**Amphipoda of the Northeast Pacific** (Equator to Aleutians, intertidal to abyss): XV. Lysianassoidea – an updated and revised review

Donald B. Cadien, LACSD 15Feb2007 (Revised 29Mar2015)

## 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.

Table of Contents

**Introduction to the Lysianassoidea**

The superfamily Lysianassoidea contains a number of families,. The fauna of the NEP is rich in these species, with most species level diversity in the Lysianassidae and the Uristidae. Eighteen families are represented in the NEP, containing 60 genera and around 165 species level taxa. No members of these lysianassoid families were treated in the amphipod section of the Taxonomic Atlas (Thomas and McCann 1995).

Inclusion of the Hyperiopsidae within the lysianassoids is somewhat controversial. While viewed as belonging there by some (i.e. Bousfield and Shih 1994, Bousfield 2001), results of other analyses differ. Berge *et al.* (2000) found the Hyperiopsidae, as used here, to be paraphyletic, with *Hyperiopsis* and *Parargissa* falling into separate clades. Their results also suggest that neither of these two parts of the Hyperiopsidae (as currently construed) are closely related to the lysianassoids. These results need further verification before they are adopted, but provide a different point of view to that espoused by Bousfield. Inclusion of at least two other groups, the Alicellidae and the valettiid group are also disputed and will be discussed later.

Bousfield (1979) raised the family Lysianassidae to superfamily status, but did not explicitly divide it into several different families. He mentioned the subfamilies Lysianassinae and Uristinae suggested by Hurley (1963), and opined they "could justifiably be elevated to family status".

**Diagnosis of the Lysianassoidea**

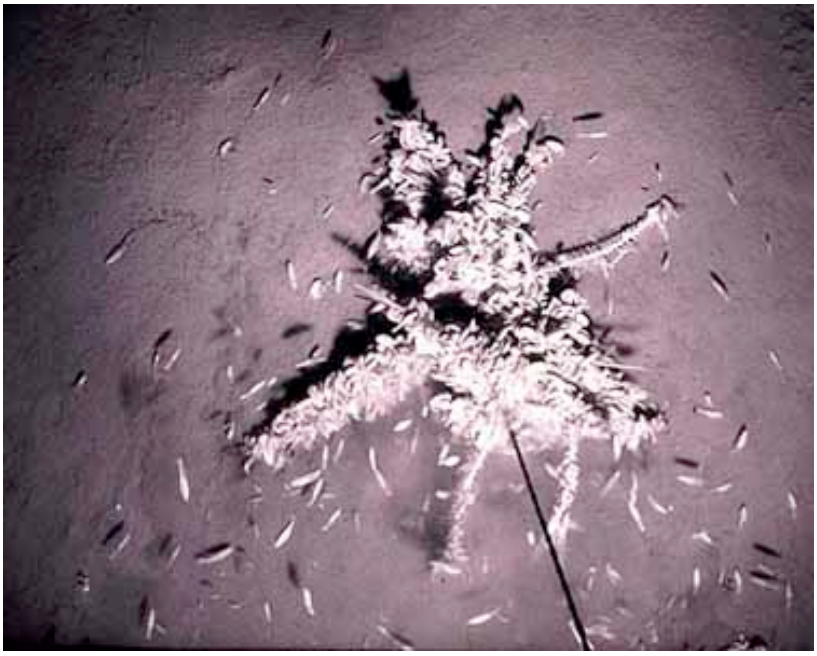
Bousfield's diagnosis of the superfamily is: "Plesiomorphic, mainly smooth-bodied, weakly rostrate, often fossorial gammarideans, usually with strongly dimorphic terminal pelagic male bearing sensory brush setae on peduncular and basally conjoint flagellar segments of antenna 1, and both calceoli and brush setae on antenna 2; antenna 1 with strong accessory flagellum; eyes deep reniform, bulbous below; mouthparts highly modified; upper lip notched, epistome often anteriorly produced; lower lip tall, lacking inner lobes; mandibular molar reduced, palp slender; maxilla 1 inner plate narrow, 2-setose; outer plate with 9 apical spine-teeth; maxilla 2, plates narrow, weakly setose; maxilliped outer plate often enlarged, with strong cutting margin; coxal plates large, deep, 4$^{th}$ strongly excavate; coxae 5-7 posteriorly lobate; gnathopods 1 and 2 non-

amplexing, markedly dissimilar, 1 variously subchelate, chelate or simple, 2 with characteristic elongate segment 3 and small microchelate propod and dactyl; pereopods 5-7 homopodous, bases expanded; brood plates sublinear; coxal gills often pleated, present on pereopod 7; pleopods normal; uropods lanceolate; rami subequal; uropod 3 foliaceous, outer ramus 2-segmented; telson lobes usually distally separated (narrowly), apices with minute notch and spine, or fused and entire, margin non spinose."

He later relaxed some of the specificity used above to include the broad diversity within the superfamily more completely (Bousfield 1982). At this point he suggested that the family Lysianassidae should be subdivided into at least 10 separate families, including elevation of the two extant subfamilies to full familial status.

By the time J. L. Barnard and Karaman (1991) covered the family, they were presenting keys to a series of coherent generic groups, the conicostomatins, pachynins, cyphocarins, and scopelocheirins, but did not treat these as subfamilies. They also did not choose to recognize the two subfamilies created earlier by Hurley, the Lysianassinae and the Uristinae. Their diagnosis of the family (still fully congruent with the superfamily concept of Bousfield) was much briefer and more inclusive: "Article 3 of gnathopod 2 elongate, remainder of appendage forming mitten apically; peduncle of antenna 1 short and stout, articles 2-3 much shorter than 1 and partly telescoped basally."

**Ecological Commentary**



The lysianassoid ***Hirondellea gigas*** swarming bait at 9605m in the Philippine Trench (Photo R. R. Hessler, SIO)

The ecology of lysianassoids has often been investigated. Members of the superfamily occupy varied niches and pursue a variety of life styles. Some are parasitic, as blood ectoparasites of fishes, or as brood parasites of decapods. Others are inquilinous and/or closely associated commensally with sponges, cnidarians, tunicates or echinoids. Most are free-living detritivores or predatory or scavenging carnivores.

A large subset of the deep-sea species are known necrophages, and form the nucleus of the deep-sea necrophage community. This community, distributed world-wide in the deep sea, is important in recycling carcasses of larger organisms (Hessler *et al.* 1978; Ingram and Hessler, 1983; Jones *et al.* 1998; Klages *et al.* 2001; Lowry and Smith 2003; De Broyer *et al.* 2004; Smith and Baco 2003). A necrophage guild is also reported from shallow waters in some areas (Keable 1995, Ingólfsson and Agnarsson 1999). When the opportunity presents itself, lysianassoid species may act as opportunistic carnivores, feeding on sleeping (Stepien and Brusca 1985), or on injured fishes (Ide *et al*. 2006). Others routinely scavenge, even in areas inhospitable to their own metabolism. De Robertis *et al.* (2001) describe the behavior of a lysianassoid scavenger that feeds on carrion in the anoxic sub-sill portion of one Canadian fjord, essentially making feeding forays into the anoxic zone, then retreating into oxic waters to recover while digesting.

A writhing mass of lysianassoid necrophages retrieved from a baited trap in the west Atlantic (Photo at http://oceanexplorer.noaa.gov/explorations/03bump/logs/aug12/aug12.html)

Necrophagic lysianassoids are usually taken in baited traps (Shulenberger and Hessler 1974, Thurston 1979, Biernbaum and Wenner 1993). These animals are often gorged with bait upon retrieval (Shulenberger and J. L. Barnard 1976), sometimes to the extent that the brood is forced from the marsupium by the expanded gut. The larger, more distensible gut is a morphological adaptation of necrophages (Sainte-Marie 1984), as is a mandible designed for efficient slicing of flesh (Dahl 1979, Steele and Steele 1993, Sainte-Marie 1984). Movements to and accumulation around bait seems moderated by both current velocity and by presence of potential predators (Lampitt *et al*. 1983). Initial attraction to the bait, and by extension to naturally occurring carrion on the seafloor, is through chemosensory odor recognition (Smith and Baldwin 1982, Busdosh *et al.* 1982, Meador 1989, Ide *et al.* 2007). Such chemoreception is localized in the

callynophore (Lowry 1986, Kaufmann, 1994), where the receptors also track pheromones as males locate females during reproductive searching. Feeding rates have been examined experimentally in situ (Smith and Present 1983), while gut content and stable isotope analyses have been used to confirm dietary intake (Sainte-Marie and Lamarche 1985, Graeve *et al.* 2001, Nyssen *et al.* 2002). Combined analysis of guts and mouthpart morphology has been performed for a few species (Arndt *et al.* 2005).

Biogeographic and bathymetric distributions of the deep-sea necrophages tend to be large, and some suggest that pan-oceanic or cosmopolitan distributions are probable (Thurston 1990). Morphological evidence is equivocal, with variation between sites often no larger than variation within sites. Within trenches vertical distributions seem more definite than they do on open abyssal plains (Perrone *et al.* 2002, Blankenship *et al.* 2006), with discrete limits to vertical excursions of the species, often without overlap. Such specificity, despite equivocal morphological evidence, is supported by genetic studies which find discrete haplotypes restricted to localized areas or narrow bathymetric zones in broadly distributed species or species complexes (Bucklin *et al.* 1987; France 1993, 1994; France and Kocher 1996; France *et al.* 1992).

Another sizeable subset of the lysianassoids are bathy-, bentho-, or meso-pelagic. Collections of these animals are often with plankton nets, or other midwater sampling devices. J. L. Barnard (1954) and Brusca (1967) discussed a few locally collected bathy-pelagic species, but more complete samplings (from other areas) are reported by Shoemaker (1945), Thurston (1976a,b), and Birstein & Vinogradov (1958, 1960, 1970). Baited traps many hundreds or thousands of meters off the bottom are also often a source of actively swimming lysianassoids (Blankenship et al 2006). Like some other nectonic animals spending significant time in the water column, some lysianassoids are bioluminescent (i.e. *Cyphocaris challengeri*, Bowman 1967).

*Trischizostoma raschi* attached just behind the last gill opening of the velvet shark, *Etmopherus spinax* at 40m in a Norwegian fjord (photo: Rudolph Svenson)

The members of the Opisidae are notable as ectoparasites of fishes (Bousfield 1987, Bousfield and Kabata 1988). The local SCB representative, *O. tridentata*, is recorded from a variety of fish hosts including *Sebastes mystinus* (blue rockfish), *S. maliger* (quillback rockfish), *S. ruberrimus* (yellow-eye rockfish), *Hexagrammos decagrammus* (kelp greenling), and *Squalus acanthias* (spiny dogfish)(Bousfield 1987). They are usually located near the dorsal fin. A second species, *Opisa odontochela*, is known from the boreal waters of Southeast Alaska. The modified first gnathopod, which is large and ovate with a long curved dactyl forming a pincher, seems related to the ectoparasitic live-style. A second lysianassoid family, the Trischizostomatidae, has a similar overall appearance to the opisids, and is also ectoparasitic on fishes (Bousfield and Kabata 1988). It is known from the Atlantic, but not yet from the Pacific.

The cebocarid *Paracyphocaris predator*, not recorded from the NEP, is reported to be an egg predator of oplophorid shrimp (Bowman and Wasmer 1984). The amphipod consumes the eggs within the marsupium, and is then carried as a false brood by the shrimp. Local cebocarids do not seem to share a symbiotic life-style. A member of the genus *Lepidepecreela* is reportedly associated with sea urchins (Berge *et al*. 2004). The local representative has only been taken once, and not in any obvious association with a sea urchin. Since Berge *et al.* (2004) record that the first gnathopod of the commensal species they describe is larger than in other species in the genus, the commensal habitus may be restricted to their species and not general within the genus. They summarize known relationships between amphipods and echinoderms, updating Vader (1978).

Relationships between lysianassoids and sea anemones are well known, especially that between *Allogaussia recondita* (now *Orchomenella*) and the anemone *Anthopleura elegantissima* (Stasek 1958; Vader and Lönning 1973; Vader 1979, 1983; De Broyer and Vader, 1990). Associations of other lysianassoids with other anemones are reported (Ansel 1969, Vader 1983) but less well known. Some lysianassoids occur in commensal associations with sponges (Peattie and Hoare 1981, Vader 1984, Bellan-Santini 1990) including the local *Aristias sp A*, collected in abundance from within the vascular system of the hexactinellid sponge *Staurocalyptus dowlingi*. Other animals are also involved as hosts in symbiotic relationships with lysianassoid amphipods including brachiopods (Vader 1970), clams (Just 1979, Bellan-Santini 1990), and the solitary ascidian *Ascidia paratropa* (Schellenberg 1936). J. L. Barnard (1969a) mentions in most of his discussions of lysianassoid species from the California intertidal that they were taken in washings or scrapings of algae, sponges, bryozoans, or ascidians on or under rocks. He did not indicate individual host associations, however. Lowry and Stoddart (1983) suggest that the conical mouthparts of conicostomatid lysianassoids may be used as a buccal pump for pierce-and-suck feeding on anemone or sponge hosts. If proven, this would make them ectoparasites or micropredators rather than commensals.

While a number of shallow-water lysianassoids are associated with algae, the nature of that association is unclear. In most instances they are probably associated with epizoites of the algae rather than the alga itself. One species has been reported to be a grazer on algal tissues (Haggitt and Babcock 2003).

Life history attributes of a number of lysianassoids are tabulated by Sainte-Marie (1991), and months in which gravid females were observed by Wesławski and Legezynska (2002). Reproductive characteristics of *Cyphocaris challengeri* were investigated by Yamada and Ikeda (2000). Conlan (1991) reports that lysianassoids are

non-mate guarders, which do not engage in precopulatory behavior, and have little morphological difference in secondary sexual characters. In some members of the superfamily, pelagic searches by males for stationary females on the bottom are reported, with the callynophore and the antennal aesthetascs the assumed chemosensory guides to the male movements. Such mate seeking water-column excursions may explain much of the observed diel movement of lysianassoids (Takekawa *et al.* 2004).

Not all members of the superfamily are as presented by Conlan, with little secondary sexual difference between males and females. In the Conicostomatinae several genera are known to be protandrous hermaphrodites, with considerable difference in appearance between the male and female stages (Lowry and Stoddart 1986). In our fauna the two taxa *Ocosingo borlus* and *Fresnillo fimbriata* were found to be female and male of the same species (Lowry and Stoddart 1983). Both forms are now known as *Ocosingo borlus*. The more typical state alluded to by Conlan involves differences mainly in the antennae (see also Moore 1983).

In the absence of bait, the population density of soft-bottom lysianassoids is generally fairly low. They are encountered regularly in benthic samples, but in small numbers. In the intertidal zone populations are both more numerous and more aggregated (as in J. L. Barnard 1969a). Rarely lysianassoids may rise to the level of community dominants, as the cyphocaridid *Cyphocaris challengeri* does in Puget Sound (Lie 1974). It is in the necrophage community that lysianassoids are dominant, and almost exclusively there. One exception is the hydrothermal vent communities of the Pacific, where lysianassoids constitute over 99% of the amphipods taken (J. L. Barnard and Ingram 1990). Virtually all of this total is in one species, the lysianassid *Ventiella sulfuris*. This animal may also be a necrophage, but Mitchell et al. 2002 suggest it is a grazer on bacterial films or a micropredator of larvae settled on the films. Interestingly, lysianassoids are totally absent from the vent areas of the Atlantic. Bellan-Santini and Thurston (1996) suggest that the ecological role of the Pacific vent lysianassoids is filled in the Atlantic by alvinocaridid shrimp.

Descriptions of some families of lysianassoids are provided by Lowry and Springthorpe (2001). They include descriptions of Hyperiopsidae, Lysianassidae, and Scopelocheiridae. Diagnoses of the following are located in the cited references: Alicellidae (Lowry & De Broyer 2008), Aristiidae (Lowry and Stoddart 1997), Cebocarididae (Lowry and Stoddard 2011b), Cyclocarididae (Lowry and Stoddard 2011b), Cyphocarididae (Lowry and Stoddart 1997), Endevouridae (Lowry and Stoddart 1997), Eurytheneidae (Stoddart and Lowry 2004), Hirondelleidae (Lowry & Stoddart 2010a), Lepedipecreellidae (Stoddart & Lowry 2010b), Lysianassidae (Lowry and Stoddart 1997), Lysianassidae Conicostomatinae (Lowry and Stoddart 2012b), Opisidae (Lowry and Stoddart 1995), Pachynidae (Lowry & Stoddard 2012a), Sophrosynidae (Lowry & Stoddart 2010b), Uristidae (Hurley 1963), and Valettiopsidae (Lowry & De Broyer 2008). The diagnoses or description will be quoted in the discussions of the individual groups below. Other lysianassoid families and groups exist, but are not known to occur in the NEP. For instance the Amaryllidae are known from the West coast of South America (Lowry and Stoddart 1987) but are not known from north of the equator in this hemisphere.

**Key to NEP lysianassoid genera** – dbcadien 26 June 2007 (modified from keys by J. L. Barnard and Karaman 1991, Lowry 1984, Lowry and Stoddart 1997)

Note: to avoid use of mouthparts in this key, several genera occur in multiple couplets. Although awkward, this was preferred to examination of mouthparts. Where this occurs, the NEP species within the genus which key out there are indicated. Species in the genus from outside the NEP may not key correctly, and the key should be used with particular caution for any region outside the NEP.

1a. Third pereopod chelate.....*Ensayara*
1b. Third pereopod not chelate, simple.....2
2a. First gnathopod chelate or subchelate.....3
2b. First gnathopod simple, or dactyl vestigial.....41
3a. First gnathopod propod attached ventrally to carpus.....*Opisa*
3b. First gnathopod propod attached dorsally to carpus.....4
3c. First gnathopod propod attached terminally to carpus.....5
4a. G1 subchelate, palm oblique, defined by short tooth.....*Pachychelium*
4b. G1 chelate, fixed finger linear, curved up at tip.....*Pachynus*
4c. G1 chelate, fixed finger curved downward distally.....*Prachynella*
5a. G1 chelate.....6
5b. G1 subchelate.....9
6a. G1 carpus and propod elongate, narrow, subequal.....*Stephonyx*
6b. G1 carpus and propod not elongate, subquadrate, propod longer than carpus.....7
7a. Dactyl of G1 closing across the fixed finger, like scissors.....*Sophrosyne*
7b. Dactyl of G1 closing against fixed finger.....8
8a. Coxa 1 not shorter than coxa 2, distally expanded.....K*yska*
8b. Coxa 1 strongly shortened, distally rounded.....*Pseudonesimus*
8c. Coxa 1 slightly shorter than coxa 2, distally tapering.....*Paronesimoides*
9a. Mandibular palp absent.....*Metacyphocaris*
9b. Mandibular palp present.....10
10a. Coxa 1 reduced or vestigial, partially or completely covered by coxa 2.....11
10b. Coxa 1 not reduced, as long or nearly as long as coxa 2, roughly parallel to coxa 2, sides parallel or distally expanded.....22
11a. Coxa 1 vestigial, scarcely wider than basis.....*Eurythenes*
11b. Coxa 1 reduced, but still much wider than basis.....12
12a. Coxa 1 not tapering distally.....13
12b. Coxa 1 tapering distally, usually strongly.....14
13a. Coxa 1 slightly shorter than coxa 2, truncate, urosomite 1 with dorsodistal spine .....*Tectovalopsis* (*wegeneri* only, other species see couplet 21)
13b. Coxa 1 strongly shortened, rounded, urosomite 1 lacking ornament.....*Aristias*
14a. Lateral cephalic lobe bluntly mamilliform.....15
14b. Lateral cephalic lobe obtusely to acutely produced.....16
14c. Lateral cephalic lobe truncate.....*Diatectonia*
15a. G2 propodus 90% of carpus length, both articles linear.....*Paralicella* (*P. vaporalis* only, for other species see couplet 25)
15b. G2 propodus ½ to 2/3 carpus length, both articles subquadrate.....*Hirondellea* [NOTE triplet]

