in Chile, where *P. hartmannorum* and *P. chilensis* are known (Andres 1979, Gonzalez 1986; Varela 1983). Most of the remaining species come from Australia or New Zealand (Chapman 2002, Hurley 1954, Myers 2009), but one is from Babelthaup Island in the South Pacific (Karaman 1979). Anatomical details seem to not match any of the described potential source populations, however, so the species remains unnamed. The differences lie in the antennae, the anterior coxal shape and ventral setation, the structure of the mandibular palp, in P7, and in the uropod 3 peduncle and rami.

Diagnosis: “*Labrum symmetrically incised, labium normal, with inner lobes. Maxilla 1: inner lobe small, palp 2-articulate. Maxilliped: inner margin of outer lobe with several slender spines. Mandible: molar triturative, incisor toothed, palp 3-articulate. Rostrum short, coxa 4 without distoposterior lobe, coxa 5 as long as coxa 4. Accessory flagellum absent. Gnathopod 1 subchelate, gnathopod 2 merochelate, distally*

chelate, parachelate or subchelate. Basis of pereopods 5-7 not lobed. Peduncle of uropod 1 with distoventral strong tooth. Uropod 3 very short, biramous, rami unisegmented. Telson short, fleshy, entire, bearing 2 distal corner teeth. Oostegites narrow, coxal gills simple. Sexual dimorphism present (gnathopod 2).” (from Wongkamhaeng et al 2015)



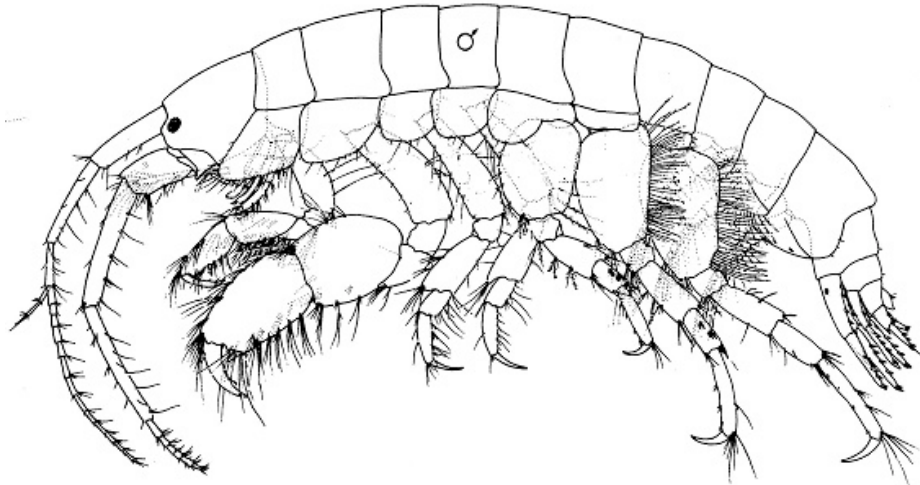
Sinocorophium alienense male (photo Rachael August from <http://www.water.ca.gov/bdma/BioGuide/BenthicBioGuide.cfm#CA>)

Sinocorophium – Although this genus is rejected by Chapman (2007) who feels that it is poorly founded, it is retained by Lowry (2015b) in WoRMS as valid, a position followed here. It currently contains 11 described species, all from the NW Pacific, although two species have been introduced from there into the NEP. Bousfield & Hoover (1997) introduced this genus, and provide a key to the eight described species known at the time. This, fortunately, includes both of the species occurring in the NEP.