16a. Uropod 2 inner ramus incised, telson not or barely tapering distally.....*Schisturella*
16b. Uropod 2 inner ramus incised, telson tapering distally.....*Thrombasia*
16c. Uropod 2 inner ramus not incised.....17
17a. Gnathopod 1 palm transverse.....18
17b. Gnathopod 1 palm oblique.....21
18a. Gnathopod 1 articles 5 and 6 subequal.....19
18b. Gnathopod 1 article 6 longer than article 5.....*Cedrosella*
19a. Telson cleft only 10% of length.....*Ventiella*
19b. Telson cleft 50% or more.....20
20a. Urosomite 1 with prominent posterodorsal tooth.....*Valettiopsis*
20b. Urosomite 1 lacking tooth.....*Valettietta*
21a. Uropod 3 rami more than twice as long as peduncle, distal article of outer ramus only about 10% of ramal length.....*Tectovalopsis*
21b. Uropod 3 rami slightly longer than peduncle, distal article of outer ramus about 1/3 length of the ramus.....*Tryphosella*
22a. Eyelobe bluntly mammiliform.....23
22b. Eyelobe obtusely to acutely produced.....26
23a. Telson emarginate, epimeron 3 subquadrate.....*Koroga*
23b. Telson cleft at least 60%, epimeron 3 rounded.....24
24a. G2 propod nearly as long (80%) as carpus.....25
24b. G2 propod more than half as long (60%) as carpus.....*Abyssorchomene*
25a. Urosomite 1 with a single posterior tooth.....*Transtectonia*
25b. Urosomite 1 with at most a low hump.....*Paralicella*
26a. Urosomite 1 with a single dorsally directed tooth.....27
26b. Urosomite 1 with a low hump or a carina, but not dorsally directed tooth.....29
27a. Basis of pereopod 5 with two finger-like posterior spikes.....*Lepidepecreoides*
27b. Basis of pereopod 5 with or without a posterior lobe, but lacking spikes.....28
28a. Epimeron 3 subquadrate.....*Uristes* (*entalladurus* only, other species see couplets 33, 41)
28b. Epimeron 3 with posteroventral tooth.....*Paracentromedon*
29a. Epimeron 3 with posteroventral tooth.....30
29b. Epimeron 3 subquadrate.....35
29c Epimeron 3 rounded.....*Orchomene* (*obtusa* only, other species see couplet 41)
30a. Urosomite 1 with at most a low hump.....32
30b. Urosomite 1 with a carina.....31
31a. Epimeron tooth located on hind margin above posteroventral corner.....*Anonyx*
31b. Epimeron tooth at posteroventral corner, next to ventral margin.....*Orchomenella* (*pacifica* only, for other species see couplets 34, 37, 39, 40)
32a. Antenna 1, basal flagellar segments fused; telson lobes well tapered, apices with a single spine.....33
32b. Antenna 1, basal flagellar segments separate; telson lobes weakly or not tapering, apices truncate with multiple spines.....*Psammonyx*
33a. Telson apices notched, spines inserted subterminally.....*Uristes* (*perspinis* only, other species see couplets 28, 41)
33b. Telson apices entire, spines inserted terminally.....34

34a. Uropod 3 rami only slightly longer than peduncle.....*Orchomenella* (*decipiens* only, for other species see couplets 31, 37, 39, 40)
34b. Uropod 3 rami significantly longer than peduncle.....*Hippomedon*
35a. Epimeron 3 posterior margin serrate.....36
35b. Epimeron 3 posterior margin smooth.....37
36a. Coxa 5 bearing posteroventral lobe.....*Orchomenella* (*pinguis* only, other species see couplets 31, 34, 39, 40)
36b. Coxa 5 lacking posteroventral lobe.....*Rimakoroga*
37a. Urosomite 1 carinate.....38
37b. Urosomite 1 bearing at most a low rounded hump.....39
38a. Body widest at 5$^{th}$ coxa, presenting a "diamond" shape when viewed from above; article 3 of antenna 2 elongate.....*Lepidepecreum*
38b. Body not noticeably widest at the 5$^{th}$ coxa, at most fusiform rather than diamond shaped; article 3 of antenna 2 not elongate.....*Orchomenella* (*holmesi* and *minuta* only, other species see couplets 31, 34, 37, 40)
39a. Telson entire, emarginate, or cleft no more than 40% of its length....*Orchomenella* (*recondita* and *tabasco* only, other species see couplets 31, 34, 37, 39)
39b. Telson cleft 50% or more.....40
40a. Eyelobe acute, distally pointed.....*Uristes* (*dawsoni* only, other species see couplets 28, 33)
40b. Eyelobe obtusely produced, rounded.....*Orchomene* (all regional species except *obtusa*; see also couplet 29)
41a. Mouthparts formed into a conical bundle.....42
41b. Mouthparts formed into a quadrate bundle.....45
42a. Telson cleft at least 40%.....43
42b. Telson entire or emarginate.....44
43a. Uropod 2 inner ramus incised.....*Socarnoides*
43b. Uropod 2 inner ramus not incised.....*Acidostoma*
44a. Telson entire.....*Ocosingo*
44b. Telson emarginate.....*Stomacontion*
45a. G1 dactyl vestigial, hooded and/or hidden by sheaf of spines or setae.....46
45b. G1 dactyl not vestigial, not hidden by hood, setae or spines.....49
46a. Coxae 1 and 2 reduced, partially hidden by coxa 3.....*Anisocallisoma*.
46b. Coxae 1 and 2 not reduced.....47
47a. Antenna 1 peduncle article 1 bearing posterodistal tooth.....*Ichnopus*
47b. Antenna 1 peduncle article 1 lacking posterodistal tooth.....48
48a. G1 propod longer than carpus, tapering.....*Paracallisoma*
48b. G1 propod shorter than carpus, linear.....*Scopelocheiropsis*
49a. Coxa 1, 1 and 2, or 1-3 reduced.....50
49b. No anterior coxa reduced.....55
50a. Coxa 1 reduced, coxa 2 not reduced.....*Centromedon*
50b. Coxa 1 and two both reduced.....51
51a. Coxa 1, 2, and 3 all reduced and partially covered by coxa 4.....*Cyphocaris*
51b. Coxa 3 not reduced.....52
52a. Epimeron 3 with posteroventral tooth.....53
52b. Epimeron 3 lacking posteroventral tooth.....54

53a. Uropod 3 outer ramus uniarticulate.....*Parargissa*
53b. Uropod 3 outer ramus biarticulate.....*Procyphocaris*
54a. Epimeron 3 subquadrate.....*Cyclocaris*
54b. Epimeron 3 posterior margin notched, truncate and serrate.....*Lepidepecreela*
55a. Telson cleft more than 50% of length.....56
55b. Telson entire or emarginate.....59
56a, Urosomite1 with multiple posterior teeth.....*Apotectonia*
56b. Urosomite 1 lacking teeth, with saddle or low hump.....57
57a. Eyelobe truncate.....*Alicella*
57b. Eyelobe obtusely to acutely produced.....58
58a. Telson tapering to distal truncation, cleft 90%, each lobe tipped with multiple large spines.....*Waldeckia*
58b. Telson acute to rounded, cleft not more than 70%, each lobe bearing a single terminal spine.....*Socarnes*
59a. Telson entire, uropod 2 inner ramus incised.....60
59b. Telson emarginate, uropod 2 inner ramus not incised.....61
60a. Uropod 3 outer ramus uniarticulate.....62
60b. Uropod 3 outer ramus biarticulate.....*Dissiminassa*
61a. Uropod 3 outer ramus uniarticulate.....*Hyperiopsis*
61b. Uropod 3 outer ramus biarticulate.....*Aruga*
62a. Eyelobe obtusely produced.....63
62b. Eyelobe truncate, slightly crenulate.....*Macronassa macromera*
63a. Epimeron 3 quadrate, uropod 3 rami strongly attenuated .....*Shoemakerella*
63b. Epimeron 3 produced posteriorly into a quadrate plate, uropod 3 rami not strongly attenuated.....*Macronassa pariter*

**Index to family and group placement of generic taxa** in the superfamily Lysianassoidea (synonyms which occur in NEP literature are unbolded)

**Abyssorchomene** – Uristidae
**Acidostoma** – Acidostomatidae
Acontiostoma – Lysianassidae
**Alicella** – Alicellidae
Allogaussia – Lysianassidae
**Anisocallisoma** – Scopelocheiridae
**Anonyx** – Uristidae
**Apotectonia** – Alicellidae
**Aristias** – Aristiidae
**Aristiopsis** – Lysianassidae
**Aruga** – Lysianassidae
**Cedrosella** – Lysianassidae
**Centromedon** – Uristidae
**Cyclocaris** – Cyclocarididae
**Cyphocaris** –Cyphocarididae
**Diatectonia** – Alicellidae
**Dissiminassa** – Lysianassidae
**Ensayara** – Endevouridae
**Eurythenes** – Eurytheneidae
Fresnillo – see Ocosingo
**Hippomedon** – Lysianassidae
**Hirondellea** – Hirondelleidae
**Hyperiopsis** – Hyperiopsidae
**Ichnopus** – Uristidae
Katius – see Eurythenes
**Koroga** – Uristidae
**Kyska** – Uristidae
**Lepidepecreela** – Lepidepecreellidae
**Lepidepecreoides** – Lysianassidae
**Lepidepecreum** – Lysianassidae
Lysianopsis – Lysianassidae
**Macronassa** – Lysianassidae
**Metacyphocaris** – Cebocarididae
**Ocosingo** – Lysianassidae
**Opisa** - Opisidae
**Orchomene** – Lysianassidae
**Orchomenella** – Lysianassidae
**Pachychelium** – Pachynidae
**Pachynus** – Pachynidae
**Paracallisoma** – Scopelocheiridae
**Paracentromedon** - Lysianassidae
**Paralicella** – Alicellidae
**Parargissa** – Hyperiopsidae
**Paronesimoides** - Lysianassidae
**Prachynella** - Pachynidae
**Procyphocaris** – Cyphocarididae
**Psammonyx** – Lysianassidae
Pseudokoroga - Lysianassidae
**Rimakoroga** – Lysianassidae
**Schisturella** - Lysianassidae
**Scopelocheiropsis** – Scopelocheiridae
Scopelocheirus - Scopelocheiridae
**Shoemakerella** – Lysianassidae
**Socarnes** - Lysianassidae
**Socarnoides** – Lysianassidae
**Sophrosyne** – Sophrosynidae
**Stephonyx** - Uristidae
**Stomacontion** – Lysianassidae
**Tectovalopsis** – Alicellidae
**Thrombasia** - Lysianassidae
**Transtectonia** – Alicellidae
**Tryphosella** – Lysianassidae
**Uristes** – Uristidae
**Valettietta** – Valettiopsidae
**Valettiopsis** – Valettiopsidae
**Ventiella** - Uristidae
**Waldeckia** – Lysianassidae
Wecomedon – Lysianassidae

Provisional species recorded by Dickinson in his 1976 thesis are included. No descriptions of them were circulated or published.. They are listed here as an indication of the diversity within the group only, and are not keyed or otherwise discussed, except where they constitute the sole record of the genus within the NEP (i.e. *Waldeckia sp a*). He published on the ecology of amphipods of the Cascadia Abyssal Plain (Dickinson and Carey 1978) but never describing the provisionals introduced in his thesis. Additional provisionals were erected by Thomas (in Blake et al 1993) from investigations in the Gulf of the Farallones in Central California.

NEP Lysianassoidea from McLaughlin *et al.* (2005) augmented by known provisional taxa. *= Taxa on the SCAMIT Ed 9 list (Cadien & Lovell 2014). Valid taxa bolded, synonyms not. (family arrangement is alphabetical)

Family Acidostomatidae

***Acidostoma hancocki** Hurley 1963 – Monterey to Baja California; 18-182m

Acidostoma obesum ortum J. L. Barnard 1967 – see A. ortum

**Acidostoma ortum** J. L. Barnard 1967 – Cascadia Abyssal Plain, Oregon to Baja Abyssal Plain: 2398-2824m

Family Alicellidae

**Alicella gigantea** Chevreux 1899 – cosmopolitan; 1720-7000m

**Apotectonia heterostegos** J. L. Barnard and Ingram 1990 – Galapagos; 2451-2518m

**Diatectonia typhodes** J. L. Barnard and Ingram 1990 – Hamilton Guyot; 1790m

**Paralicella caperesca** Shulenberger and J. L. Barnard 1976 –North Atlantic, NEP to San Clemente Basin; 1875-5940m

**Paralicella tenuipes** Chevreux 1908 – abyssal Pacific and Atlantic Oceans; 5720m

**Paralicella vaporalis** J. L. Barnard & Ingram 1990 – Hess Guyot to Jasper Seamount; 706-1740m

**Paralicella sp 1** of Thomas 1991 – Gulf of the Farallones: 2045-3085m

**Tectovalopsis diabolus** J. L. Barnard and Ingram 1990 – East Pacific Rise at 13°N; 2635m

**Tectovalopsis fusilus** J. L. Barnard and Ingram 1990 – off Pta. San Telmo, Mexico; 2884m

**Tectovalopsis nebulosus** J. L. Barnard and Ingram 1990 – Jasper Seamount; 706m

**Tectovalopsis regelatus** J. L. Barnard and Ingram 1990 – Hess Guyot; 1740m

**Tectovalopsis wegeneri** J. L. Barnard and Ingram 1990 – East Pacific Rise at 13° N; 2635m

**Transtectonia torrentis** J. L. Barnard and Ingram 1990 – East Pacific Rise at 13°N; 2630-2635m

Family Aristiidae

**Aristias androgans** J. L. Barnard 1964 – Aleutians; 890m

**Aristias expers** J. L. Barnard 1967 – Baja Abyssal Plain;2398-2475m

**Aristias pacificus** Schellenberg 1936 – British Columbia; 22-30m

**Aristias tumidus** (Krøyer 1846) – NWP to Aleutians; 30-270m

**Aristias veleronis** Hurley 1963 – Puget Sound; 0-18m

***Aristias sp A** SCAMIT 1985§ - off Pt. Loma; 168m

Family Cebocarididae

**Metacyphocaris helgae** W. M. Tattersall 1906 – Cosmopolitan, bathypelagic; 600-1200m

Family Cyclocarididae

**Cyclocaris guilelmi** Chevreux 1899 – Cosmopolitan, meso-bathy-abysso-pelagic; 200-2200m

**Cyclocaris tahitiensis** Stebbing 1888 – North and South Pacific; 560-2038m

Family Cyphocarididae

**Cyphocaris anonyx** Boeck 1871 – Cosmopolitan, off Catalina in SCB; 1033-1182m

**Cyphocaris challengeri** Stebbing 1880 – Cosmopolitan, in NEP from Alaska to SCB; 0-3000m

**Cyphocaris faurei** K. H. Barnard 1916 – Cosmopolitan, in the NEP off Baja California; 554-1108m

Cyphocaris kincaidi Thorsteinson 1941 (see Cyphocaris challengeri)

**Cyphocaris latirama** Hendrycks and Conlan 2003 – off Pt. Conception; 3450-4050m

**Cyphocaris richardi** Chevreux 1905 – Cosmopolitan, San Nicholas Basin to Baja California; 1163-1790m

**Procyphocaris indurata** (K. H. Barnard 1925) – South Africa, Australia, New Caledonia, NEP off Pt. Conception; 1280-4050m

Family Endevouridae

**Ensayara ramonella** J. L. Barnard 1964 – Bahia San Quintin; 2-3m

Family Eurytheneidae

**Eurythenes gryllus** (Lichtenstein in Mandt1822) – cosmopolitan; 870-7800m

**Eurythenes obesus** (Chevreux 1905) – cosmopolitan; 128-5610m

Gammarus gryllus Lichtenstein in Mandt 1822 (see Eurythenes gryllus)

Katius obesus Chevreux 1905 (see Eurythenes obesus)

Family Hirondelleidae

**Hirondellea brevicaudata** Chevreux 1910 – Atlantic Ocean, Pacific north of Hawaii; 3000-5940m

**Hirondellea fidenter** J. L. Barnard 1966 – San Nicholas Basin to San Diego Trough: 1200-1244m

**Hirondellea glutonis** J. L. Barnard and Ingram 1990 – East Pacific Rise at 13°N to Galapagos; 2491-2635m

**Hirondellea guyoti** J. L. Barnard and Ingram 1990 – Hess Guyot; 1740m

Family Hyperiopsidae

**Hyperiopsis sp** of Hendrycks and Conlan 2003 – off Pt. Conception; 3450m

**Hyperiopsis sp CS1** Cadien 2004§ - Oregon; 1372m

**Parargissa americana** J. L. Barnard 1961 – Gulf of Panama; 3570m

Family Lepidecreellidae

**Lepidepecreela charno** J. L. Barnard 1966 – San Clemente Basin; 1895m

Family Lysianassidae

Subfamily Conicostomatinae

Acontiostoma sp of Hurley 1963 (see Stomacontion sp)

Fresnillo fimbriata J. L. Barnard 1969 (see Ocosingo borlus)

***Ocosingo borlus** J. L. Barnard 1964 – Central California to Northern Baja California; 0-180m

***Socarnoides illudens** Hurley 1963 – Oregon to SCB; 20-156m

**Stomacontion** sp (Hurley 1963) – San Pedro Seashelf; 20m

Subfamily Lysianassinae

Aruga dissimilis (Stout 1913) (see Dissiminassa dissimilis)

***Aruga holmesi** J. L. Barnard 1955 – Florida, Monterey Bay to Ecuador; 0-183m

Aruga macromerus Shoemaker 1916 (see Macronassa macromerus)

***Aruga oculata** Holmes 1908 – Monterey to SCB; 1-457m

***Dissiminassa dissimilis** (Stout 1913) – Tomales Bay to Galapagos; 0-73m

Lysianax cubensis Shoemaker 1897 (see Shoemakerella cubensis)

Lysianopsis holmesi J. L. Barnard 1955 (see Aruga holmesi)

Lysianopsis (?) macromerus (Shoemaker 1916) (see Macronassa macromerus)

Lysianopsis oculata Holmes 1908 (see Aruga oculata)

Lysianassa pariter J. L. Barnard 1969 (see Macronassa pariter)

**Macronassa macromera** (Shoemaker 1916) – Cayucos to Cabo San Lucas; 0m

**Macronassa pariter** (J. L. Barnard 1969) – Cayucos to La Jolla; 0m

Nannonyx dissimils Stout 1913 (see Dissiminassa dissimilis)

**Shoemakerella cubensis** (Stebbing 1897) – Trans-isthmic; Gulf of Mexico and Caribbean, and NEP from Coronados Islands to Gulf of California; 6-20m

***Socarnes hartmanae** Hurley 1963 – Central California to SCB; 89m

**Socarnes vahlii** (Krøyer 1838) – Circumarctic-Boreal, North Atlantic, NWPacific NEP from Bahia San Cristobal, Baja California; 8-300m

**Waldeckia sp a** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2828m

Subfamily Tryphosinae

Allogaussia recondita Stasek 1958 (see Orchomenella recondita)

Ambasiopsis fomes J. L. Barnard 1967 (see Cedrosella fomes)

Aristiopsis tacita J. L. Barnard 1961 (see Pseudonesimus tacitus)

Aristiopsis tacitus J. L. Barnard 1961 (see Pseudonesimus tacitus)

**Cedrosella fomes** (J. L. Barnard 1967) – Baja Abyssal Plain; 3705-3745m

**Cedrosella perspinis** (J. L. Barnard 1967) – Cascadia Abyssal Plain, Oregon to Baja California; 1244-2820m

**Centromedon pavor** J. L. Barnard 1966 – Oregon to Monterey Bay; 84-200m

**Hippomedon coecus** (Holmes 1908) – Monterey Bay; 102-105m

***Hippomedon columbianus** Jarrett & Bousfield 1982 – British Columbia to SCB; 4-67m

**Hippomedon granulosus** Bulycheva 1955 – San Diego Trough: 1302-1354m

**Hippomedon keldyshi** Vinogradov 1994 – vents off California; 3041m

**Hippomedon strages** J. L. Barnard 1964 – Cascadia Abyssal Plain, Oregon to Ecuador; 2813-2864m

***Hippomedon subrobustus** Hurley 1963 – SCB; 30-150m

***Hippomedon tenax** J. L. Barnard 1966 – SCB; 88m

**Hippomedon tracatrix** J. L. Barnard 1971 – Cascadia Abyssal Plain, Oregon: 2762-2816m

Hippomedon wecomus J. L. Barnard 1971 (see Psammonyx wecomus)