Diagnosis: “*Urosome segments uncoalesced. Head, rostrum distinct; inferior lateral sinus large, regressed below. Antenna 1 elongate (usually exceeding antenna 2, peduncular segment 4); peduncular segment 3 shortened «1/2 segment 2). Antenna 2 strong, pediform (often subsimilar in female), segment 4 with simple (occasionally bifid) posterodistal tooth; segment 5, median tooth and posterodistal process lacking (or weak); flagellum 2-3-segmented, shorter than peduncular segment 5; gland cone large, prominent. Mouthparts basic. Upper lip, epistome produced, acute. Lower lip, mandibular lobes small. Mandibular palp basic (types PI, Plr of Hirayama, 1987b). Maxilla 1, palp longer than outer plate. Maxilliped, inner plate, apex rounded, setose; outer plate broad, inner margin variously setose; palp segment 2 elongate, often broadened, outer margin with long filter setae. Gnathopod 1 primitively subchelate; palm of propod short, vertical; dactyl short. Gnathopod 2, merus not occluding distal free*

margin of carpus; dactyl large, simple. Peraeopods 3&4, basis sublinear; segment 4 little broadened distally, segment 5 little (or not) shorter than 4; dactyl medium, curved. Peraeopods 5 & 6, bases little broadened, posterior margin (especially of P6) setose, segment 4 long, with anterodistal lobe; segment 5 distinct, posterodistal spines elongate; segment 6 and dactyl not reversed. Peraeopod 7 elongate, basis little broadened; dactyl long. Pleon plate 3, hind corner acuminate or squared. Pleopod peduncles little broader than deep. Uropod 1, rami sublinear, inner ramus the shorter. Uropod 2 not shortened, rami linear, both margins spinose. Uropod 3, ramus linear to subovate, usually longer than peduncle. Telson short, subtriangular. Coxal gills medium, slender sac-like, on peraeopods 3-6. Brood lamellae medium, marginal setae short.” (from Bousfield & Hoover 1997)

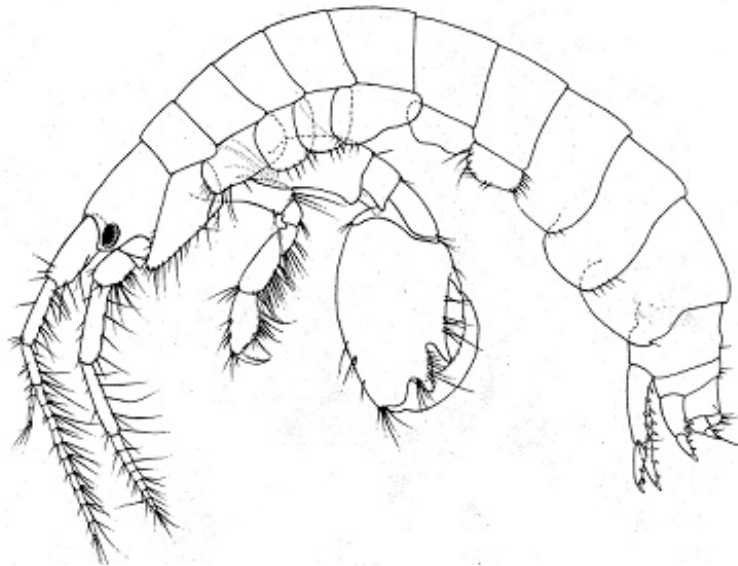
Subfamily Protomedeiinae – Conlan (1983) in her treatment of the family Isaeidae, included all species currently placed in Protomedeiinae among them. That family has since been significantly realigned, and severely restricted, moving most of the contents she treated elsewhere. She provides a key which includes the genera here as members of the subfamily, as well as a number of other related genera now placed in other families.



Cheirimeдея zotea (from Conlan 1983)

Cheirimeдея – Treated by Conlan (1983) as a subgenus of *Protomeдея*, this is currently viewed as a genus level taxon with eight species (Lowry 2015c). The genus is a North Pacific endemic, with most representatives from the Arctic or NWP. Conlan (1983) provides a key to the NEP members of the genus, including *C. macrodactyla* from the Bering Sea. Lowry (2015f) lists *C. alaskensis* as valid, with *C. dentatus* of Holmes as a homonym. I assume this bizarre rendition stems from the treatment in J. L. Barnard & Karaman (1991) of *Cheirimeдея alaskensis* (Stebbing 1910). They indicate its equality with *C. dentata* (now *Pareurystheus dentatus*) as a homonym. The actual situation is that Stebbing (1910) proposed *Eurystheus alaskensis* as a substitute name for a presumably preoccupied homonym *Eurystheus dentatus* of Holmes 1908 (presumably based on Stebbing 1906, who placed Chevreux’s 1900 *Podoceropsis dentata* in *Eurystheus*). This homonymy was ephemeral, and *C. alaskensis* becomes an unnecessary replacement name and junior synonym of *P. dentatus*.

Diagnosis: “Body dorsoventrally depressed. Head lobe square, antenna 1 sinus shallow. Eye small to medium, round. Antenna 1, peduncular segment 3 shorter than segment 1; accessory flagellum multisegmented. Antenna 2 subequal to or shorter than antenna 1; flagellum 1 longer than flagellum 2. Upper lip, epistome moderately produced. Mandibular palp slender; molar with up to 2-3 raker spines. Maxilla 1 inner plate setose. Maxilla 2 lacking facial setae. Coxae shallow, increasingly so posteriorly. Coxa 1 produced forward; coxa 3 (D) lacking stridulation ridges. Gnathopod 1, segment 5 not produced into a posterior lobe; palm distinct, dactyl usually much longer than the palm. Gnathopod 2 (♂), segment 2 lacking stridulation ridges; segment 5 subequal to or longer than segment 6 and not produced into a narrow posterior lobe; palm not incised. Peraeopods 3 and 4, anterior margin of segment 4 weakly setose (5 or less groups of setae); segment 4 anterodistally overhanging segment 5; segment 5 one third to one half the length of segment 4. Peraeopod 5 (D), segment 2 not posterodistally notched; dactyl lacking an accessory tooth. Peraeopods 6 and 7 longer than peraeopod 5; segment 2, hind margin setose; segment 5 bearing comb spines. Pleopods, peduncles broad. Epimera not posterodistally notched, usually lacking a lateral ridge. Urosome dorsally smooth, bearing a pair of setae on segments 1 and 2. Uropod 1 bearing a peduncular spinous process; uropods 1 and 2 terminating in a group of spines; uropod 3, peduncle short, outer ramus a single segment, usually terminating in short spines and a seta; inner ramus usually half the length of the outer ramus (but subequal in *C. similicarpa*). Telson bearing a pair of apical cusps or small spines. Brood plates narrow, elliptical; setae rather sparse, not hook-tipped. Small size (regional species 4.0 to 9.0 mm).” (from Conlan 1983)



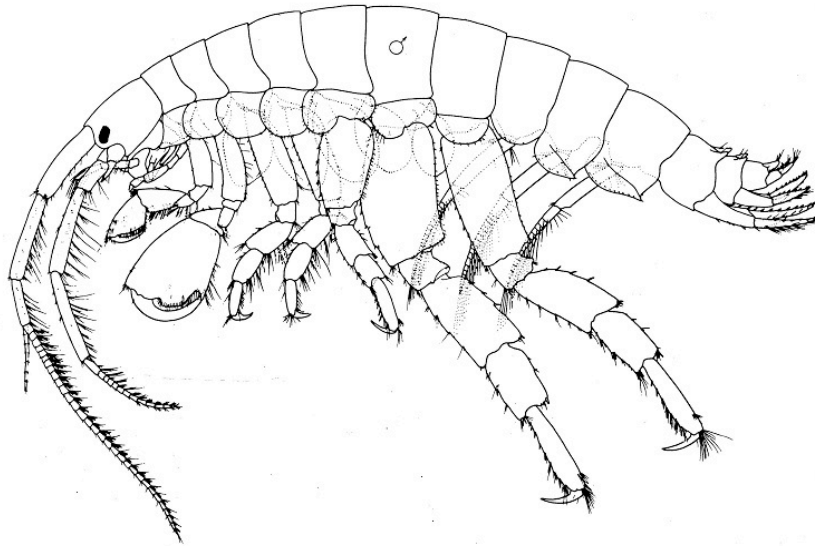
Cheiriphotis megacheles male (from J. L. Barnard 1962)