***Hippomedon zetesimus** Hurley 1963 – SCB; 30-150m

***Hippomedon sp A** Diener 1990§ - SCB; 30-150m

**Hippomedon sp A** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2813m

**Hippomedon sp B** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2815m

**Lepidepecreoides nubifer** J. L. Barnard 1971 – Oregon; 2860m
**Lepidepecreum californiensis** Vinogradov 1994 – East Pacific Rise; 2779m
**Lepidepecreum comatum** Gurjanova 1962 – NWP to Oregon; 40-950m
**Lepidepecreum eoum** Gurjanova 1938 – Sakhalin Id. NWP to Aleutians; 0-130m
***Lepidepecreum garthi** Hurley 1963 – Oregon to SCB; 30-225m
***Lepidepecreum gurjanovae** Hurley 1963 – Japan to SCB;135-950m
**Lepidepecreum kasatka** Gurjanova 1962 – NWP to Central California; 123-229m
**Lepidepecreum magdalenensis** (Shoemaker 1942) –Bahia San Ramon to Bahia Magdalena, Baja California; 3-11m
***Lepidepecreum serraculum** Dalkey 1998 – Alaska to Mexican border; 0-150m
**Lepidepecreum sp LA1** Cadien 2003§ - Slope of San Pedro Sea Shelf; 643m
**Lepidepecreum sp A** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2762-2800m
**Lepidepecreum sp 1** of Dickinson 1976 – San Diego Trough: 1229m
**Lepidepecreum sp 1** of Thomas 1991 – Gulf of the Farallones: 2045-3085m
**Lepidepecreum sp 2** of Thomas 1991 – Gulf of the Farallones: 2045-3085m
Orchomene abyssorum Stebbing 1888 (see Abyssorchomene abyssorum in Uristidae)
***Orchomene anaquelus** J. L. Barnard 1964 – SCB; 38-92m
Orchomene distincta Birstein and Vinogradov 1960 (see Abyssorchomene distinctus in Uristidae)
Orchomene gerulicorbis (see Abyssorchomene gerulicorbis in Uristidae)
**Orchomene limodes** Meador & Present 1985 – La Jolla; 55-176m
Orchomene magdalenensis (Shoemaker 1942) (see Lepidepecreum magdalenensis)
**Orchomene obtusa** (G. O. Sars 1891) – North Atlantic, NWP, Monterey Bay; 200-1505m
Orchomene tabasco J. L. Barnard 1967 (see Orchomenella tabasco)
Orchomenella affinis Holmes 1908 (see Orchomene obtusa)
***Orchomenella decipiens** Hurley 1963 – Monterey to Bahia San Cristobal, Baja California; 35-793m
Orchomenella magdalenensis Shoemaker 1942 (see Lepidepecreum magdalenensis)
**Orchomenella minuta** (Krøyer 1846) – Circumarctic, NEP to Chignik Bay, Gulf of Alaska; 25-160m
***Orchomenella pacifica** Gurjanova 1938 – NWP, Japan Sea, Okhotsk, NEP from Monterey to SCB; 46-780m
***Orchomenella pinguis** (Boeck 1861) – Mediterranean, amphi-Atlantic, NWP, NEP Laguna Beach; 1-85m
**Orchomenella recondita** (Stasek 1958) – Southern Oregon to Moss Beach, northern California; 0m
**Orchomenella tabasco** (J. L. Barnard 1967) – Cascadia Abyssal Plain, Oregon to off Baja California; 1230-2816m
Orchomenopsis obtusa G. O. Sars 1895 (see Orchomene obtusa)

**Paracentromedon sp a** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2762-2820m

**Paronesimoides voightae** Larsen 2007 – Juan de Fuca Ridge vent area; 2213-2656m

**Psammonyx longimerus** Jarrett & Bousfield 1982 – British Columbia to Oregon; 0-200m

**Psammonyx similis** (Jarrett & Bousfield 1982) – North Bering Sea to British Columbia: 0-29m

**Psammonyx wecomus** (J. L. Barnard 1971) – SE Alaska to Oregon: 0-100m

Pseudokoroga rima J. L. Barnard 1964 (see Rimakoroga rima)

**Pseudonesimus abyssi** Chevreux 1926 – Cosmopolitan, in NEP off Baja California: 2667-2702m

**Pseudonesimus cedrosianus** (J. L. Barnard 1967) – San Diego Trough to off Baja California: 1229-1748m

**Pseudonesimus robustus** (J. L. Barnard 1961) – Tasman Sea, San Diego Trough?: 1235-3580m

**Pseudonesimus tacitus** (J. L. Barnard 1961) – Tasman Sea, off Baja California: 842-3580m

**Pseudonesimus zopa** (J. L. Barnard 1966) – Catalina Submarine Canyon: 914m

***Rimakoroga rima** (J. L. Barnard 1964) – Port Hueneme to Punta Canoas; 2-30m

Schisturella abyssi (Chevreux 1926) (see Pseudonesimus abyssi)

Schisturella cedrosianus J. L. Barnard 1967 (see Pseudonesimus cedrosianus)

***Schisturella cocula** J. L. Barnard 1966 – off Pt. Conception; 162m

***Schisturella dorotheae** (Hurley 1963) – SCB; 111-406m

Schisturella grabensis J. L. Barnard 1967 (see Thrombasia grabensis)

**Schisturella hansgeorgi** Larsen 2007 – Juan de Fuca Ridge vent area: 2213m

**Schisturella spinirama** Hendrycks and Conlan 2003 – off Pt. Conception; 3580m

Schisturella totorami J. L. Barnard 1967 (see Thrombasia tracalero)

Schisturella tracalero (J. L. Barnard 1966) (see Thrombasia tracalero)

Schisturella zopa J. L. Barnard 1966 (see Pseudonesimus zopa)

**Thrombasia grabensis** (J. L. Barnard 1967) – San Diego Trough to off Baja California; 1200-1748m

***Thrombasia tracalero** J. L. Barnard 1966 – Santa Monica Bay; 167m

Tryphosa coeca Holmes 1908 (see Hippomedon coecus)

Tryphosa index J. L. Barnard 1966 (see Tryphosella index)

**Tryphosella californica** (Hurley 1963) – SCB; 416-628m

**Tryphosella index** (J. L. Barnard 1966) – SCB; 1620m

**Tryphosella metacaecula** J. L. Barnard 1967 – off Baja California; 791-842m

**Tryphosella sp a** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon: 2813-2824

**Tryphosites sp a** of Dickinson 1976 – Cascadia Abyssal Plain, Oregon to San Diego Trough: 1324-2816m

Wecomedon similis Jarrett & Bousfield 1982 (see Psammonyx similis)

Wecomedon wecomus (J. L. Barnard 1971) (see Psammonyx wecomus)

Family Opisidae

**Opisa odontochela** Bousfield 1987 – SE Alaska; 73m

***Opisa tridentata** Hurley 1964 – Aleutians to SCB; 17-183m

Family Pachynidae

**Pachychelium fucaensis** Lowry and Stoddart 2012 – Vancouver Id, British Columbia to San Diego; 75-222m

Pachychelium sp SD1 Pasko & Nestler 2003 (see P. fucaensis)

***Pachynus barnardi** Hurley 1963 – Oregon to the Gulf of California and Pacific southern Mexico; 12-800m

**Prachynella epa** Lowry and Stoddart 2012 – South-west of San Francisco to northern Baja California; 700-2010m

***Prachynella lodo** J. L. Barnard 1964 - Monterey to Bahia San Cristobal; 10-157m

**Prachynella oculata** Lowry and Stoddart 2012 – Pt. Loma to northern Baja California; 40-140m

Prachynella sp A SCAMIT 2007 – (see P. epa)

Family Scopelocheiridae

**Anisocallisoma armigera** Hendrycks and Conlan 2003 – off Pt. Conception; 3450-4050m

**Paracallisoma coecum** (Holmes 1908) SCB; 1207-1902m

**Paracallisoma spinipoda** Hendrycks and Conlan 2003 – off Pt. Conception; 3450-4050m

**Scopelocheiropsis abyssalis** Schellenberg 1926 – Atlantic, Antarctic, NEP off Pt. Conception; 3000-4000m

Scopelocheirus coecus Holmes 1908 (see Paracallisoma caecum)

Family Sophrosynidae

**Sophrosyne californica** Lowry and Stoddart 2010b – known only from Tanner Basin, offshore Southern California, 1298m

Sophrosyne robertsoni Stebbing and Robertson 1891 – (see Sophrosyne Californica)

Family Uristidae

**Abyssorchomene abyssorum** (Stebbing 1888) - South Atlantic, New Zealand, Galapagos; 550-4330m

**Abyssorchomene distinctus** (Birstein and Vinogradov 1960) - Palau to East Pacific Rise at 13°N; 2000-4732m

**Abyssorchomene gerulicorbis (**Shulenberger and J. L. Barnard 1976) – off Northern Baja California; 5720m

**Anonyx adoxus** Hurley 1963 – Oregon to Monterey Bay; 18-98m

**Anonyx anivae** Gurjanova 1962 – Sea of Okhotsk to Vancouver Id.; 42-45m

**Anonyx attenuatus** Steele 1989 – Bering Sea and Aleutian Ids.; depth ?

**Anonyx beringi** Steele 1982 – Aleutian Islands to Gulf of Alaska; 16-22m

**Anonyx carinatus** (Holmes 1908) – Gulf of Alaska to San Diego; 15-225m

**Anonyx comecrudus** J. L. Barnard 1971 – Oregon; 80-150m

**Anonyx dalli** Steele 1983 – Bering Sea, Aleutian Islands to Gulf of Alaska; depth ?

Anonyx dorotheae Hurley 1963 (see Schisturella dorotheae in Lysianassidae)

**Anonyx eous** Gurjanova 1962 - NWP, Sea of Okhotsk to northern British Columbia; 42-45m
**Anonyx epistomicus** Kudrjashov 1965 – Okhotsk Sea to Aleutians; depth ?
Anonyx filiger Stimpson 1864 (a Lepidepecreum, and nomen dubium)
**Anonyx gurjanovi** Steele 1986 – NWP Sea of Japan, Okhotsk, Bering Sea NEP southern British Columbia to outer coast of Washington; 10m
**Anonyx hurleyi** Steele 1986 – British Columbia to Puget Sound; shallow
**Anonyx laticoxae** Gurjanova 1962 – NWP, Kuriles, Okhotsk, NEP Alaska to Vancouver Island; 150m
**Anonyx lebedi** Gurjanova 1962 – NWP Sea of Japan, to Vancouver Id.; 280m
***Anonyx lilljeborgi** Boeck 1870 – Amphi North Atlantic, circumarctic, NWP Sea of Japan to SCB in the NEP; 20-900m
**Anonyx makarovi** Gurjanova 1962 – Western boreal Atlantic, Arctic, NWP Sea of Japan to Gulf of Alaska in NEP; 40-126m
Anonyx minutus Krøyer 1846 ( see Orchomenella minuta in Lysianassidae)
**Anonyx multiarticulatus** (Pearse 1913) – NWP to Puget Sound; depth ?
**Anonyx nugax** (Phipps 1774) - Boreal North Atlantic, circumarctic, NWP Sea of Japan to SE Alaska in NEP; 0-1000m
**Anonyx ochoticus** Gurjanova 1962 – North Atlantic, Arctic, NWP Sakhalin Id. to Vancouver Island in NEP; 250-2000m
**Anonyx peterseni** Steele 1986 – NWP to Vancouver Island; depth ?
Anonyx pinguis Boeck 1861 (see Orchomenella pinguis in Lysianassidae)
**Anonyx pseudeous** Steele 1991 – Arctic Alaska to northern British Columbia; depth?
**Anonyx sarsi** Steele & Brunel 1968 – Boreal North Atlantic, circumarctic, NEP Bering Sea, Aleutians to SE Alaska; 10-50m
**Anonyx schaefferi** Steele 1986 – NWP Sea of Japan, NEP Bering Sea to Aleutian Islands; depth?
**Anonyx sculptifer** Gurjanova 1962 – Sea of Japan to Gulf of Alaska; 49m
**Anonyx shoemakeri** Steele 1983 - Aleutian Islands; depth ?
Anonyx tumidus Krøyer 1846 (see Aristias tumidus in Aristiidae)
**Anonyx sp 1** of Dickinson 1976 – San Diego Trough: 1317-1335m
Anonyx sp 2 of Dickinson 1976 – San Diego Trough: 1317-1335m
Cancer nugax Phipps 1774 (see Anonyx nugax)
Chironesimus multiarticulosus Pearse 1913 (see Anonyx multiarticulosus)
Euonyx laqueus J. L. Barnard 1967 (see Stephonyx laqueus)
Euonyx mytilus J. L. Barnard and Ingram 1990 (see Stephonyx mytilus)
**Ichnopus pelagicus** Schellenberg 1926 – Southwestern Pacific, NEP from Costa Rica south to equator; in upper 150m of water column offshore
**Koroga megalops** Holmes 1908 – Cosmopolitan, Cascadia Abyssal Plain, Oregon: 500-2810m
**Kyska dalli** Shoemaker 1965 – Aleutians; 11-15m
Lakota carinata Holmes 1908 (see Anonyx carinatus)
**Stephonyx laqueus** (J. L. Barnard 1967) - San Clemente Basin to 13° N on the East Pacific Rise to Sea of Okhotsk; 1187-2800m

**Stephonyx mytilus** (J. L. Barnard and Ingram 1990) – Galapagos to Okinawa Trough and East China Sea; 534-2635m

Uristes californicus Hurley 1963 (see Tryphosella californica in Lysianassidae)

**Uristes dawsoni** Hurley 1963 –SCB; 203-434m (incertae sedis, family?)

***Uristes entalladurus** J. L. Barnard 1963 – SCB; 0-18m (incertae sedis, fam ?)

Uristes induratus K. H. Barnard 1925 (see Procyphocaris indurata in Cyphocarididae)

Uristes perspinis (see Cedrosella perspinis in Lysianassidae Tryphosinae)

**Ventiella sulfuris** J. L. Barnard and Ingram 1990 – Galapagos to East Pacific Rise at 13°N; 2450-2676m

Family Valettiopsidae

**Valettietta cavernicola** Stock and Iliffe 1990 – Galapagos, anchihaline caves; 17-29m

**Valettiopsis concava** Hendrycks 2007 – Monterey Bay to Pt. Conception; 3607-4100m

**Valettiopsis dentata** Holmes 1908 – Cosmopolitan, SCB to San Diego Trough: 183-4300m

Valettiopsis sp DC1 SCAMIT 2014§ - Dume Submarine Canyon: 564m

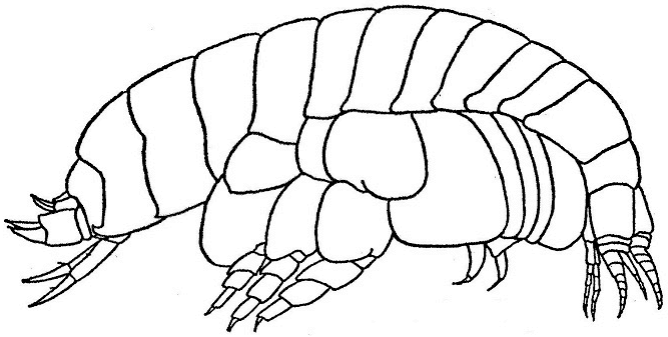
## COMMENTS BY FAMILY/GROUP ON NEP LYSIANASSOID GENERA

**Acidostomatidae** – Erected by Stoddart and Lowry 2012 to accommodate the genera *Acidostoma* and *Shakletonia*, both removed from the conicostomatine group, which had earlier been placed as a subfamily of the Lysianassidae. The family is characterized by a 7/4 tooth arrangement on maxilla 1 also found in six other families of lysianassoids. They are differentiated from those families by nature of the first gnathopod, and their conical mouthparts. The other group with conical mouthparts does not share the special maxilla tooth arrangement with acidostomatids. *Shakletonia* is an austral genus with no NEP representatives, while *Acidostoma* occurs in the NEP.

The family is diagnosed as "*Head exposed, slightly deeper than long or about as long as deep, without cheek notch. Antennae calceoli absent. Antenna 1 with callynophore in male. Antenna 2 peduncular article 3 without distal hook. Epistome and upper lip fused; epistome with proximal portion not produced. Mouthpart bundle conical. Mandible incisors well developed, symmetrical, left convex, smooth, right convex, smooth; left lacinia mobilis absent; accessory setal row with less than 5 robust setae, without distal setal tuft; molar large or small, flap-like, setose to non-setose, or vestigial or absent; palp inserted approximately midanteriorly. Maxilla 1 inner plate with 2 or less apically pappose setae; outer plate with 9-12 setal-teeth in modified 7/4 arrangement, setal-teeth small; palp large, moderate or vestigial, with or without apical robust setae. Maxilla 2 inner plate significantly shorter than (1/2 to ¾ length) outer plate, inner plate without oblique row of facial setae. Maxilliped outer plate medial setae vestigial or absent, without apical slender setae; palp 4-articuulate, article 4 well developed, reduced or vestigial. Gnathopod 1 simple to weakly subchelate; coxa large (length more than 1.9x breadth); ischium short (length up to 2x breadth); carpus short (length up to 2 x breadth); propodus small; dactylus slightly curved. Gnathopod 2 coxa large, subequal in size to coxa 3. Pereopods all simple; distal spurs absent. Pereopod 4*

*coxa with well-developed posteroventral lobe. Pereopod 5 coxa anterior and posterior lobes subequal. Pereopod 6 coxa posterior lobe slightly or much deeper than anterior lobe.*

*Uropod 2 peduncle with well-developed lateral flange. Uropod 3 biramous. Telson cleft, notched, or entire.*" (Stoddart and Lowry 2012)



*Acidostoma hancocki* female (from Hurley 1963)

**Acidostoma** – there are two species recognized regionally, *A. hancocki* from southern California at shelf depths, and *A. ortum* from the Baja abyssal plain. The two clearly differ in that *A. hancocki* lacks the reduced maxillary palp found in *A. ortum*. They are most easily distinguished grossly by *A. hancocki* having U3 rami shorter than the peduncle, and *A. ortum* having longer rami than peduncle on U3. J. L. Barnard (1966) mentions a juvenile with a palp he identified as *A. hancocki* from 672m in a submarine canyon in Southern California. This is either a misidentification of *A. ortum* (and a considerable increase in its bathymetric range), or a third as yet undistinguished species from the NEP. The specimen, and others from waters deeper than the normal range of *A. hancocki*, require close reexamination.

Diagnosis: "*Body short and robust. Side plates large and deep. Antenna 1, segs. **2** and 3 short, nearly as stout as seg. 1 in male but not in female; seg. 1 of flagellum short in female, laminar and densely fringed in male; accessory flagellum in both sexes nearly as long as primary. Antenna 2 rather slender. Upper lip long, narrow. Lower lip with narrowed lobes. Mandible narrow, simple, minute tooth at each end of cutting edge; molar absent; palp slender, nearly as long as the trunk, armed only at apex. Maxilla 1, inner plate small, narrow; outer plate narrow, tipped with small unguiform teeth, palp only a rudiment. Maxilla 2, both plates stiliform. Maxillipeds, inner plates tapering, outer large, lack marginal teeth; palp scarcely reaching beyond outer plate, its 4th segment rudimentary. Gnathopod 1 rather robust, seg. 5 as long as 6, the latter tapering, without palm. Gnathopod 2, seg. 6 narrowly oblong, densely hairy, dactylus minute or absent. Peraeopods 3-5 robust, segs. 2 and 4 much expanded. Uropod 2 has broad peduncle; 3 is very small. Telson short, broad, emarginate or somewhat cleft.*" (from Hurley 1963)

**Alicellidae –** consisting of the genera *Alicella* and *Paralicella*, and a suite of genera transferred from the valettiopsid group (by Lowry and De Broyer 2008), this family contains large scavenging necrophage species exclusively. Among them are the largest known amphipod, *Alicella gigantea* (see J. L. Barnard and Ingram 1986). They are similar in some respects to the Cebocarididae, the Eurytheneidae, and the Valettiopsidae. In their formal erection of the family, replacing the informal "alicellid group" established

by Dahl (1959), Lowry and De Broyer suggest that this group does not belong among the lysianassoids because its members possess a right lacinia mobilis, do not have a mitten-shaped gnathopod 2, and have calceoli unlike those expected in lysianassoids (Lincoln and Hurley 1981). They did not, however, suggest another superfamilial alignment for this family. It's position remains unresolved, perhaps requiring the eventual establishment of a new superfamily to accommodate it.