Cheiriphotis – A moderately sized genus of 17 species (Lowry 2015d), primarily southern hemisphere in distribution. The NEP representative, *C. megacheles*, is the type, and was originally described from India. It is very widely distributed in temperate and tropical waters of the Indo-Pacific, and these reports may conceal a sibling species complex as yet undifferentiated (Chapman 2007). A comprehensive key to the members

of the genus is provided by Souza-Filho et al (2012), which covers the almost simultaneous publication of another species (Wongkamhaeng et al 2012).

Diagnosis: “*Body laterally compressed, smooth, normal; urosomites free, urosomite 1 ordinary. Rostrum short, ocular lobes short, pointed, antennal sinus weak to deep. Eyes small. Antennae of medium length, nearly subequal, both slender, peduncular article 3 of antenna 1 shorter than 1, articles 1-2 longest, accessory flagellum pluriarticulate. Antenna 2 peduncular article 3 short, flagellum often short. Epistome unproduced anteriorly. Labrum incised. Mandible normal, palp strong, slender, article 3 rectilinear or clavate, article 3 scarcely shorter than 2. Labium with entire outer lobes, with well-developed inner lobes, mandibular lobes short, pointed. Inner plate of maxilla 1 triangular, large, with a row of medial setae, outer plate with 9 spines, palp 2-articulate. Plates of maxilla 2 ordinary, inner plate with medifacial row of setae. Inner plate of maxilliped with distal spines, outer plate normal, not reaching apex of palp article 2, with spines on medial margin, palp with 4 articles, article 2 long, article 3 unlobed, article 4 long, stubby, with long nail and setae. Coxae small, relatively short, weakly overlapping, of various sizes and shapes, progressively elongate from 2 to 4, spiniform, coxa 1 dilated, produced forward, coxa 2 shorter than 1, broad, coxa 4 not longer than coxa 1, not lobed, coxa 5 as long as 4, coxae 6-7 smaller than anterior coxae. Gnathopods 1-2 diverse; gnathopod 2 greatly larger than 1, gnathopod 1 in male subchelate, article 5 long, unlobed, longer than 6. Gnathopod 2 enlarged, subchelate, with article 2 slightly dilated, with article 4 enlarged, extended distally along posterior margin of article 5, article 5 shorter than 6, very short, often seemingly absent or fused to article 4, lobed, article 6 greatly dilated, sometimes with false chela or processes on posteroproximal margin, dactyl long. Pereopods similar, with inflated article 2, article 4 dilated, dactyls short. Pereopods 5-7 similar to each other, progressively longer, pereopod 5 much shorter than pereopod 7, pereopods 5-7 with broad, lobed, setose article 2, dactyl of pereopods 5-7 curved, medium. Sternal processes of thorax absent. Coxal gills [undescribed, present on segments ?2-6]. Pleopods normal. Epimeron 3 bisinuate. Uropods 1-2 biramous, stout, rami subequal, much shorter than peduncle, peduncle of uropods 1-2 without ventrodistal process. Uropod 3 small, very short, uni- or biramous, both rami very short, almost spine-like, peduncle plate-like, longer than rami but very short, often dilated medially (when inner ramus absent), outer ramus with small article 2 or spine, inner ramus scale-like, shorter than outer ramus or lost in adults. Telson entire, short, broader than long, semicircular, pointed apically, with 2 hooked apical cusps.*” (from J. L. Barnard & Karaman 1991)