Description: "***Head*** *exposed; deeper than long; anteroventral margin concave or rounded, weakly or moderately recessed or not recessed, moderately excavate; anteroventral corner rounded, subquadrate or absent; rostrum vestigial or absent,; eyes present or absent, if present then small, oval. Body laterally compressed.*

***Antenna 1*** *shorter than or subequal in length to antenna 2; peduncle 3-articulate, with sparse slender setae; peduncular article 1 longer than article 2; article 2 longer than article 3; peduncular articles not geniculate; accessory flagellum short, callynophore present; calceoli present (Lincoln & Hurley 1981). Antenna 2 short or medium length; peduncle with sparse slender setae, without brush setae; without hook-like process; flagellum longer than peduncle, 5 or more articulate.*

***Mouthparts*** *well developed, forming a subquadrate bundle. Mandible incisors asymmetrical, straight or slightly curved, smooth to minutely dentate anteriorly, posterodistal part of incisor becoming strongly dentate; lacinia mobilis present on both mandibles (left broader than deep with serrate margin, occasionally narrow or vestigial; right reduced or vestigial, occasionally broadened with serrate margin); molar present, non-triturative or with tiny triturating patch; palp present. Maxilla 1 inner plate setose along medial margin; outer plate with 8/3 setal-tooth formula; palp symmetrical, 2-articulate. Maxilla 2 inner plate at least ¾ length of outer plate; inner plate with oblique setal row. Maxilliped inner plates well developed, separate; outer plate longer than palp article 1, not longer than palp article 2; palp 4-articulate.*

***Pereon***. *Pereonites 1-7 separate; complete; pleurae absent. Coxae 1-7 well developed, none fused with pereonites, overlapping, none acute ventrally. Coxae 1-3 well developed, none hidden or vestigial and hidden by other coxae. Coxae 2-4 none extensively broadened.*

***Gnathopod 1*** *similar in males and females; smaller (or weaker) than or similar in size to gnathopod 2; similar in form to gnathopod 2; simple or subchelate; coxa smaller than or subequal to coxa 2, not produced anteroventrally; ischium elongate, about 2 x as long as broad; merus and carpus not rotated; carpus shorter than, subequal to, or longer than propodus; dactylus large.* ***Gnathopod 2*** *similar in males and females (not sexually dimorphic): subchelate to minutely subchelate; coxa subequal to but not hidden by coxa 3; ischium long; carpus/propodus elongate, rectolinear; carpus long, not produced along posterior margin of propodus, propodus without complex setae along posterodistal margin; dactylus small.*

***Pereopods****, none prehensile, 3-7 without hooded dactyli. Pereopod 3 coxa longer than broad or as long as broad; carpus shorter than or subequal to propodus, not produced; dactylus well developed. Pereopod 4 coxa subequal to or larger than coxa 3, not ventrally acute, with small to large posteroventral lobe; carpus shorter than or subequal to propodus, not produced; dactylus well developed. Pereopods 5-7 with few robust or slender setae. Pereopod 5 shorter than or subequal in length to pereopod 6; coxa smaller than or subequal to coxa 4, coca equilobate; basis expanded, subquadrate,*

*without posteroventral lobe; carpus linear; dactylus with setae absent. Pereopod 6 subequal in length to or longer than pereopod 7; basis expanded; dactylus without setae. Pereopod 7 longer than pereopod 5, similar in structure to pereopod 6; basis expanded, without dense slender setae; dactylus minute (less than 1/8 length of propodus), short (between 1/8 and ¼ length of propodus) or medium length (1/4 to ½ length of propodus).*

***Pleon.*** *Pleonites 1-3 without transverse dorsal serrations, pleonite 3 with or without dorsal spines, without lateral teeth or ridging, without dorsal carina. Epimeron 1 well developed. Epimeron 2 setose.*

***Urosome*** *not dorsoventrally flattened; urosomites 1-3 free; urosomite 1 carinate or not. Urosomite 3 not fused with telson. Uropods 1-2 apices of rami without robust setae or setae embedded. Uropod 1 peduncle without long plumose setae; biramous. Uropod 2 well developed; without dorsal flange; inner ramus subequal in length to or longer than outer ramus. Uropod 3 not sexually dimorphic; without medial process; biramous; outer ramus longer than peduncle; inner ramus subequal to outer ramus. Telson longer than broad; deeply cleft; dorsal or lateral robust setae present; apical slender setae absent; apical robust setae present*." (from Lowry & De Broyer 2008)

**Alicella –** Monotypic, containing only the type *Alicella gigantea*. This huge animal (reaching a length of 340mm fide J. L. Barnard and Karaman 1991) lives in the abyss, apparently worldwide (Jamieson et al 2013). Specimens taken from seabird stomachs are assumed to be from dead specimens floating at the surface. The animals are near neutrally buoyant due to lipid droplets between the flesh and the carapace. Addition of any gas generated by decomposition of a dead individual would rapidly make the corpse positively buoyant, and rocket it to the surface. A thorough redescription of the animal and discussion of the information known at the time is provided by J. L. Barnard and Ingram (1986).

*Alicella gigantea* from 7000m deep in the Kermadec Trench, the largest amphipod currently known, a supposedly cosmopolitan species from the deep sea (from Pixgood.com)

Diagnosis: "*Peduncle of antenna 2 very short, article 1 strongly swollen. Mouthparts forming quadrate bundle. Labrum and epistome not prominent, separate, neither dominant in projection, blunt. Incisor edge straight with few inner corer teeth, and 1 middle tooth, rakers absent; molar simple, large, conicolaminate, setulose; palp attached strongly distal to molar. Inner plate of maxilla 1 with numerous setae on medial edge; palp biarticulate, large. Maxilla 2 with medial facial row of setae. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed.*

*Coxa 1 broadly expanded anteriorly, visible. Gnathopod 1 short, simple, article 3 elongate, article 5 longer than 6, dactyl large; article 6 of gnathopod 2 slightly shorter than article 5, both very elongate and linear, hand minutely subchelate; article 7 strongly overlapping obsolescent palm. Dactyls of pereiopods 3-7 very short.*

*Inner ramus of uropod 2 without notch. Uropod 3 equiramous, peduncle ordinary, outer ramus minutely 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Ingram 1986)

**Apotectonia –** J. L. Barnard and Ingram (1990) present a series of keys which separate the new taxa they propose from each other, and from other similar deep sea lysianassoid genera (*Alicella*, *Paralicella*, *Eurythenes*, *Ventiella*, *Schisturella*). These keys should be consulted in separating the genera of this group. A single species in the genus is known, *A. heterostegas*, taken from near vents in the Galapagos Rift area. It was not found at sites on the East Pacific Rise.

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size, blunt. Incisor weakly toothed; left lacinia mobilis shorter than broad, right vestigial; molar large, conical, setulose, without tiny apical trituration surface, palp attached strongly distal to molar. Inner plate of maxilla 1 strongly setose medially (13), palp biarticulate, large. Inner plate of maxilla 2 much smaller than outer, with strong row of mediofacial setae (20, but number of setae in row about three-fourths that in Valettiopsis and Valettietta). Inner and outer plates of maxilliped well developed, inner beveled, palp strongly exceeding outer plate, dactyl well developed, with apical nail and several accessory setules.*

*Coxa 1 scarcely shortened, beveled, partly covered by coxa 2. Posteroventral lobe on coxa 4 of medium size.*

*Gnathopod 1 elongate, simple, articles 5 and 6 subequal, article 3 greatly elongate; dactyl small; article 6 of gnathopod 2 slightly shorter than article 5, both very elongate and linear, propodus subchelate. Pereopods 5-7 elongate.*

*Pleonite 4 complexly carinate (versus Alicella and Paralicella). Only outer ramus of uropod 2 shortened. Inner ramus of uropod 2 without notch. Uropod 3 aequiramous, ordinary, peduncle ordinary, inner ramus not shortened, outer ramus 2-articulate. Telson elongate, deeply cleft.*" (from J. L. Barnard & Ingram 1990)

**Diatectonia –** The single species, *D. typhodes*, is known only from Hamilton Guyot. It should be keyed from other members of the alicellids and valettiopsids using the keys to genera in J. L. Barnard and Ingram (1990).

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size, blunt. Incisor weakly toothed (4 teeth each side); left and right laciniae mobiles shorter than broad, right very small; molar large, conical, setulose, with tiny apical trituration surface; palp attached strongly distal to molar. Inner*

*plate of maxilla 1 strongly setose medially (19), palp biarticulate, large. Inner plate of maxilla 2 slightly smaller than outer, with strong row of mediofacial setae (27), number of setae in row like that in Valettiopsis and Valettietta. Inner and outer plates of maxilliped well developed, inner scarcely beveled, with 4 widely spread jewel-spines; palp strongly exceeding outer plate, dactyl well developed, ordinary, with 1 apical nail and several accessory setules.*

*Coxa 1 strongly shortened and partly covered by coxa 2, tapering. Posteroventral lobe on coxa 4 strong.*

*Gnathopod 1 elongate, strongly subchelate, palm oblique, article 6 shorter than 5,article 3 greatly elongate; dactyl small; article 6 of gnathopod 2 shorter than article 5, both very elongate and linear, propodus barely subchelate. Pereopods 5-7 elongate.*

*Pleonite 4 carinate (versus Paralicella),with 3 teeth (versus Tectovalopsis, new genus). Only outer ramus of uropod 2 shortened. Inner ramus of uropod 2 without notch. Uropod 3 aequiramous, ordinary, peduncle ordinary, inner ramus not shortened, outer ramus 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Ingram 1990)

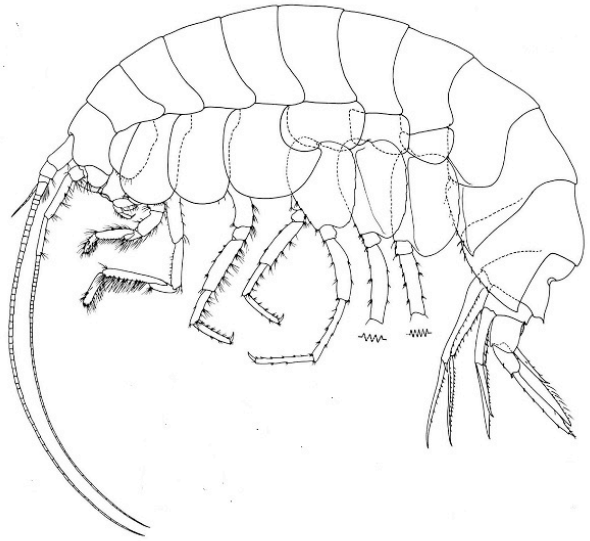
**Paralicella –** Three of the five known members of the genus are reported from the NEP, all from deep water (see J. L. Barnard and Shulenberger 1976, Shulenberger and J. L. Barnard 1976). Specimens of a provisional species were reported by Thomas from abyssal collections in the Gulf of the Farallones. These large necrophagic scavengers are found on abyssal plains and in trenches. J. L. Barnard and Ingram (1990) characterize the genus as bathy- and abysso-pelagic. They provide a key to the species (loc. cit., pg. 39) which suffices to separate the NEP forms. Although *P. vaporalis* is known from as shallow as 706m, it is only known from offshore seamounts and guyots, and is extremely unlikely to venture into the Southern California Borderland where it might be captured in regional sampling. *P. caperesca* have been taken by trawling at 1875m over the San Clemente Basin, which has a fauna with abyssal rather than bathyal affinities (France 1994). Unless we push much deeper in future sampling, we will not encounter these animals.

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome not differentially produced, separate, labrum weakly dominant Incisor ordinary, molar simple or barely triturative, large, conicolaminate, setulose, palp attached opposite molar. Inner plate of maxilla 1 strongly (10+) setose; palp biarticulate, large. Inner plate of maxilla 2 slightly smaller than outer, with oblique facial row of setae (9+),but number of setae about half that in Valettietta. Inner and outer plates of maxilliped well developed, inner with oblique apical margin, with excavation separating spines or some spines attached within excavation, palp strongly exceeding outer plate, dactyl well developed, ordinary, tapering, lacking strong acclivity, with long apical nail(s) and accessories.*

*Coxa 1 large and visible, adz-shaped and expanding apically, or occasionally significantly shortened, tapering and partially covered by coxa 2. Coxa 4 with well-developed posteroventral lobe.*

*Gnathopod 1 subchelate, palm oblique, article 3 elongate (versus Aristias, Eurythenes); articles 5 and 6 subequal, dactyl large; article 6 of gnathopod 2 slightly shorter than article 5, both very elongate and linear, propodus subchelate, palm oblique or almost obsolescent, but well defined, dactyl large. Article 2 of pereopods 5-7 diverse in size and form.*

*Outer ramus of uropod 2 and usually uropod 1 shorter than inner; inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle slightly elongate, rami subequal, outer ramus 2-articulate. Telson elongate, deeply cleft."* (from J. L. Barnard & Ingram 1990)



*Tectovalopsis wegeneri* (from J. L. Barnard & Ingram 1990)

**Tectovalopsis –** Unlike the other new genera established in the group by J. L. Barnard and Ingram (1990). this genus has multiple members in the vent communities of the NEP. Five new species of *Tectovalopsis* were created. They can be separated by use of the specific keys produced by J. L. Barnard and Ingram (1990, pp. 57-58).

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size, blunt. Incisor weakly toothed or smooth; left and right laciniae mobiles shorter than broad; molar large, conical, setulose, with tiny apical trituration surface; palp attached strongly distal to molar. Inner plate of maxilla 1 strongly setose medially (about 15); palp biarticulate, large. Inner plate of maxilla 2 slightly smaller than outer, with strong row of mediofacial setae (about 1 l),but number of setae in row about half that in Valettiopsis and Valettietta. Inner and outer plates of maxilliped well developed, inner not beveled, with 3 spines grouped medially, apicolateral margin bulging, palp strongly exceeding outer plate, dactyl well developed, either ordinary or with inner acclivity and tooth, 2 apical nails and several accessory setules.*

*Coxa 1 strongly shortened and partly covered by coxa 2, tapering or weakly truncate. Posteroventral lobe on coxa 4 strong.*

*Gnathopod 1 elongate, strongly subchelate, palm oblique, articles 5 and 6 subequal, article 3 greatly elongate; dactyl small; article 6 of gnathopod 2 shorter than article 5,both very elongate and linear, propodus subchelate. Pereopods 5-7 elongate.*

*Pleonite 4 carinate (versus Paralicella). Only outer ramus of uropod 2 shortened. Inner ramus of uropod 2 without notch. Uropod 3 aequiramous, ordinary, peduncle ordinary, inner ramus not shortened, outer ramus 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Ingram 1990)

**Transtectonia –** Monotypic, with only the species *T. torrentis*. This form was not taken in the Galapagos Rift area, and is currently endemic at vent sites near 13°N on the East Pacific Rise. Once again, the keys in J. L. Barnard and Ingram (1990) can be used to separate the genus from other similar genera..

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size, blunt. Incisor strongly toothed; left and right laciniae mobiles longer than broad, right vestigial; molar large, conical, setulose, with tiny apical fused spine cluster; palp attached strongly distal to molar. Inner plate of maxilla 1 strongly setose medially (16), palp biarticulate, large. Inner plate of maxilla 2 slightly smaller than outer, with strong row of barely submarginal mediofacial setae (4),but number of setae in row about one-third or less that in Valettiopsis and Valettietta. Inner and outer plates of maxilliped well developed, inner beveled, palp strongly exceeding outer plate, dactyl well developed, with apical nail and several accessory setules.*

*Coxa 1 not shortened and not strongly covered by coxa 2, scarcely tapering, not truncate. Posteroventral lobe on coxa 4large.*

*Gnathopod 1 elongate, weakly subchelate, palm oblique, articles 5 and 6 subequal, article 3 slightly elongate, dactyl small; article 6 of gnathopod 2 shorter than article 5,both very elongate and linear, propodus subchelate. Pereopods 5-7 elongate.*

*Pleonite 4 carinate (versus Paralicella). Only outer ramus of uropod 2 shortened. Inner ramus of uropod 2 without notch. Uropod 3 dispariramous, ordinary, peduncle ordinary, inner ramus shortened, outer ramus 2-articulate. Telson elongate, deeply cleft."* (from J. L. Barnard & Ingram 1990)

**Family Aristiidae** - Diagnosis "Head: deeper than long. Antennae: calceoli absent. Epistome and upper lip: fused, usually with a central notch. Mandible: incisors small or large, usually asymmetrical, left straight, minutely serrate, right straight or slightly convex, smooth; left lacinia mobilis a small peg or absent; accessory setal row without distal setal tuft; molar present or absent, if present a smooth, weakly setose flap. Maxilla 1: inner plate usually strongly setose, always more than 2 pappose setae, outer plate broad or very broad; setal-teeth in a modified 7/4 arrangement; palp large, 2-articulate. Maxilliped: outer plate with or without apical simple, slender setae, without apical robust setae. Gnathopod 1: simple, subchelate or parachelate. Coxa 1: vestigial; coxa 2 small or large; coxa 3 large. Pereopods 3-7 simple, propodus with distal spur (rarely absent). Telson: entire or cleft." (Lowry and Stoddart 1997)

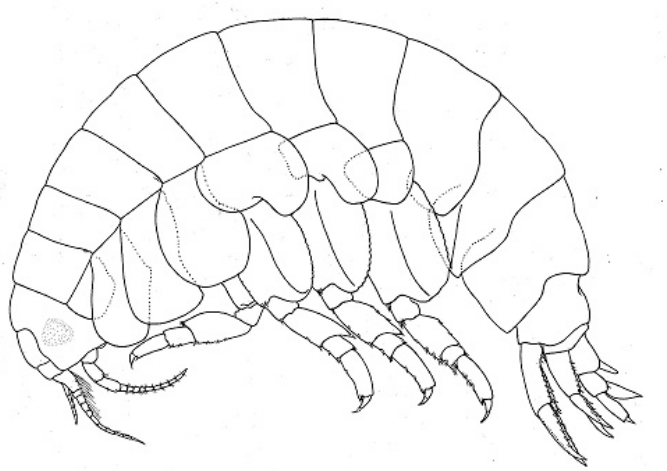
Key to NEP *Aristias* species (modified from Gurjanova 1962) dcadien, 6 Jan 2007

1a. Eyes absent or obscure, suggested only by tissue density.....2
1b. Eyes present, pigmented, obvious.....3
2a. Telson cleft 1/3 length or less.....*A. expers*
2b. Telson cleft 2/3 length or more.....*A androgans*
3a. Inner ramus of uropod 3 shorter than segment 1 of outer ramus.....*A. tumidus*
3b. Inner ramus of uropod 3 equal to or longer than segment 1 of outer ramus.....4

4a. Telsonic apices each bearing two stout spines.....*A. pacificus*
4b. Telsonic apices each bearing a single stout spine.....5

5a. Uropod 1 peduncle bearing 4-5 spines on lateral margins; posterior lobe of basis of pereopod 7 with 4 posterior denticles; epimeron 1 shield shaped, bearing a small but acute spine ventrally.....*A. veleronis*

5b. Uropod 1 peduncle bearing 12-14 spines on lateral margins; posterior lobe of basis of pereopod 7 with 7-12 posterior denticles; epimeron 1 subquadrate, lacking spine on posteroventral corner.....*A. sp A*



*Aristias androgans* (J. L. Barnard 1964)

**Aristias -** several representatives of the genus occur in the NEP, all probably associated symbiotically with other organisms. *Aristias sp A* occurs in association with the hexactinellid sponge *Staurocalyptus dowlingi* at outer shelf depths in the SCB, living both inside the central cavity of the sponge, and within the sponge canal system. *Aristias pacificus* was described from the solitary ascidian *Ascidia paratropa*. Hosts of other NEP members of the genus are not yet known. *Aristias tumidus* is known only from the NW Pacific east as far as the Aleutian Islands, not occurring in either the boreal or temperate portions of the NEP. It is reportedly taken in association with the tunicate *Molgula retortiformis* (Shoemaker 1955).

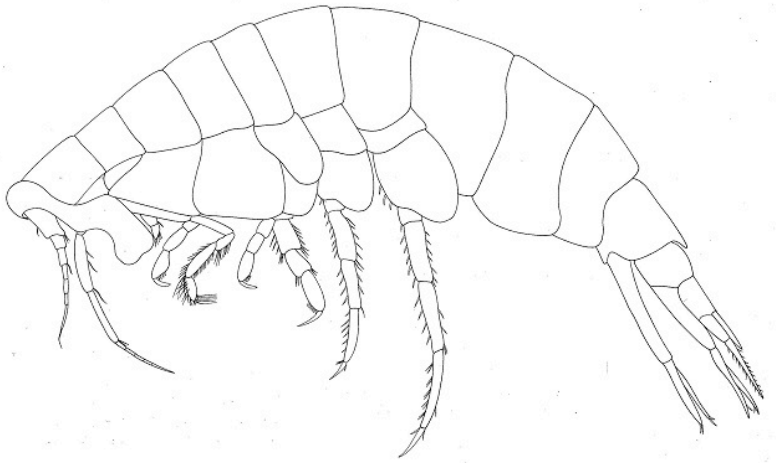
Diagnosis: **"***Body short and thick. Side plates rather small, first almost concealed, 4th very slightly excavate. Antenna 1 not very turgid; peduncle, 2nd segment not extremely short, 1st segment of flagellum rather large. Antenna 2 in female shorter than antenna 1, Epistome scarcely projecting, defined by a small but distinct sinus. Lower lip, front lobes narrow, hind processes blunt. Mandible strong, cutting edge simple, molar narrow, prominent, acuminate, palp central. Maxilla 1 has 5 or more setae on inner plate, outer plate very broad, palp normal. Maxilla 2, plates divergent, inner very broad, outer much narrower. Maxillipeds, inner plates small, outer large, oval, seg. 1 of palp the largest. Gnathopod 1 rather robust, seg. 6 tumid at base, tapering to an apex rather wider than the base of the finger. Gnathopod 2 slender, minutely chelate. Peraeopods 3-5, basis not greatly dilated. Uropod* ***3,*** *outer ramus the longer, with small 2nd segment. Telson rather short, deeply cleft*." (from Hurley 1963)

**Family Cebocaridae** – Members of this family are all swimmers, and are in general known as meso- or bathypelagic taxa.

Description. "***Head*** *exposed or covered by Pereonite 1 and coxa 1;* ***much deeper than long, extending well below insertion of antenna 2,*** *without cheek notch. Antennae calceoli present or absent in male. Antenna 2 peduncular article 3 without distal hook. Epistome with proximal portion not produced. Mouthpart bundle subquatrate.* ***Mandible*** *incisors well developed,* ***asymmetrical****, left straight, minutely serrate, right convex, smooth; left lacia mobilis present or absent, if present then blade-like, broader than long, with serrate margin or rod-like; accessory setal row with 5 or less robust setae, without distal setal tuft;* ***molar vestigial or absent****; palp present or absent, if present then inserted approximately midanteriorly.* ***Maxilla I*** *inner plate with papose setae along medial margin or with apical pappose setae;* ***outer plate with setal-teeth in modified 8/3 crown arrangement****, setal-teeth large;* ***palp*** *large,* ***with apical robust setae****.* ***Maxilla 2 inner plate significantly shorter than outer plate****, inner plate with or without oblique row of facial setae (week when present). Maxilliped outer plate present, medial setae vestigial or absent, with apical slender setae; palp 4-articulate, article 4 well developed.*

***Gnathopod 1*** *simple;* ***coxa vestigial****; ischium short or long; carpus short; propodus small; dactylus slightly curved.* ***Gnathopod 2 coxa vestigial****.* ***Pereopods some prehensile****; distal spurs absent. Pereopod 4 coxa with posteroventral lobe well developed, weak or absent. Pereopod 5 coxa anterior and posterior lobes subequal, or posterior lobe deeper than anterior lobe.*

*Uropod 3 rami biramous. Telson cleft or e*ntire". (Lowry and Stoddard 2011).



*Metacyphocaris helgae* (from J. L. Barnard and Karaman 1991)

**Metacyphocaris –** Monotypic, containing only *M. helgae*. Shoemaker (1945) discusses this taxon, and repeats earlier records, including Thorsteinson's (1941) record from the Gulf of Alaska, which established the presence of the species in the NEP. Hurley (1963) reproduces Tattersall's figure of the anterior of the species, and provides additional records from the NEP. Another pelagic species taken in or over deep water, and unlikely to feature in collections made within the Southern California Borderland.

**Diagnosis: "***Of cyphocarin form, head tall, horizontally short, grotesque, with hood. Flagella of antennae short (4-articulate); accessory flagellum vestigial, l-articulate. Mouthparts forming quadrate bundle. Labrum and epistome [?continuous, not*

*differentially produced, prominent, coalesced, separate, labrum epistome slightly strongly dominant in size. projection. and blunt. sharp]. Incisor ordinary, molar simple, small; rakers absent; palp absent. Inner plate of maxilla 1 weakly (2) setose; palp 2-articulate,large. Inner small and outer plate of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxae 1-2 small, strongly shortened and partly covered by coxa 3, coxa 4 largest, lobate, excavation weak. Gnathopod 1 short, nearly simple, articles 5 and 6 subequal, dactyl medium; article 6 of gnathopod 2 greatly shorter than article 5, propodus simple. Uropod 3 ordinary, peduncle ordinary, parviramous, inner ramus strongly shortened, outer ramus 2-articulate. Telson elongate, weakly cleft*." (from J. L. Barnard & Karaman 1991)

**Family Cyclocarididae** – Newly erected by Lowry and Stoddart (2011). Diagnostic description: "***Head*** *exposed,* ***slightly deeper than long****, without cheek notch. Antennae calceoli present or absent in male. Antenna 2 peduncular article 3 without distal hook. Epistome and upper lip separate. Epistome with proximal portion not produced. Mouthpart bundle subquadrate.* ***Mandible*** *incisors well developed, incisors asymmetrical, left straight,* ***minutely serrate****, right convex, smooth; left lacinia mobilis rod-like; accessory setal row with more than 5 robust setae, without distal setal tuft;* ***molar a setose tongue****;* ***palp inserted distally****. Maxilla 1 inner plate with pappose setae along medial margin; outer plate with setal-teeth in 7/4 crown arrangement, setal-teeth large; palp large, with apical robust setae. Maxilla 2 inner plate significantly shorter than outer plate, inner plate without oblique row of facial setae. Maxilliped outer plate present, medial setae small, blunt or bead-shaped, with apical slender setae; palp 4-articulate, article 4 well-developed.*

*Gnathopod 1 sinple; coxa vestigial; ischium long; carpus long; propodus small; dactylus slightly curved. Gnathopod 2 coxa vestigial. Pereopods all simple; distal spurs absent. Pereopod 4 coxa with posteroventral lobe weak or absent. Pereopod 5 coxa anterior and posterior lobes subequal.*

*Uropod 3 biramous. Telson cleft*". (Lowry and Stoddard 2011)

***Cyclocaris guilelmi*** a cyclocarid amphipod (Photo: Zosia Joanna Legezynska)

**Cyclocaris –** Two of the four species in this genus occur in the NEP, *C. guilelmi* (see photograph above), and *C. tahitiensis*. The other two species were recently described from the Atlantic (Horton & Thurston 2014). *C. tahitiensis* has been reported from vent collections along the East Pacific Rise at 21° N by Vinogradov (1993), the first record outside the type locality. Horton and Thurston (2014) review distribution of the genus, and accept Vinogradov's record as true *C. tahitiensis*.. These animals are pelagic, having an appearance similar to some hyperiids. *Cyclocaris guilelmi* was the most numerous of the species of pelagic gammaridians taken during the Vityaz cruises in the NWP (Birstein and Vinogradov 1970), but was smaller than many of the other lysianassoids at only 3-8mm length. J. L. Barnard (1959) figures the species well, but does not provide a whole body illustration (for which see the photograph above).

Diagnosis: as for family

**Family Cyphocarididae –** members of this family are usually taken in midwater collections, but also figure prominently in some benthic collections. They are very common in Puget Sound, where they are routinely taken in benthic grab samples. It is likely that the animals spend a significant amount of their time swimming, although they are based on the bottom.

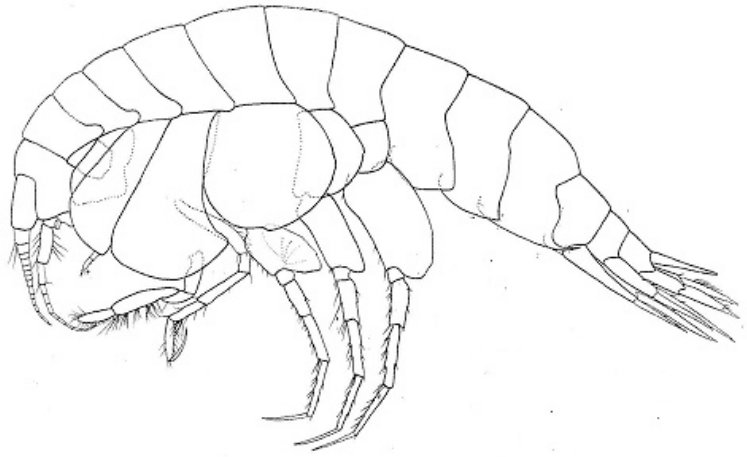
Diagnosis: "Head: much deeper than long. Antennae: calceoli present or absent. Epistome and upper lip separate. Mandible: incisors small, convex, symmetrical; left lacinia mobilis a stemmed, distally serrate blade; accessory setal row without distal setal tuft; molar columnar, triturating. Maxilla 1: inner plate usually strongly setose, always more than 2 pappose setae; outer plate broad, setal-teeth in a 6/5 arrangement; palp large, 2 articulate. Maxilliped: outer plate with or without apical slender pappose setae, without apical robust setae. Gnathopod 1: simple or weakly subchelate. Coxa 1: vestigial; coxa 2 very small; coxa 3 vestigial or large. Pereopods 3-7: simple or weakly prehensile, propodus without distal spur. Telson: deeply cleft." (Lowry and Stoddart 1997)

**Cyphocaris challengeri**, a common component in the benthic community of Puget Sound and the west coast of British Columbia (Photo from Fisheries and Oceans Canada)

**Cyphocaris –** As can be seen in the accompanying photograph of *C. challengeri*, *Cyphocaris* species appear somewhat different from many lysianassoids, particularly benthic forms. Their swimming activities are facilitated by a slim, relatively elongate body, and a modified head somewhat reminiscent of the galeate head of synopiids. Adults are outlandishly outfitted with head spikes, large and often long saw-blades or smooth spikes extending back from the basis of the 5th pereopod, and other distinctive features. Conveniently, Schellenberg (1926b) provides in his Plate V whole body illustrations of each of four of the five species recorded from the NEP; *C. anonyx*, *C. challengeri*, *C. faurei*, and *C. richardi* (the fifth species, *C. latirama*, lacks both a produced head and a posterior projection on the basis of P5, so can be easily separated from the other species). He provides illustrations of the 5$^{th}$ legs of these species in Text Figure 2. Features of the head and the protuberance on the 5$^{th}$ leg (or lack thereof in *C. richardi*) seem highly distinctive. One should, however, also pay attention to the variation in these features illustrated by Schellenberg (1926b), Bowman and McCain (1967), and others (i.e. Shoemaker 1945, Fig. 1; J. L. Barnard 1954, Plt. 2). There is considerable variation with size and age in some features, and in proportions, so be careful in your examination and evaluation of these animals.

Behavior of males, females, and juveniles may also dictate that you will see only a small subset of the population in any given sample. Thurston (1976a) documents the distribution of various parts of the *C. challengeri* population over time during a series of midwater tows in the North Atlantic. He found that adult males and adult females occupied different vertical segments of the water column, and that they were both generally separated from the juveniles. Brusca (1967) summarized the day/night distribution of *C. richardi* off California, but did not segregate by sex.

Diagnosis: " *Of cyphocarin form, head tall, horizontally short, grotesque. Flagella of antennae long, base of flagellum on antenna 1 with callynophore, accessory flagellum large. Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size nor projection. Incisor ordinary, molar triturative, large, quadrate, palp well setose, attached opposite molar. Inner plate of maxilla 1 strongly setose; palp 2- articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxae 1-3 small, strongly shortened and partly covered by coxa 4, latter large and visible, strongly lobate (spined) and excavate, coxa 5 usually large. Gnathopod 1 short, simple, articles 5 and 6 subequal, dactyl large; article 6 of gnathopod 2 slightly to greatly shorter than article 5, often both very elongate and linear, propodus minutely subchelate. Uropod 3 ordinary to elongate, peduncle elongate, aequiramous, outer ramus 1 or 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Karaman 1991)

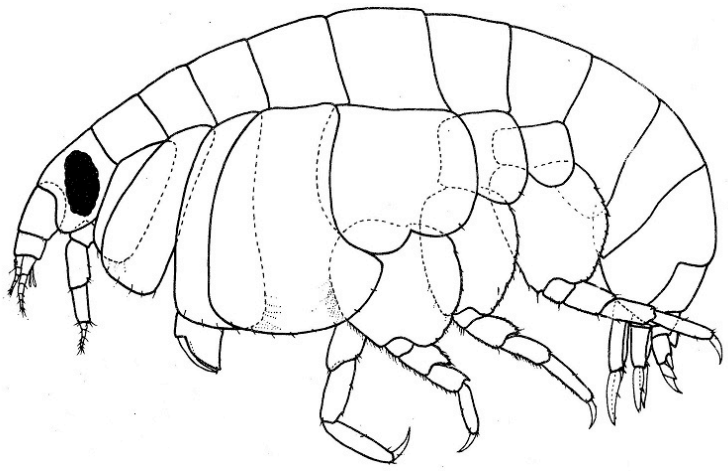


*Procyphocaris primata* (=*P. indurata*) (from J. L. Barnard 1961)

**Procyphocaris –** Looks much more like a "typical" lysianassoid, lacking the head and leg extravagances of *Cyphocaris*. There is only a single NEP record for any member of the genus, from deep water off Pt. Conception (Hendrycks and Conlan 2003). They record *P. indurata*, originally known from Africa. The genus was erected by J. L. Barnard (1961) to house his *P. primata*, which has been recognized as a synonym of the earlier *Uristes induratus* of K. H. Barnard (1925). Records of *P. indurata* from elsewhere in the depths of the world ocean demonstrate it will probably prove to be cosmopolitan. The genus is now monotypic with the synonymy of the two species listed in J. L. Barnard and Karaman (1991) as comprising it. It is distinguished from other cyphocaridid genera by details of the mandibular palp and molar (J. L. Barnard 1961)

Diagnosis: **"***Of cyphocarid form with coxae 1-2 strongly shortened and partly covered by coxa* ***3,*** *both tapering, coxa 2 largest. Mouthparts forming quadrate bundle. Labrum and epistome differentially produced, not prominent, coalesced, neither dominant in size nor projection, blunt. Incisor ordinary, molar weakly triturative, small; palp attached opposite molar. Inner plate of maxilla 1 [?weakly setose]; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Gnathopod 1 short, nearly simple, palm oblique, article 5 longer than 6, dactyl large; article 6 of gnathopod 2 greatly shorter than article 5, ordinary, propodus subchelate. Inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle slightly elongate, inner ramus slightly shortened, outer ramus 2-articulate. Telson elongate, deeply cleft."* (from J. L. Barnard & Karaman 1991)

**Family Endevouridae –** Diagnosis: "Head: as long as deep or deeper than long. Antennae: calceoli absent. Epistome and upper lip separate. Mandible: incisors small, convex, symmetrical; lacinia mobilis absent; accessory setal row with distal setal tuft; molar smooth or weakly ridged; setose or not. Maxilla 1: inner plate with less than 2 apical setae; outer plate narrow, with setal-teeth in a modified 6/5 arrangement; palp large, 2-articulate. Maxilliped: outer plate without apical slender or robust setae. Gnathopod 1: simple. Coxae 1-4 large, longer than broad, overlapping. Pereopod 3: subchelate or chelate, propodus enlarged. Pereopods 4-7 simple, propodus without distal spur. Telson: entire." (Lowry and Stoddart 1997). The family contains two genera, one in the NEP.



*Ensayara ramonella* (from J. L. Barnard 1964a)

**Ensayara –**The type *E. ramonella* is from the NEP, and other species from New Zealand, Mauritius, and the Mediterranean (Lowry and Stoddart 1983). Six additional species have been described in the genus since its erection: *E. denarius* from Japan (Hirayama 1985), *E. microphthalma* from Madagascar (Ledoyer 1986), *E. entrichoma* from Bermuda (Gable and Lazo-Wazem 1990), *E. jumanae* from Belize (J. L. Barnard and Thomas 1990), and *E. kermadecensis* and *E. ursus* from New Zealand (Kilgallen 2009). *Ensayara ramonella* was described from Bahia San Quintin on the West coast of Baja California. The original description (J. L. Barnard 1964a) should be consulted for details. Like the type genus of the family *Endevoura*, *Ensayara* has a large chelate 3rd pereopod. This is much more prominent than either the simple 1st gnathopod, or the typically mitten-shaped 2nd gnathopod. No other NEP genus or species shares this character. *Ensayara ramonella* has been recorded only from the type locality to date. [Please note: Ledoyer (1986) listed the two species he discussed as *Ensaraya* throughout his text; a lapsus]

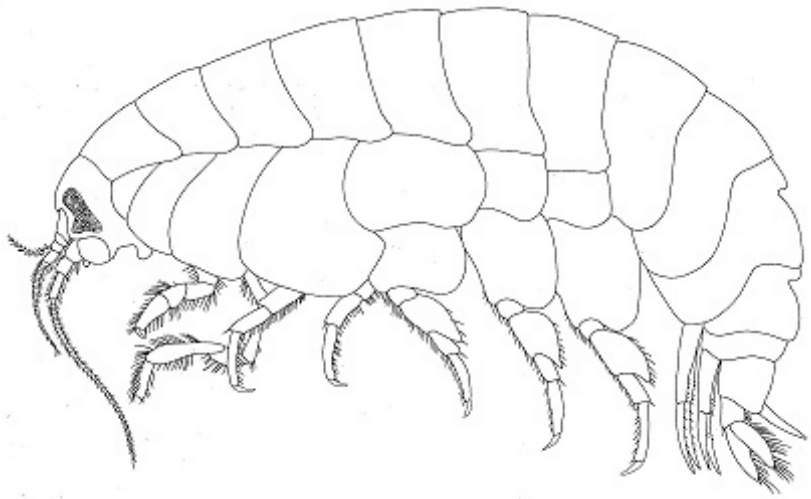
Diagnosis: "*Mouthparts not forming a cone-like bundle below head; mandible with distinct, untoothed cutting edge, the molar unridged, intermediate in size, the tri-articulate palp attached nearly level with molar; inner lobe of maxilla 2 much reduced in size; fourth palp article of maxilliped unguiform; gnathopod 1 simple, styliform; pereopod 1 formed into a large cheliform organ similar to a gnathopod ; pereopod 2 normal; article 3 of antenna 1 apparently telescoped into end of article 2 or missing; inner ramus of uropod 3 about two thirds as long as the biarticulate outer ramus; telson short, oboval, entire*." (from J. L. Barnard 1964a)

**Eurytheneidae –** The family contains only the genus *Eurythenes*. Diagnosis "Head exposed, much deeper than long, not extending much below insertion of antenna 2, without cheek notch. Antennae with calceoli present in male, absent in female. Antenna 1 with well developed two-field callynophore in male and female. Antenna 2 peduncular article 3 without distal hook. Mouthpart bundle subquadrate. Epistome and upper lip separate. Mandible incisors present, well developed, symmetrical, convex, smooth; right lacinia mobilis absent; accessory setal row without distal setal tuft; molar a setose tongue, with small triturating surface; palp present, inserted approximately mid-anteriorly.

Maxilla 1 inner plate with more than two apical pappose setae; outer plate narrow with setal-teeth in 8/3 crown arrangement, setal-teeth large, ST6 and ST7 slender, ST7 slightly displaced from ST6; palp large, with apical robust setae. Maxilla 2 inner plate significantly shorter than outer plate. Maxilliped outer plate present, medial setae small, blunt or bead-shaped; palp four-articulate, article 4 well developed. Gnathopod 1 subchelate to parachelate; coxa vestigial; merus and carpus not rotated; carpus short; propodus large, palm straight to convex; dactylus slightly curved, not hidden by setae. Gnathopod 2 coxa small, shorter than coxa 3. Pereopods all simple; distal spurs absent. Pereopod 3 coxa large. Pereopod 4 coxa large with well developed posteroventral lobe. Pereopod 5 coxa with anterior and posterior lobes subequal. Uropod 2 inner ramus without constriction. Uropod 3 biramus. Telson present, cleft." (Stoddart and Lowry 2004)

**Eurythenes –** *Eurythenes* are very widely distributed abyssal scavengers. Speciation in the genus has been controversial. We currently have two species listed as occurring in the NEP, *E. gryllus* and *E. obesus*. While some consider the two species synonyms, evidence presented by Thurston and Bett (1995, but see also J. L. Barnard 1961) validates their separation. *E. obesus* was originally described in a different genus, *Katius*, and is found under that name in some literature (i.e. Shoemaker 1920,1956).

Diagnosis: as for family.



*Eurythenes gryllus* (from J. L. Barnard and Karaman 1991)

While *E. gryllus* is recorded from appropriate habitat all over the globe, genetic investigations (France and Kocher 1996) suggest that what is currently viewed as a single taxon morphologically has significant haplotype disparity genetically. One of these differing haplotypes has recently been separated as a third species in the genus (Stoddart and Lowry 2004) with a disjunct distribution in the southern Pacific and the tropical western Atlantic. A table of characters differentiating these three is presented by Senna (2009).

These amphipods grow quite large, with adult sizes to at least 120mm. They are active necrophagic scavengers, and are routinely taken in baited traps. *In situ* observations are reported by Bowman and Manning (1972), and Smith and Baldwin (1984) comment on the natural history of the animal, and Thurston et al. (2002) on its population structure. A thorough and extensive summary of the literature on *E. gryllus* is

provided by Stoddart and Lowry (2004), which should be consulted for additional information not provided by the references cited above.

***Hirondellea gigas*** from 10900m in the Challenger Deep section of the Mariana Trench, currently the deepest capture record of an amphipod (photo: JAMSTEC)

**Family Hirondelleidae** - Description. "**Head** free, not coalesced with pereonite 1; exposed; deeper than long; anteroventral margin rounded or oblique, anteroventral corner subquadrate or absent; rostrum absent; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair, or trioculate; not bulging. Body laterally compressed; cuticle smooth.

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

*Mouthparts* well developed. **Mandible incisor smooth**; lacinia mobilis present on left side only; accessory setal row without distal tuft; molar present, medium, non-triturative; palp present. *Maxilla 1* present; inner plate present, weakly setose apically; 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, small; palp 4-articulate, article 3 without rugosities. *Labium* smooth.

**Pereon**. Pereonites 1-7 separate; complete; sternal gills absent; pleurae absent. *Coxae 1-7* well developed, none fused with pereonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. **Coxae 1-3** not successively smaller, **coxa 1 vestigial**. *Coxae 2-4* none immensely broadened.