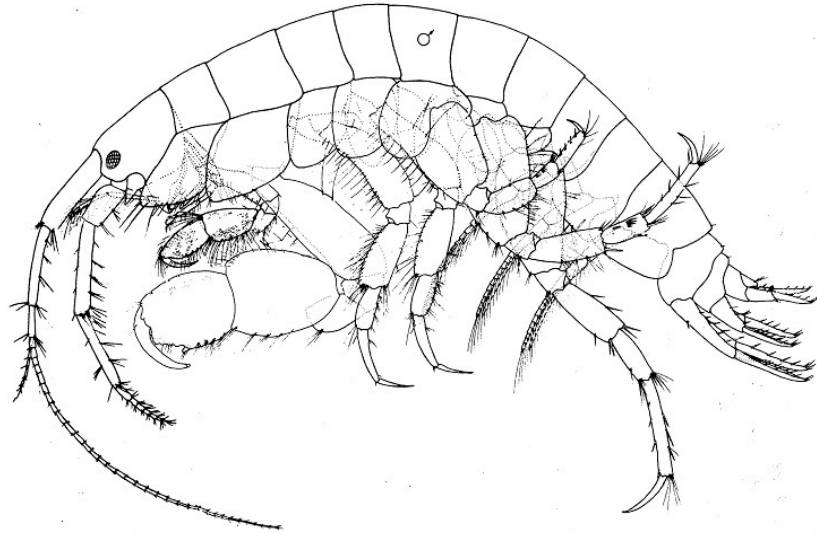
Pareurystheus – Seven species are listed as valid on WoRMS, three reported from the NEP. *Pareurystheus dentatus* (Stebbing 1910) was listed in McLaughlin et al (2005) as a valid taxon from the Pacific Coast of North America. The species was discussed under *Cheirimedeia*, where *C. alaskensis* and *C. dentatus* were supposedly homonyms. There are, however, actually two *P. dentatus* species: that of Holmes 1908 (as *Eurystheus*), and “*P. dentatus* Holmes 1908” of Gurjanova (1938). This animal, which differed from *P. dentatus*, was renamed *P. gurjanovae* by Tzvetkova (1977). The genus is a North Pacific endemic, with most members in the NWP. The three NEP species as well as several others in the genus are keyed by Conlan (1983).



Pareurystheus tzvetkovae (from Conlan 1983)

Diagnosis: “Body subcylindrical, urosomites free, urosomite 1 of ordinary length, toothed or carinate. Rostrum short, ocular lobes short, blunt; antennal sinus weak to moderate. Eyes small to medium. Antennae of various lengths, nearly subequal, or usually 1 longer than 2, both slender, peduncular article 3 of antenna 1 shorter than 1, articles 1-2 longest, accessory flagellum multiarticulate. Antenna 2 peduncular article 3 scarcely elongate. Epistome produced anteriorly. Labrum subrounded, entire. Mandible normal, palp strong, article 3 clavate, shorter than or equal to 2. Labium with entire outer lobes, with well-developed inner lobes, mandibular lobes long, pointed. Inner plate of maxilla 1 triangular, large, with a row of medial setae, outer plate with 9 spines, palp 2-articulate. Plates of maxilla 2 ordinary, inner plate with medifacial row of setae. Inner plate of maxilliped with distal spines, outer plate normal, not reaching apex of palp article 2, with spines on medial margin, palp with 4 articles, article 2 long, article 3 unlobed, article 4 short, with long setae. Coxae relatively short, [probably not weakly overlapping], not progressively elongate from 1 to 4, coxa 1 dilated, produced forward, coxa 4 not longer than coxa 1, not lobed, coxa 5 nearly as long as 4, coxae 6-7 not much smaller than anterior coxae. Gnathopods 12 similar, of subequal size, small, gnathopod 2 slightly larger than 1, gnathopod 1 in male subchelate, article 5 as long as 6, poorly lobed. Gnathopod 2 subchelate, with article 2 not dilated, article 5 shorter than 6, weakly lobed, article 6 scarcely dilated or not. Pereopods 3-4 normal but longer than gnathopods, similar, with scarcely inflated article 2, article 4 scarcely dilated, dactyls short. Pereopods 5-7 similar to each other (or not), progressively longer, almost prehensile, pereopod 5 much shorter and slightly different from pereopods 6-7, with slightly broader (relative to size) article 2. Pereopods 6-7 with narrow, almost lobed article 2, dactyl of pereopods 5-7 short, curved, without accessory spine on outer margin. Sternal processes of thorax [undescribed]. Coxal gills [undescribed, present on segments ?2-7]. Pleopods normal. Epimeron 3 not bisinuate. Uropods 1-2 biramous, normal, rami slightly unequal, longer than or as long as peduncle, peduncle of uropod 1 with ventrodiscal process. Uropod 3 small, biramous, both rami short, peduncle slightly elongate, as short as outer ramus, ramus 1-articulate, inner ramus shorter than outer