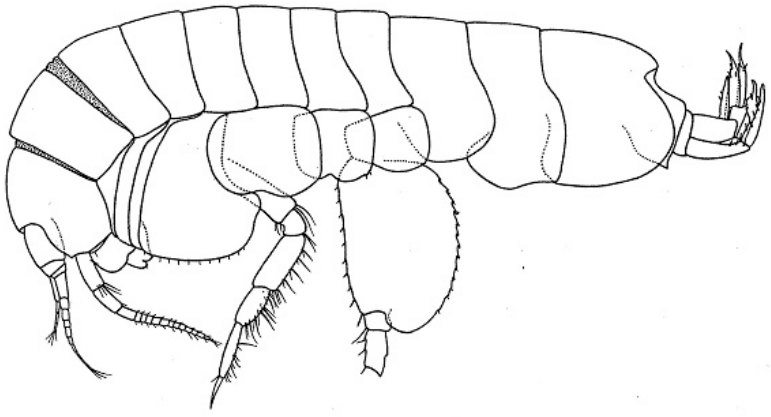
*Gnathopod 1* not sexually dimorphic; smaller (or weaker) than gnathopod 2; vestigial, hidden or partially hidden by coxa 2, or smaller than coxa 2; gnathopod 1 merus

and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus; gnathopod 1 not produced along posterior margin of propodus; dactylus large. *Gnathopod 2* not sexually dimorphic; subchelate, or chelate; coxa subequal to but not hidden by coxa 3; ischium elongate; merus not fused along posterior margin of carpus or produced away from it; carpus/propodus not cantilevered, carpus elongate, longer than propodus, not produced along posterior margin of propodus.

*Pereopods* heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Pereopod 3* well developed. *Pereopod 4* well developed. 3-4 not glandular; 3-7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus shorter than propodus, produced anteriorly or not produced; dactylus well developed. Coxa larger than coxa 3, not acuminate, with well developed posteroventral lobe; carpus not produced. *Pereopods 5-7* with few robust or slender setae; dactyli without slender or robust setae. *Pereopod 5* well developed; subequal in length to pereopod 6; coxa smaller than coxa 4, without posterior lobe; basis expanded, subrectangular, without posteroventral lobe; merus/carpus free; carpus linear; setae absent. *Pereopod 6* subequal in length to pereopod 7; merus/carpus free; dactylus without setae. *Pereopod 7* with 6-7 well developed articles; subequal to pereopod 5, or longer than pereopod 5; similar in structure to pereopod 6; with 7 articles; basis 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 without robust setae. *Uropods 1-3* similar in structure and size. *Uropod 1* peduncle without long plumose setae, without basofacial robust seta, 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 elongate; outer ramus longer than peduncle, 2-articulate, without recurved spines. *Telson* laminar; moderately cleft; longer than broad; apical robust setae present, or absent" (Lowry and Springthorpe 2001)



*Hirondellea fidenter* (from J. L. Barnard 1966)

**Hirondellea –** While a definition of the monotypic family was available on-line, it was not officially erected until the publication of Lowry and Stoddart (2010) who reviewed the Australian representatives of the genus, and provided a key to the extant species. J. L. Barnard and Karaman (1991) list seven species in the genus, all from deep water, and most from trenches. Two additional species were described by J. L. Barnard and Ingram (1990) from vents in the NEP. Another species was added by Horton and Thurston (2009), and five more by Lowry and Stoddart (2010). All are necrophages, and are usually taken in large numbers in baited traps (see *in situ* photo of *H. gigas* at the bottom of the Philippine Trench on pg. 3). *Hirondellea* are an order of magnitude smaller than the largest of the alicellid necrophages (*Alicella gigantea*), and probably do not exceed 35mm in length.

Of the four species reported from the NEP, only one – *H. fidenter* is from an area which might reasonably be sampled by public agencies at some point in the future. It was taken from the San Nicholas Basin, within the Southern California Borderland. The other three are from much further afield; *H. brevicaudata* from abyssal traps well away from shore, *H. guyoti* from the Hess Guyot, and *H. glutonis* from vents on the East Pacific Rise at 13°N and the Galapagos Rift zone. All species are keyed by J. L. Barnard and Ingram (1990), and their key should easily separate all of the NEP taxa.

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome differentially produced, prominent, separate, both strongly projecting, blunt. Incisor ordinary, molar simple, large, conicolaminate or subconical, setulose; palp attached opposite molar. Inner plate of maxilla 1 weakly (2) setose, in adults setae sickle-shaped; palp biarticulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed.*

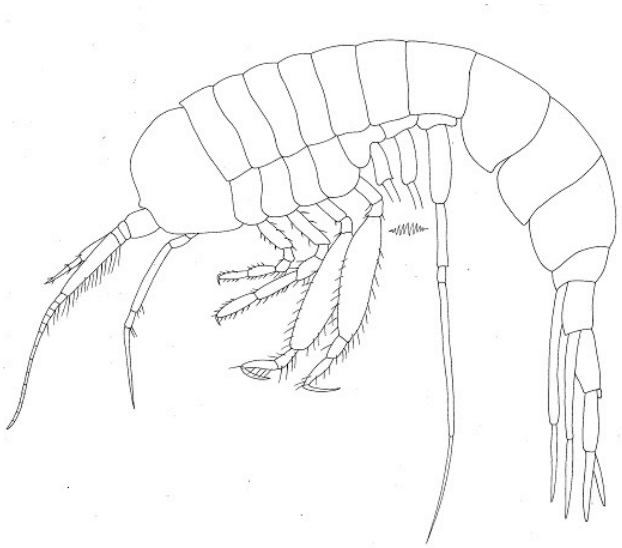
*Coxa 1 strongly shortened and partly covered by coxa 2, tapering or subrectangular, setation much stronger than on coxae 2-4.*

*Gnathopod 1 short, strongly subchelate, palm transverse, sometimes chelate, article 5 subequal to or longer than 6,dactyl large; article 6 of gnathopod 2 greatly shorter than article 5, ordinary, propodus minutely chelate.*

*Inner ramus of uropod 2 with or without large notch. Uropod 3 almost aequiramous, ordinary, peduncle ordinary, outer ramus 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Ingram 1990)

**Family Hyperiopsidae** – Diagnosis: " Accessory flagellum well developed. Article 1 of primary flagellum on antenna 1 formed of fused basal articles, elongate. Article 5 of peduncle on antenna 2 very short. At least one palp of maxilla 1 bent or claviform. Gnathopods feeble. Article 4 of pereopods 3-4 greatly elongate relative to article 5. (J. L. Barnard and Karaman 1991)

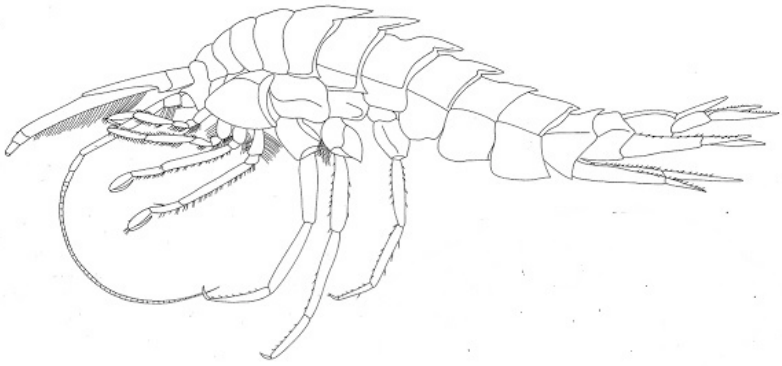
The family consists of only two genera, both represented in the NEP. A key to separate the two is provided by J. L. Barnard and Karaman (1991, pg. 373). Inclusion of this family within the lysianassoids remains controversial, and is contraindicated by some phylogenetic analyses (i.e. Berge, Boxshall and Vader 2000).



*Hyperiopsis voringi*, type of the genus (from J. L. Barnard and Karaman 1991)

**Hyperiopsis –** A small genus of seven described species (J.L. Barnard and Karaman 1991), none of which are known from the NEP. There are, however, records of several different taxa in the region which remain provisional. Hendrycks and Conlan (2003) record a species of *Hyperiopsis* from off Point Conception at 3450m. The specimen was immature. They noted it was similar to, but differed from, *Hyperiopsis laticarpa* from the Western Pacific. Since the single specimen was too immature to sex they declined to describe the material. Their *H. sp*. record does not reflect the same animal as the second regional provisional, *Hyperiopsis sp CS1* from 1372m off Oregon. The later species is strongly characterized by a long rostrum, unusual in the genus.

Diagnosis: "*Peduncular article 2 of .antenna 1 unproduced. Labium with alate mandibular lobes greatly extended. Coxae 1-4 subequal in size, generally similar, weakly rounded below, none hidden. Article 4 of pereopods 3-4 broadly expanded; article 2 of pereopods 5-7 rectolinear*." (from J. L. Barnard & Karaman 1991)



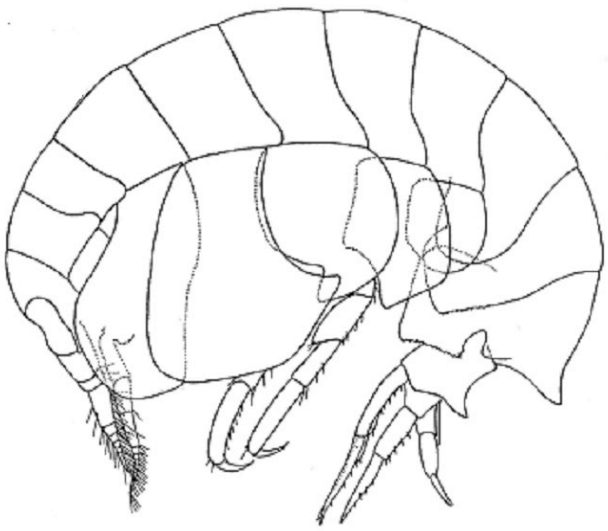
*Parargissa galatheae* (from J. L. Barnard and Karaman 1991)

**Parargissa** – The genus contains 6 species, most described from the Western Pacific (J. L. Barnard and Karaman 1991). A single species is reported from the NEP, *P. americana*. We treat it here as a full species, although it is often only accorded subspecific status as *P. galatheae americana* (i.e. J. L. Barnard and Karaman 1991). The animal is known only from the initial collection at 3750m between Acapulco and

Panama. The unique female holotype is rather large at 42mm. J. L. Barnard (1961) illustrates the differences between this and the closely related *P. galatheae.*

Diagnosis: "*Peduncular article 2 of antenna 1 with apical process. Labium ordinary, mandibular lobes not greatly extended. Coxae 1-3 small and mostly hidden by large coxa 4. Article 4 of pereopods 3-4 narrow; article 2 of pereopods 5-7 expanded, shape on 7 distinct from 5-6*." (from J. L. Barnard & Karaman 1991)

**Family Lepidepecreellidae -** Diagnostic description**. "*Head*** exposed, **much deeper than long, not extending much below insertion of antenna 2**, without cheek notch. *Antennae* calceoli absent in male and female. *Antenna 1* callynophore present in male and female. *Antenna 2* peduncular article 3 without distal hook. ***Epistome and upper lip*** **fused**, **with proximal portion produced into large triangular keel**. *Mouthpart bundle* subquadrate or subconical. ***Mandible*** **incisors well developed**, symmetrical, left and right straight, smooth; right lacinia mobilis absent; accessory setal row with 5 or less robust setae, without distal setal tuft; molar vestigial or small, flap-like, weakly setose to asetose; palp present, inserted approximately midanteriorly. ***Maxilla 1*** inner plate without apical pappose setae; **outer plate with** (10–11) **setal-teeth in 7/4 arrangement**, setal-teeth large, setal-tooth 6 slender, setal-tooth 7 slender, setal-tooth 7 contiguous with setal-tooth 6; palp large, 1- or 2-articulate, without apical robust setae. ***Maxilla 2*** **inner plate subequal to or slightly shorter than outer plate**, without oblique row of facial setae. *Maxilliped* coxa and basis normal; outer plate present, medial setae vestigial or absent, without apical setae; palp 4-articulate, article 4 well developed.
*Uropod 2* inner ramus without constriction. ***Uropod 3*** **uniramous**. *Telson* entire.
***Gnathopod 1*** simple; coxa vestigial; ischium long (length 3–3.6 x breadth); merus and carpus not rotated; carpus elongate; propodus linear, elongate; **dactylus filiform**, rarely not so. *Gnathopod 2* coxa vestigial; propodus with palmate setae; dactylus minute. *Pereopods* all simple; distal spurs absent. *Pereopod 3* coxa large. *Pereopod 4* coxa with well-developed posteroventral lobe. *Pereopod 5* coxa posterior lobe much deeper than anterior lobe. *Pereopod 6* coxa posterior lobe much deeper than anterior lobe." (from Stoddart & Lowry 2010b)



*Lepidepecreela charno* (from J. L. Barnard 1966)

**Lepidepecreela –** The single NEP representative of the eleven member genus, *L. charno*, is probably a bathypelagic species. It was taken at 1895m in the San Clemente Basin; the female holotype remaining unique. J. L. Barnard (1966b, Figure 17) provides good illustrations, and also a key to the genus as known at the time. At least one member of this genus is associated with an echinoid (Berge *et al.* 2004). There is nothing to suggest such an association for the local taxon, although several echinoids occur in abundance at the depth from which it was recovered.

Diagnosis: as for the family

**Family Lysianassidae -** Diagnosis**:** "*Head: exposed, concealed or partially concealed; as long as deep, longer than deep or deeper than long. Antennae: calceoli present or absent. Epistome and upper lip: separate or fused. Mandible: incisor smooth; lacinia mobilis present on left side only or absent; accessory setal row without distal setal tuft; molar present or absent, if present vestigial, small or medium size, setose with reduced triturating patch, fully setose, or a smooth nonsetose flap. Maxilla 1: inner plate weakly setose (6 or less) or without setae; outer plate narrow, with 11 setal-teeth in 6/5 or modified 6/5 arrangement; palp small or large, 1- or 2-articulate, with or without terminal robust setae. Maxilliped: without apical robust setae. Coxae 1 to 4 longer than broad, overlapping; coxa 1 fully developed or slightly reduced. Gnathopod 1: simple, occasionally weakly subchelate or parachelate. Pereopods simple. Telson usually entire, occasionally deeply moderately or weakly cleft or notched.*" (from Lowry and Stoddart 1997)

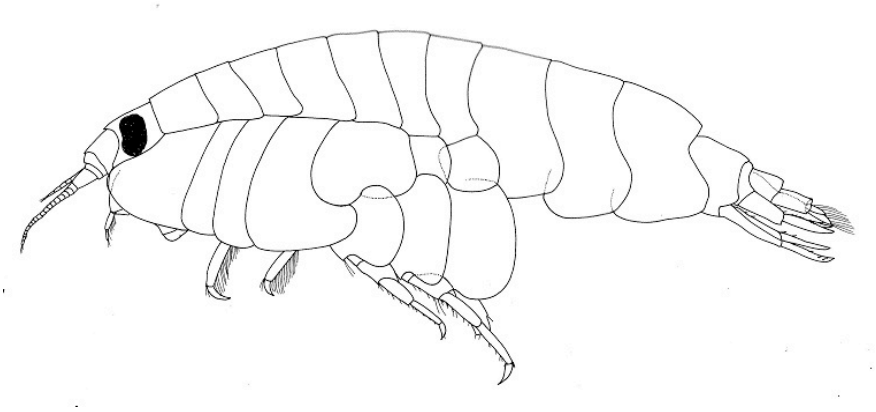
Within this family various authors have reached different conclusions regarding synonymy and validity at generic and subgeneric levels. This is particularly true in the cluster of genera including *Orchomene*, *Orchomenella*, *Orchomenopsi*s, *Allogaussia*, and *Abyssorchomene*. Discussion of these issues will be provided under the genus *Orchomene* below. The best supported case appears to be that developed by De Broyer in a long series of papers dealing with *Orchomene* and related forms in the southern ocean. In general his conclusions will be followed here. Similar problems have persisted regarding the cluster of *Aruga*, *Lysianopsis*, and *Shoemakerella*. These genera were synonymized in Hurley (1963) following the suggestions of some earlier workers. Since then they have been treated as valid genera by Lowry and Stoddart (1997), and are so treated here. These two histories exemplify the trend of lysianassid taxonomy, with the recognition of increasingly small features as forming valid generic boundaries in convergent clusters of species. In particular, the separation of species typified by either the 7/4 or 6/5 terminal spine-seta arrangements on the maxilla 1 outer plate has helped recognition of evolutionary trajectories within the group. [The usage of spine formulae and the various arrangements are detailed in Lowry and Stoddart 1992]

These spine formulae are among the characters used to divide the family into Lysianassidae s.s. and Tryphosinae by Lowry and Stoddart (1997). They later chose to create a third subfamily, the Conicostomatinae, for those taxa having a conical mouthpart bundle but lacking specialized 7/4 spine configuration on the maxilla. Along with the recognition that Hurley's subfamily Uristidinae should be elevated to full familial status, this division redrew the concept of Lysianassidae in the broad sense. The gradual removal of it's former members into newly created family level groups finalized the progression from a generalized Lysianassidae to one characterized by a series of generic

clusters, and eventually a restricted and sub-divided Lysianassidae plus many smaller family, and family level groups not yet formally named.

[**Aristiopsis]** – A single member of this genus has been reported from the NEP, taken on the Baja Abyssal Plain (J. L. Barnard 1967). This is a very significant range extension from the Tasman Sea where the holotype of *Aristiopsis tacita* was taken (J. L. Barnard 1961). The animal has not been seen since, although the distance between the two captures suggests that it is widespread if not common. The genus differs from *Aristias* in the nature of the mandibular molar, the attachment of the mandibular palp, and the condition of the inner lobes of maxilla 1 (J. L. Barnard 1961). The genus is sometimes placed in the family Aristiidae, but lacks the family level synapomorphy of distal pereopodal spurs. Further revision of tryphosine lysianassids by Lowry and Kilgallen (2014) reassigned *A. tacida* to *Pseudonesimus* as *P. tacitus*. They treat *Aristiopsis* as a junior synonym of *Pseudonesimus*.

**Aruga –** The genus is small, containing only three species (J. L. Barnard and Karaman 1991). Subsequently *Aruga subantarctica* was removed to the genus *Lysianopsis* (Lowry and Stoddart 1997) leaving only the two species from the NEP in the genus. These two, *Aruga holmesi* and *A. oculata* both occur in shallow waters within the SCB, and both are reported by local monitoring agencies. They can easily be distinguished by the condition of the third epimeron, which is convexly rounded in *A. holmesi*, and truncated subquadrate in *A. oculata*. Holmes (1908) and J. L. Barnard (1955) should be consulted for the original descriptions. The latter also presents the possibility that *Nannonyx dissimilis* of Stout might be an *Aruga*, a placement later rejected in favor of formation of a new genus to receive it (J. L. Barnard and Karaman 1991).



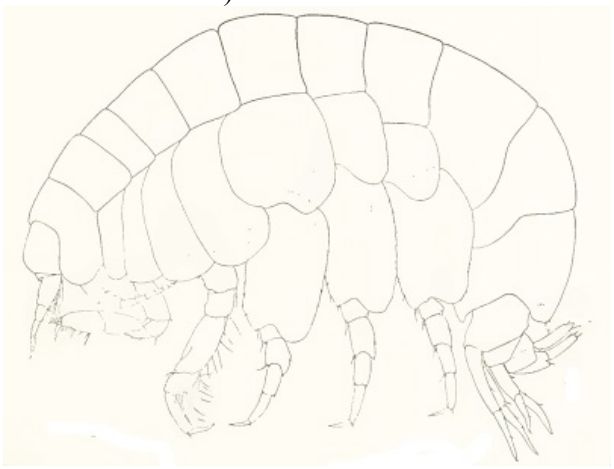
*Aruga holmesi* (from Lowry and Stoddart 1997)

Hurley (1963, pp. 67-73) considered *Aruga*, along with the genus *Shoemakerella*, to be synonyms of the genus *Lysianopsis*. Some workers accepted his arguments, but in recent years *Aruga* has been viewed as valid, as has *Shoemakerella* (see Lowry and Stoddart 1997). Generic boundaries within the lysianassids are subject to frequent and heated debate, with a series of different views on the validity or invalidity of genera. We follow the revisionary treatments of Lowry and Stoddart here, accepting *Aruga* as valid and separable from other related genera within the family Lysianassidae.

Despite the prevalence of cognate species pairs in the tropical west Atlantic and east Pacific now separated by the closure of the Isthmus of Panama, *Aruga holmesi* is found across the barrier. It was reported as widely distributed on the Florida Middle

Ground by Lowry and Stoddart (1997), and is even more broadly distributed in the eastern Pacific. Why this animal has not evolved into two distinct cognates since the closure of the land bridge as so many others have (i.e. cognate pairs in *Ensayara*, *Rimakoroga*, and *Dissiminassa*) remains an unanswered question.