ramus, both narrow, tapering, with few armaments mostly apical. Telson entire, short, broader than long, subquadrate, with 2 tiny hooked apical cusps.” (from J. L. Barnard & Kararman 1991)



Protomeдея grandimana (from Conlan 1983)

Protomeдея – Lowry (2015e) lists 14 valid taxa in the genus, placing *P. chelata* as a nomen dubium, although both sexes were recently redescribed by Labay (2013). It is a WNP species, and is not reported from the study area. Six species occur in the NEP, along with the reporting construct *P. articulata* CMLX, used in southern California and including *P. articulata*, *P. penates*, and *P. prudens*. This was created as the separation of these three species was viewed as problematic for all except terminal males. Separatory difficulty was echoed by Conlan (1983) who, while omitting *P. penates* from her regional key, indicated “The Californian *P. penates* of Barnard may prove synonymous with *P. prudens*.” One of these reported forms, *P. fasciata*, occurs only outside the coverage area in the Bering and Okhotsk Seas in the North Pacific, as well as in the North Atlantic. As the genus has a few North Atlantic species, but is primarily known from the North and Arctic Pacific. Conlan (1983) provides a key which includes both sexes of the species reported from the NEP, and also *P. fasciata*, which is taken just north of our coverage.

Diagnosis: “Body dorsoventrally depressed. Head lobe square, antenna 1 sinus shallow. Eye small to medium, round. Antenna 1, peduncular segment 3 shorter than segment 1; accessory flagellum multisegmented. Antenna 2 shorter than antenna 1, flagellum 1 shorter than flagellum 2. Upper lip, epistome moderately produced. Mandibular palp slender; molar with up to 2-3 raker spines. Maxilla 1, inner plate setose. Maxilla 2 lacking facial setae. Coxae shallow. Coxa 1 produced forward; coxae 1 and 2 (a) not shallower than coxae 3-5; coxa 3 (a) lacking stridulation ridges. Gnathopod 1, segment 5 not produced into a posterior lobe; palm distinct, dactyl much longer than the palm. Gnathopod 2 (a), segment 2 lacking stridulation ridges; segment 5 subequal to or longer than segment 6 and not produced into a narrow posterior lobe; palm not incised. Peraeopod 3 and less so in peraeopod 4, anterior margin of segment 4 strongly setose (10 or more groups of setae in peraeopod 3); segment 4 not anterodistally overhanging segment 5, segment 5 half to two thirds the length of segment 4. Peraeopod 5 (a), segment 2 not posterodistally notched; dactyl lacking an accessory tooth.

Peraeopods 6 and 7 longer than peraeopod 5; segment 2, hind margin setose; segment 5 bearing comb spines. Pleopods, peduncles broad. Epimera not posterodistally notched, usually lacking a lateral ridge. Urosome dorsally smooth, bearing a pair of setae on segments 1 and 2. Uropod 1 bearing a peduncular spinous process; uropods 1 and 2 terminating in a group of spines; uropod 3, peduncle short; outer ramus a single segment, usually terminating in long spines; inner ramus usually two thirds to fully the length of the outer ramus. Telson bearing a pair of apical cusps or small spines. Brood plates narrow, elliptical; setae rather sparse, not hook-tipped. Medium size (regional species 4.5- 14.0 mm).” (from Conlan 1983)

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