Diagnosis: *"Antenna 1: with strong 2-field callynophore in female and male. Antenna 2 in male: peduncular article 4 enlarged, longer than broad; flagellum elongate. Epistome: not produced; upper lip: produced. Mandible: with protuberance on midposterior margin; lacinia mobilis a long slender peg; molar setose with vestigial distal triturating surface. Maxilla 1: outer plate, left and right ST7 symmetrical or weakly asymmetrical, STA-STD medially cuspidate; palp apically serrate. Gnathopod 1: simple, not sexually dimorphic. Peraeopods 3 and 4 in male: merus and carpus with plumose setae along posterior margin. Uropod 3: peduncle elongate, usually without lateral flange; male peduncle and rami with plumose setae; outer ramus 2-articulate. Telson: entire*." (from Lowry & Stoddart 1997)

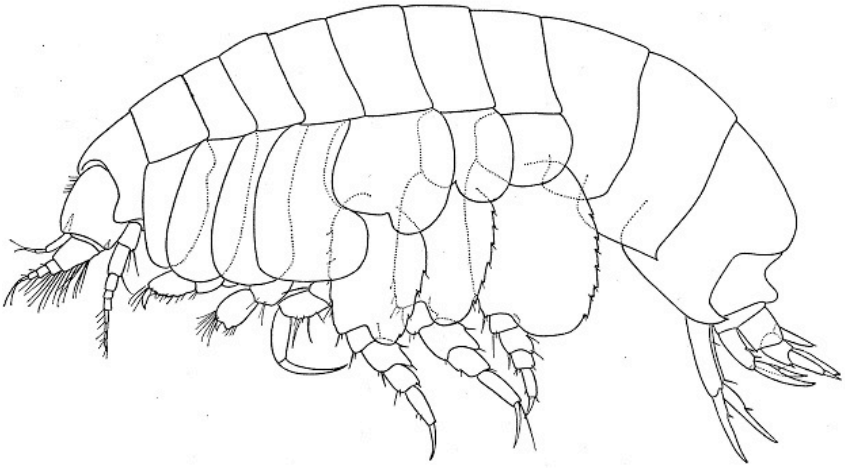


*Cedrosella perspinis* (from J. L. Barnard 1967)

**Cedrosella –** Originally described as *Ambasiopsis fomes* by J. L. Barnard 1967 ("the generic assignment of the species is uncertain" loc. cit. pg. 50), this species was transferred to the newly created *Cedrosella* by J. L. Barnard and Karaman (1987). *C. fomes* was taken on the Baja Abyssal Plain, and is known only from the small, unique male holotype. J. L. Barnard and Karaman (1991) contrast its characters with those of other similar lysianassoids. Lowry & Kilgallen (2014b) recently transferred *Uristes perspinis* to this genus. The two NEP representatives can easily be distinguished by the condition of the 3rd epimeron, subquadrate in *C. fomes*, and strongly produced into a broad tooth in *C. perspinis*. A third species, from Australia, was added by Lowry and Kilgallen (2014a)

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome differentially produced, not prominent, separate, labrum slightly dominant in size and projection, blunt. Incisor ordinary, molar weakly triturative, large, also setulose, palp attached opposite molar. Inner plate of maxilla 1 weakly (2) setose; palp biarticulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxa 1 strongly shortened and partly covered by coxa 2, tapering. Gnathopod 1 short, strongly subchelate, palm transverse, article 5 shorter than 6, dactyl large; article 6 of gnathopod 2 much shorter than article 5, ordinary, propodus*

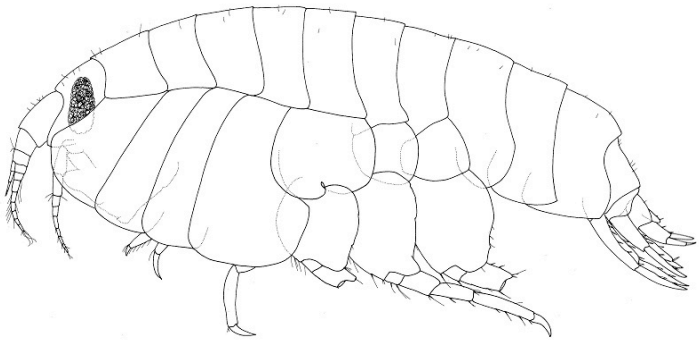
*minutely chelate. Inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle ordinary, inner ramus slightly shortened, outer ramus 2-articulate. Telson ordinary, short, deeply cleft*." (from J. L. Barnard & Karaman 1987)



*Centromedon pavor* (from J. L. Barnard 1966)

**Centromedon –** A northern hemisphere boreo-arctic genus of five species (J. L. Barnard and Karaman 1991), with species submerging at increasing distance from the pole. A single species is known from the sub-arctic NEP, *Centromedon pavor*, described initially from 84m in Monterey Bay. It is now known from central California to central Oregon, and from depths of 84-200m. Despite its relatively shallow occurrence, the species lacks eyes. Only three specimens are mentioned in the literature; the holotype and a paratype from Monterey, and a small male from off Oregon. Both the illustrations of the original description (J. L. Barnard 1966a) and the later description (J. L. Barnard 1971) should be consulted to confirm identification.

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome differentially produced, prominent, separate, labrum strongly dominant in projection, blunt. Incisor ordinary, molar simple, large, subconical, setulose; palp attached opposite molar. Inner plate of maxilla 1 weakly (2) setose; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl small, vestigial. Coxa 1 slightly shortened and partly covered by coxa 2, tapering. Gnathopod 1 short, nearly simple, palm oblique, articles 5 and 6 subequal, dactyl large, article 6 of gnathopod 2 greatly shorter than article 5, both elongate, propodus minutely subchelate, article 7 short Inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle ordinary, inner ramus slightly shortened, outer ramus 2-articulate. Telson elongate, deeply cleft."* (from J. L. Barnard & Karaman 1991)



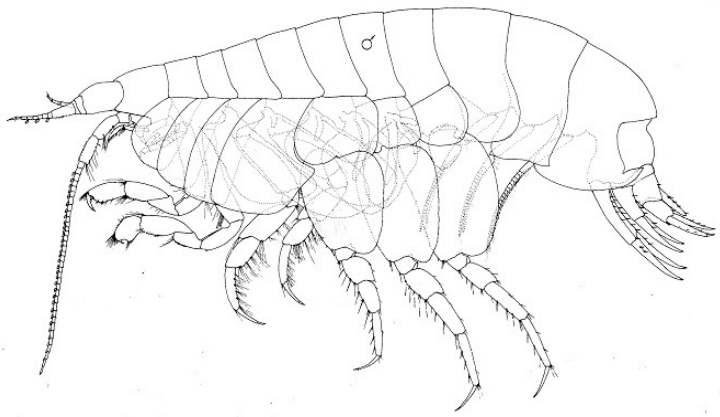
*Dissiminassa homosassa* from Florida (from Lowry & Stoddart 1997)

**Dissiminassa –** The genus was created by J. L. Barnard and Karaman (1991) to house *Nannonyx dissimilis* Stout 1913. A second species has been described from Florida by Lowry and Stoddart (1997), *D. homosassa*. These are the only two species known for the genus.

It appears to be closely related to *Aruga* (Lowry and Stoddart 1997). Shoemaker (1942) and J. L. Barnard (1969a) both provided good redescriptions and illustrations of *D. dissimilis*, and are probably better sources for information than the original description. J. L. Barnard also provided a key to separate the species of *Lysianassa* from California (loc. cit. pg. 186). These species are now allocated to the genera *Aruga*, *Dissiminassa*, and *Macronassa*, but the key still functions well and might be used for separation of these related forms. Known primarily from intertidal and fouling occurrences in California, members of the genus occur to 73m depths in both the eastern Pacific and western Atlantic.

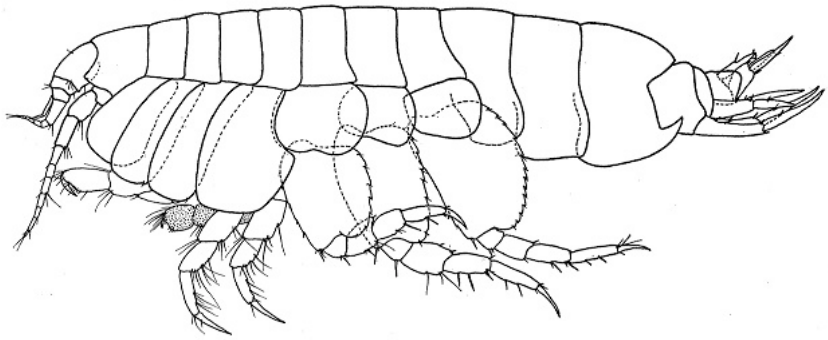
Diagnosis: *"Antenna 1 : callynophore weakly developed in female, well developed in male. Antenna 2 in male: peduncular article 4 enlarged, longer than broad, flagellum elongate. Epistome and upper lip: produced. Mandible: without protuberance on midposterior margin; molar a small smooth flap with finely setose margins; lacinia mobilis a long slender peg. Maxilla 1 : outer plate, left and right ST7 slightly asymmetrical, STA to STD apically bifurcate; palp apically serrate. Gnathopod 1 simple, not sexually dimorphic. Peraeopods 3-4 in male: merus and carpus with plumose setae along posterior margin. Uropod 3: peduncle elongate, without a lateral flange; male peduncle and rami with plumose setae. Telson: entire*." (from Lowry & Stoddart 1997)

**Hippomedon –** One of the earlier lysianassoid genera, many species originally described as *Hippomedon* have been later removed to other genera. The concept of the genus was revised and (hopefully) refined by Jarrett and Bousfield in 1982. J. L. Barnard and Karaman (1991) seem to have accepted their redefinition of the genus. They list 49 species in the genus, with another 6 species described by 2004 (Vader 2004). The genus is known worldwide in cool or cold waters, and from the intertidal to abyssal plains. In the NEP there are records of 12 species assigned to *Hippomedon*. Two of these taxa are provisionals from off Oregon erected by Dickinson, for which we have no information. A third species, *H. keldyshi* was described from deep water in the NEP, from areas of hydrothermal venting.



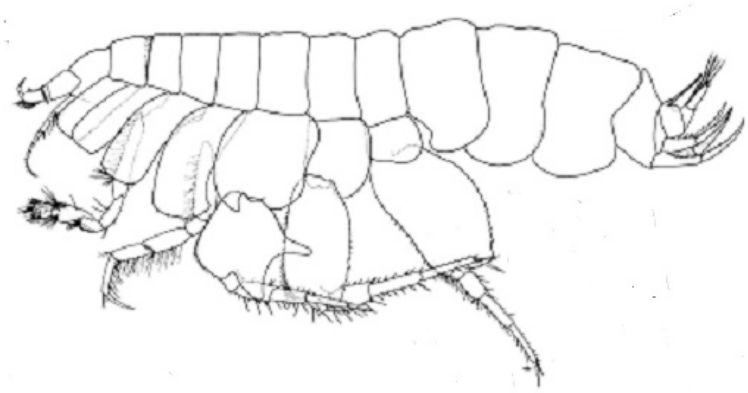
*Hippomedon columbianus* (from Jarrett & Bousfield 1982)

These three species are not covered in the key to the genus constructed for SCAMIT by Doug Diener when his *H. sp A* was introduced. While this key remains useful (and recommended for use) it includes a number of forms which are only known from the Arctic or the NW Pacific. *H. granulosus*, described from the NW Pacific, is included in the key, but the only local reports are those of Dickinson 1976 from the San Diego Trough. His material is not accessible to verify this record, which remains dubious. When using the key please keep in mind that not all of the included species occur in our study area. If you arrive at an ID of one of these species, please carefully consult the description of the animal prior to accepting it. We already have far too many



*Hippomedon tenax* (from J. L. Barnard 1966)

spurious records of taxa which do not occur in our area (such as *H. denticulatus*) based on confusion introduced by previous misidentifications and misinterpretations in the literature (see for example the discussion of *Hippomedon* species in J. L. Barnard 1971). While the Dickinson species must remain unkeyed, *H. keldyshi* would key out to *H. propinquus* in the Diener key. Since *H. propinquus* is not currently known from validly identified NEP specimens, animals that key here may be presumed to be *H. keldyshi* and validated by checking against the illustrations of the species in Vinogradov (1994).



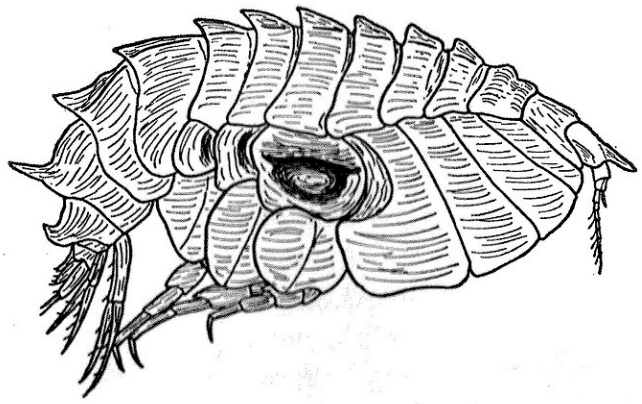
*Lepidepecreoides nubifer* (from J. L. Barnard 1971)

**Lepidepecreoides –** A small genus, consisting of four species (Lowry and Stoddart 2002b). Only *L. nubifer* is known from the NEP. Although at one time also reported from the Cape Basin off South Africa (Griffiths 1977), this animal has been subsequently described as a new species (Lowry and Stoddart 2002b), and *L. nubifer* remains endemic off Oregon. Our species is immediately recognizable from among other NEP lysianassoids by the combination of the fingerlike crest on the first urosomite and the narrow process on the hind margin of the basis lobe of P5. The species is well described by J. L. Barnard (1971).

Diagnosis: "*Antenna 1 accessory flagellum 2-articulate, terminal article small, offset. Antenna 2 peduncular article 3 short. Gnathopod 1 carpus long (length 2 to 3.9 × breadth). Pereopod 4 coxa with a weak posteroventral lobe (posterior margin concave). Pereopod 5 basis, posterior margin with mid-central spine*." (from Lowry & Stoddart 2002)

**Lepidepecreum –** A large genus, with 37 described species worldwide (Lowry and Stoddart 2002b). Eight described and five provisional species in the genus are reported from the NEP, but four of the provisionals are moot due to lack of specimens or description (*L.* sp. a and sp 1of Dickinson 1976; and L. sp 1 and 2 of Thomas in Blake et al 1991). There are, then, nine species level *Lepidepecreum* taxa in the NEP which can be discriminated. The biology of these animals remains unknown (Lowry and Stoddart 2002b), but most species are from the Continental Shelf and slope. *L. californiensis* forms an exception, being taken at 2779m in association with hydrothermal activity, but not with active venting (Vinogradov 1994). One of Dickinson's provisionals and both of Thomas' are also from abyssal depths. Species can usually be distinguished by the shapes and patterns of teeth or dorsal cusps on the pereonites, pleonites, and urosomites. Five species are known from shelf and slope depths in the SCB, a sixth from the Central California slope, and a seventh from the Central California slope apron or near-shore abyssal zone. The species known as *Lepidepecreum sp A* in early SCAMIT lists and discussions was described as *L. serraculum* by Dalkey (1998).

No key to the members of the genus in the NEP is available except those of Gurjanova (1962) and Hurley (1963), neither of which is comprehensive. An attempt is made below to provide a comprehensive key to the known described and provisional species which occur in the NEP. The two provisionals of Dickinson 1976 are undefined, as are the two of Thomas, and could not be included in the key.



*Lepidepecreum garthi* (from Hurley 1963)

Key to the known ***Lepidepecreum*** from the NEP – dcadien 19 June 2014

1a. No dorsal carination or dentition on posterior margin of any pleonal or pereonal somite.....*magdalenensis*
1b. Dorsum not smooth, bearing carina or posterodorsal teeth on some or all pleonal or pereonal segments.....2
2a. Third pleonal segment with prominent tooth or process distodorsally.....4
2b. Third pleonal segment lacking prominent tooth or process, bearing at most a low rounded knob distodorsally.....3
3a. Urosomite 1 with dorsal process bluntly truncate.....*serraculum*
3b. Urosomite 1 with dorsal process posteriorly upswept and acuminate..... .....*gurjanovae*
4a. No pereonites dorsally carinate or dentate……..…5
4b Some pereonites dorsally carinate and/or dentate.....6
5a Weak posterodorsal tooth on pleonite 2, strong posteriorly directed tooth on pleonite 3, urosome without dorsal ornament……..*kasatka*
5b Sharp posterodorsal tooth on pleonite 2, strong upswept tooth on pleonite 3, urosome 1 with low rounded boss, urosome 2 with sharp retrorse cusp, urosome 3 w/o dorsal ornament, epimeron 3 with ventral tooth…..sp LA1
6a. Pereonites 4-7 bearing a low carina for at least some of their length, dorsal processes or posterodorsal teeth lacking.....*eoum*
6b. Some pereonites bearing posterodistal teeth..... .....7
7a. Posterodistal teeth on only pereonites 5-7, pleon and urosomite 1..... .....*californiensis*
7b. Posterodistal teeth and/or processes beginning at pleonal segment 2-4.....8
8a. Posterodistal ornament beginning at pereonite 4; head bearing double carina anteriorly, separated by furrow; coxa 5 lacking lateral plate-like boss .....*comatum*
8b. Posterodistal ornament beginning at pereonite 2 or 3; head lacking double carina; coxa 5 bearing lateral plate-like boss.....*garthi*

Diagnosis: "*Body expanded to form a lateral bulge (not known for all species). Antenna 2 peduncular article 3 elongate. Mandible molar columnar (sometimes reduced) oval, fully triturating. Gnathopod 1 coxa large, about as long as coxa 2 (more than 0.7 ×); carpus long (length 2 to 3.9 × breadth). Uropod 3 outer ramus 2-articulate*." (from Lowry & Stoddart 2002)

**Macronassa –** Like *Aruga*, *Macronassa* consists solely of two species from the NEP, *M. macromerus* and *M. pariter*. Both are predominantly intertidal, but range into the shallow shelf. They are associated with invertebrate turfs, or with mussel beds, algae or other complex habitats. J. L. Barnard and Karaman (1991) described the genus, and differentiate it from other related forms. The two species are described and characters which allow their separation are presented in J. L. Barnard (1969a), where both are called *Lysianassa*.

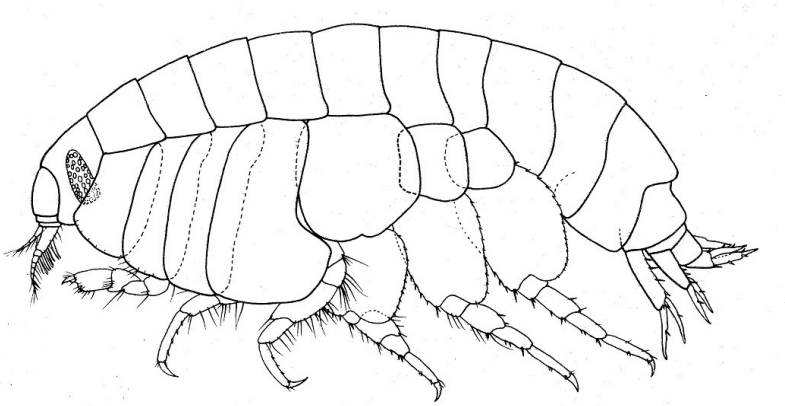
Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome both produced, prominent, separate, blunt. Incisor ordinary, molar simple, conicolaminate, subconical, setulose; palp attached strongly proximal to molar. Inner plate of maxilla 1 weakly setose; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxa 1 large and visible, not tapering. Gnathopod 1 short, simple, articles 5 and 6 subequal, dactyl large; article 6 gnathopod 2 greatly shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 with large notch. Uropod 3 short, peduncle expanded, inner ramus not or slightly shortened, outer ramus 1- articulate. Telson ordinary, entire*." (from J. L. Barnard & Karaman 1991)

*Ocosingo borlus* (from J. L. Barnard & Karaman 1991)

**Ocosingo –** A single species is known from the NEP, and a second species from New Zealand (Lowry and Stoddart 1984). *Ocosingo borlus* was described by J. L. Barnard (1963a) from shallow water off northern Baja California and San Diego, California. He later refound it in intertidal samples from central California (J. L. Barnard 1969a). In the latter publication he described a new genus and species, *Fresnillo fimbriatus*, which he noted was quite similar to *Ocosingo* in many respects. Lowry and Stoddart (1983), in establishing the conicostomatid group, reviewed the existing genera. They synonymized the two genera, suggesting that *Fresnillo* was based on the secondary male form of *Ocosingo borlus*. This paralleled the morphology of secondary males seen

in other genera within the group. They covered the sexual morphology of these animals again in a later publication (Lowry and Stoddart 1986) which reported on protandrous hermaphroditism in the lysianassoids. This was revisited (Lowry and Stoddart 1997) in their description of the genus *Eclecticus*. Good descriptions of *O. borlus* are presented in J. L. Barnard (1963a, 1969a), which should be consulted for identification.

Diagnosis: **"***Head* completely concealed by pereonite 1 and coxa 1. *Maxilla 1* palp article 1 slender, tapering distally. *Maxilliped* basis (inner plate) not greatly enlarged; outer plate distomedial margin smooth or smooth, forming a hardened, serrate incisor-like margin or serrate. *Body* pereon with or without dorsal projections, pleon with strong dorsal projections. *Uropod 3* without rami. *Telson* laminar." (from Lowry & Stoddart 2012b)



*Orchomene anaquelus* (from J. L. Barnard 1964)

**Orchomene –** At least one of the forms listed as from the Pacific by McLaughlin et al, *Orchomene nugax*, is only known from the Bering Sea above the Aleutian chain, and is outside the coverage area of this review. Before considering the genus further, it might be wise to visit the results of the study of intraspecific variation in *Orchomene limodes* performed by Meador and Present (1985). Studies of this type are too rarely allowed by the collected material. Situations where the will to perform tiring and repeated analysis of numerous individuals exist are even less common. The above authors examined the variability of 35 different characters, and found no variation in the following: shape of lateral lobe of the head, shape of the epistome, ornamentation of posterior margin of third pleonal epimeron, shape of posterodistal corner of third pleonal epimeron, orientation of tip of dactyl to edge of palm in gnathopod 1, location of insertion of mandibular palp, extension of posteroventral lobe of article 1 of pereopod 6 relative to anterior lobe, number of spines or teeth on apex of maxilliped outer plate, number of spines on medial surface of maxilliped outer plate. These characters might be fruitfully examined in other members of the genus, with the implicit and unproven assumption that the pattern of variability will differ little among congeners.

The genus has been a source of confusion for some time. J. L. Barnard has alternatively combined and separated the genus from the similar genera *Orchomenella* and *Orchomenopsis* (see for instance his discussion of these groups in 1964a). De Broyer is involved in a long term analysis of the genus, and has separated *Orchomene* sensu J. L. Barnard 1969b into four genera: *Orchomene* s.s., *Orchomenella*, *Allogaussia*, and *Abyssorchomene* (De Broyer 1985a, b). His results have had a degree of acceptance, but

some have reached other conclusions. Oleröd (1975), for instance, agrees with the retention of *Orchomene* and *Orchomenella* as valid genera, but also finds evidence in mouthpart structure for retention of *Orchomenopsis* as a separate genus rather than a subgenus as proposed by De Broyer. Both *Allogaussia* and *Abyssorchomene* have been treated as subgenera within *Orchomene* by some subsequent authors, and this is in part reflected in the placement of species by McLaughlin *et al.* (2005).

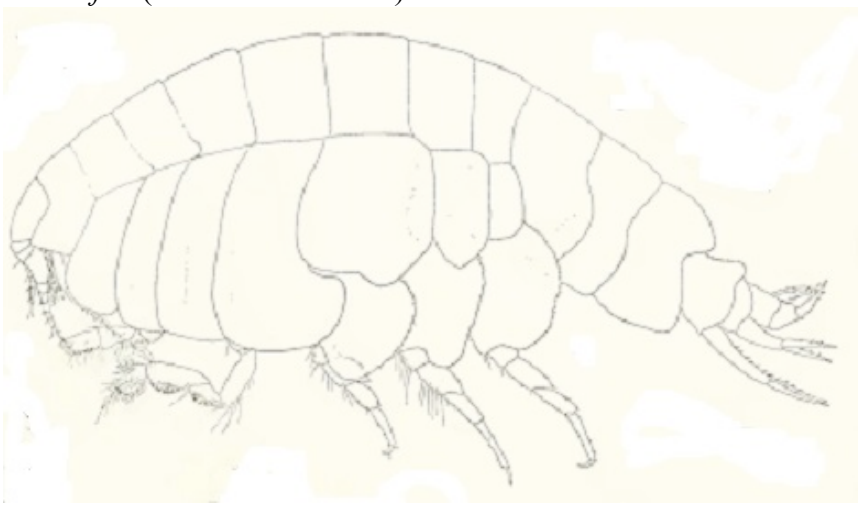
J. L. Barnard and Karaman (1991) opted to treat *Orchomene* as a "supergenus" and include within it those species placed in *Orchomenella*, *Orchomenopsis*, *Allogaussia*, *Orchomenyx*, and *Abyssorchomene*. This amalgamation produced a huge genus of 85 taxa. They did offer some preliminary guidelines for separation of the included taxa, which they viewed as either valid genera or valid subgenera of *Orchomenella*. They viewed *Orchomene*, *Orchomenella*, *Allogaussia*, and *Abyssorchomene* as valid taxa at the generic level, indicating acceptance of De Broyer's proposal. J.L. Barnard and Ingram (1990) offered almost the same take on the generic taxa in the *Orchomene* s. l. complex as did J. L. Barnard and Karaman (1991), with some interesting tweaks. Since the final adjustments to the monograph published in 1991 were made in 1986, the paper with Ingram provided a view of J. L. Barnard's evolving thinking on these issues. Virtually the same wording is used in describing the situation in the two papers, but the parenthetical entries in the synonymy were changed in some cases. Thus *Orchomene*, *Orchomenella*, *Orchomenopsis*, and *Abyssorchomene* are treated as valid subgenera of *Orchomene*, while *Allogaussia* was retained as a valid genus (J. L. Barnard and Ingram 1990, pg. 20). Why these changes in generic valuation were made is not clear from the content of the paper. The wording of his "summary of the sketchy details" separating the parts of *Orchomene* s. l. is identical in the 1990 and 1991 papers, with one exception – the substitution of "distinctions" for "details" in the paper with Ingram. Since the evidence remains precisely the same as discussed in J. L. Barnard and Karaman (1991) the rationale for the change is opaque. Without J. L. Barnard around to explain his thinking it seems unwise to accept the later changes (later although actually published earlier) embodied in J. L. Barnard and Ingram (1990), especially since De Broyer has shown no subsequent tendency to modify or question his cladistic results.

Consequently *Allogaussia* remains a valid genus, as do *Orchomene*, *Orchomenella*, and *Abyssorchomene*. The placement of *Allogaussia recondita* was discussed by De Broyer and Vader (1990). They made it clear that, while *Allogaussia* is a valid genus, it contains only three Antarctic species, and *A. recondita* belongs in *Orchomenella*.

J. L. Barnard (1964a) provides a key to the genus *Orchomene* as he viewed it at the time. This includes *Orchomene*, *Orchomenella*, and *Abyssorchomene* species as allocated here. Virtually all of the species known from the NEP are included in the key, exceptions being *Abyssorchomene distinctus* Birstein and Vinogradov 1960, *Orchomene gerulicorbis* Shulenberger and J. L. Barnard 1976, and *Orchomene limodes* Meador and Present 1985. As the key includes the world species it is a bit cumbersome, but workable. For routine use the pictorial key to the lysianassids taken in the San Diego program is very useful, and covers all of the taxa frequently encountered in the SCB within the *Orchomene*/*Orchomenella*/*Abyssorchomene* complex. The key will get you to species, but confirm generic allocation using the present document. Hirayama (1986) discusses

the genus in Japan, where he reports only five species, one (*Orchomene pinguis*, now placed in *Orchomenella*) also occurring in the NEP.

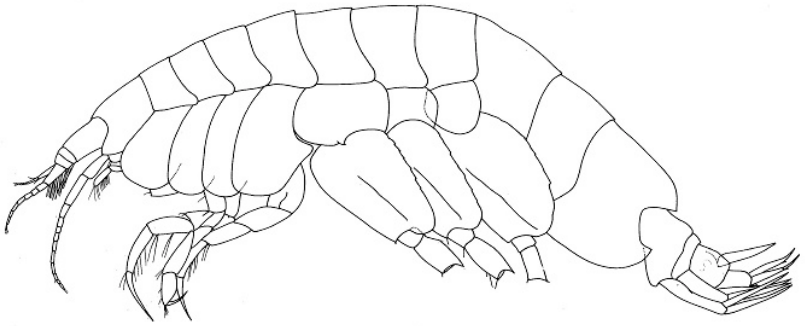
Diagnosis: "*Antenna 1 and 2 short in female; antenna 2 long and filiform in male. Epistome variable, usually broad and lobed; upper lip often prominent; mandible with molar weakly developed, palp attachment proximal to molar; maxilla 1 and 2 basic; maxilliped basic (Fig. 25b), outer plate broadly oval with distal margin crenulate, palp reaching beyond apex of outer plate. Gnathopod 1 subchelate, usually short and robust, propodus longer than carpus. Gnathopod 2 minutely chelate or subchelate. Uropod 3 outer ramus 2-articulate, setation often differing between sexes. Telson variable, entire or more or less cleft.*" (from Lincoln 1979)



*Orchomenella tabasco* (from J. L. Barnard 1967)

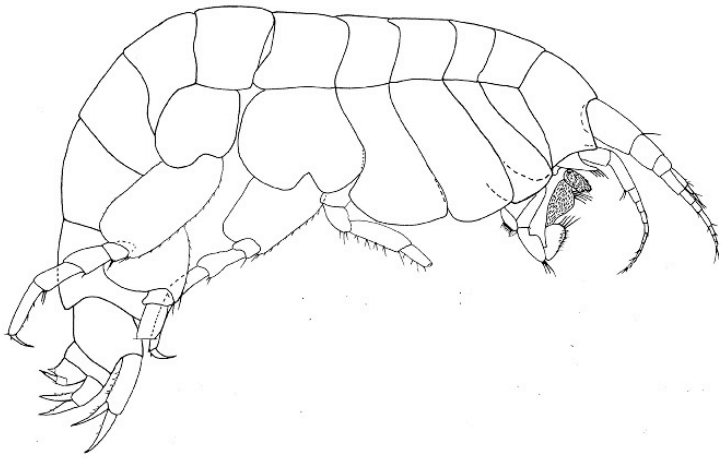
**Orchomenella –** [see also discussion above under the genus *Orchomene*]. De Broyer (1985a, b) presented a part of his cladistic analysis of the "Orchomene" s. l. group. Within this he indicated that *Orchomenella* consisted of four subgenera; *Orchomenella* s. s., *Orchomenopsis*, *Orchomenyx*, and an unnamed group to house the species *pacifica*, *magdalenensis*, and *tabasco*. Lowry and Stoddart (2002a) have since transferred *O. magdalenensis* to *Lepidepecreum*, but did not also explicitly transfer the other two species. Given the similarities between them, this is likely to happen in future, and the unnamed subgenus of *Orchomenella* should conveniently disappear. As with the species of *Orchomene*, *Orchomenella* can be keyed using J. L. Barnard (1964a, pg. 86-89). *Orchomenella tabasco* is not included there, but should be recognizable using the characters mentioned by J. L. Barnard in his discussion of the species (1967, pg. 68). The remaining NEP taxa now placed in *Orchomenella* are all represented in the key.

Diagnosis: "*Similar to Orchomene. Epistome not or not very lobate in front, not prominent. Mandibular molar large, subcylindrical, with oval ridged area, without setulose crest; palp attached submedially. Coxa 2 not distally expanded. Telson deeply cleft*." (from Diviacco & Ruffo 1982)



*Paracentromedon pacificus* from 1730m off Indonesia (from Lowry & Stoddart 1993)

**Paracentromedon -** The only record of the genus in the NEP is based on a provisional species erected by Dickinson in his thesis. The identity of this form is moot. J. L. Barnard and Karaman (1991) list 5 species in the genus, all from the Atlantic. If Dickinson's generic allocation of his provisional is accurate, the record from off Oregon would be a considerable broadening of the range of the genus. *Paracentromedon* differs from closely related genera by the length of article 3 of the mandibular palp and the cleft in the telson (see key to genera in Jarrett and Bousfield 1982).



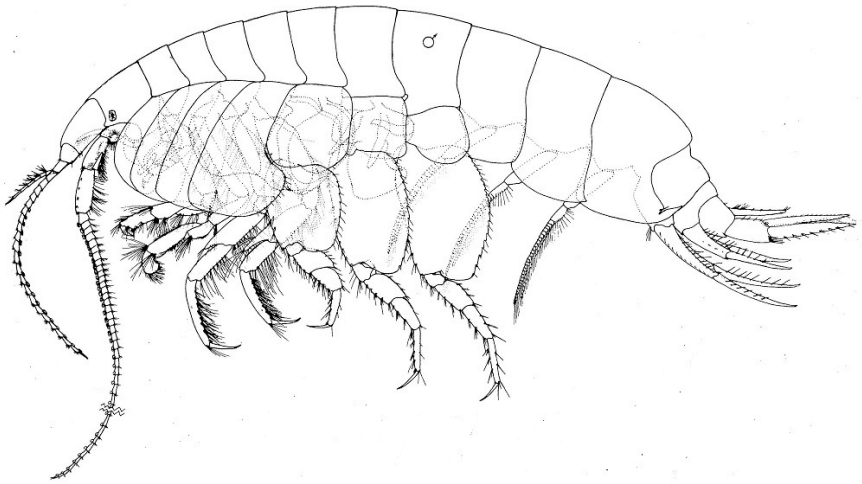
*Paronesimoides voightae* (from Larsen 2007)

**Paronesimoides** – A very small genus of apparently obligate associates with submerged wood. A species was just described from submerged oak blocks placed on the bottom in the Juan de Fuca Ridge vent system (Larsen 2007). This is the first record of the genus in the NEP, and only the second member of the genus described. The generotype, *P. lignivorus* was described by Pirlot (1933) from the Celebes Sea. Both live at lower bathyal or upper abyssal depths. The genus is in the subfamily Tryphosinae. It is not closely related to any other lysianassoids known from the NEP, and can be differentiated from other genera as indicated in the generic key.

Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome separate, neither dominant in size nor projection, blunt. Incisor ordinary, molar weakly triturative, small, almost conicolaminate; palp attached opposite molar. Inner plate of maxilla 1 weakly (2) setose; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxa 1 large*

*and visible, not tapering. Gnathopod 1 short, nearly simple, palm oblique, article 5 slightly shorter than 6, dactyl large and strongly overlapping obsolescent palm; article 6 of gnathopod 2 slightly shorter than article 5, ordinary, propodus minutely and weakly chelate. Inner ramus of uropod 2 without large notch. Uropod 3 ordinary, peduncle ordinary, inner ramus slightly shortened, outer ramus 2-articulate. Telson elongate, weakly or well cleft.*" ( from J. L. Barnard & Karaman 1991)

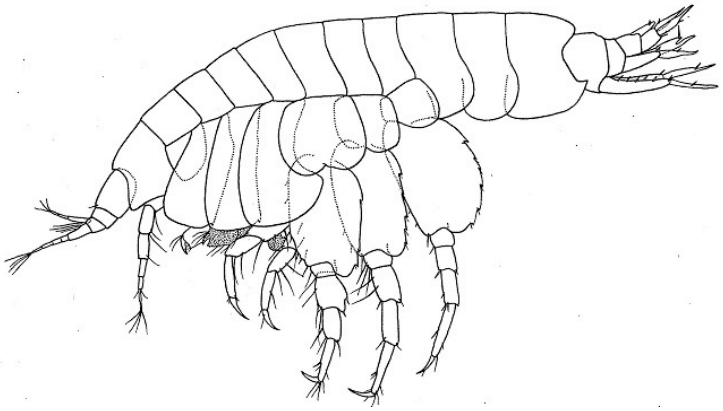
**Psammonyx –** The genus has been recently treated by Budnikova (2005) who described two new species. One of these bridged the small gap between *Psammonyx* and *Wecomedon*, forcing the collapse of that genus. The resulting *Psammonyx* now contains eleven species, of which only three are reported from the NEP. All three of these species are described and keyed by Jarrett and Bousfield (1982), who erected *Wecomedon*, and placed two of the species in their new genus. Both of these species are now placed in *Psammonyx*. Of the two *P. similis* is the more northern, distributed from the Bering Sea to British Columbia. *Psammonyx wecomus* overlaps the former in SE Alaska, and ranges south to Oregon. While the two species are quite similar, *P. similis* bears a much longer more slender tooth on the third epimeron, and other less visible differences. Both have a posteroventral tooth on the 3rd epimeron which lacks a defining notch. This is present in the similarly distributed *P. longimeris*, and allows its easy separation from the other two. All three look very much like species of *Hippomedon*, to which they are apparently closely related.



*Psammonyx longimerus* (from Jarrett & Bousfield 1982)

Diagnosis: "*Body slender, elongate. Eyes when present, small, subovate. Antenna 1 elongate; peduncular segment 1 long, cylindrical, slightly produced anterodistally, peduncular segments 2 and 3 not shortened; flagellum proximal segments not fused, accessory flagellum with several segments. Antenna 2 less than twice length of antenna 1. Antennae 1 and 2 calceolate (male); 1 and/or 2 not always calceolate (female). Mandible, molar strong; palp segment 1 usually with distal setae; segment 2 with mediodistal setae; segment 3 both margins setose. Maxilla 1, inner plate with 1 or 2 apical setae. Maxilla 2, inner plate slightly smaller than outer. Maxilliped, outer plate short, not extending beyond palp segment 2; palp stout. Gnathopod 1 subchelate, palm well defined, dactyl strong. Gnathopod 2 minutely chelate or subchelate. Peraeopods 3 and 4, segment 4 strongly produced anterodistally; segment 6 with 2 short spines*

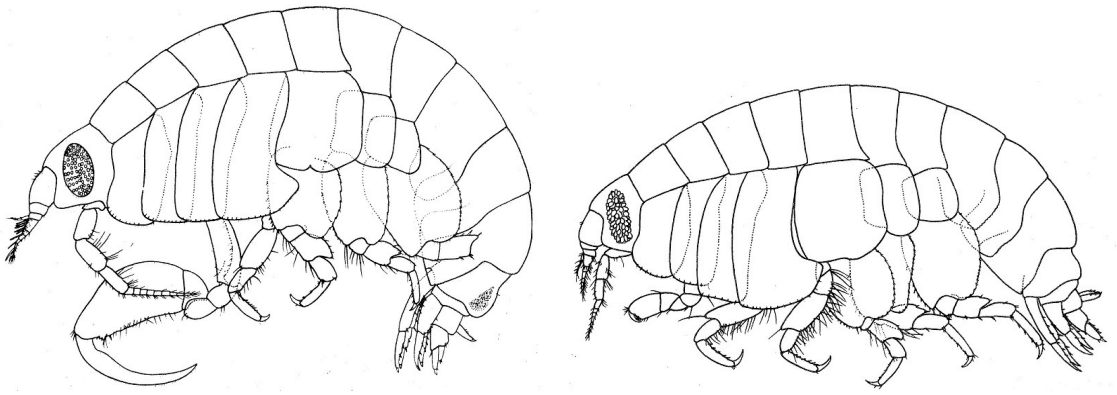
*posterodistally. Coxa 4, posterodistal margin notched. Peraeopod S much shorter than 6 and 7, coxa equal to or deeper than segment 2; segments 4 and S expanded. Peraeopod 7 longest, lacking coxal gill. Epimeral plate 3 with or without a posterodistal tooth. Uropod 3 large, rami extending well beyond uropods I and 2, rami marginally spinose, and plumose. Telson lobes elongate, fused basally, weakly tapered, apices subtruncate, each with 2-S spines*." (from Jarrett & Bousfield 1982)



*Pseudonesimus zopa* (from J. L. Barnard 1966)

**Pseudonesimus** – In their review of the tryphosine lysianassids Kilgallen and Lowry (2014) removed *Pseudonesimus* from the synonymy of *Schisturella* which had followed Barnard (1967). They also united *Pseudonesimus* and *Aristiopsis*, making the latter a junior synonym. In addition to Chevreux's type species, and Barnard's type species of *Aristiopsis*, they added several others removed from *Schisturella*, *P. cedrosiana*, *P. robustus* and *P. zopa*. All these are illustrated and described in their revision, but no key to the genus was provided. Except for *P. tacitus*, these can be differentiated using the characters in the *Schisturella* key provided by Barnard & Ingram (1990). It should be noted that the record of *P. robustus* from the NEP is questionable. It was listed as being taken at three sites in the San Diego Trough by Dickinson (1976). *S. cedrosiana* was recorded from 2 other sites in the same area. I suspect that the reports of *P. robustus*, which was described from the Tasman Sea, probably refer to *P. robustus cedrosiana*, later raised to full specific status, and are only a clerical error. However, *P. tacitus*, also described from the Tasman Sea, has been reported to occur in the NEP on the Baja Abyssal Plain (J. L. Barnard 1967).

Diagnostic description "*Antenna 1 flagellum article 1 lacking robust seta on distal margin; accessory flagellum forming cap. Antenna 2 flagellum articles 3–5 slender in female and (?) male, with weak brush setae on the anterior margin or brush setae absent. Mandibular incisor curved; molar with reduced column and convex triturating surface (button); palp attached midway. Maxilla 1 ST-7 serrate along the distomedial margin; ST-D slender, apically cuspidate. Maxilliped outer plate with apical robust setae. Gnathopod 1 subchelate; coxa vestigial; carpus subequal or slightly longer than propodus; propodus palm transverse, convex. Pereopod 4 coxa with well developed posteroventral lobe. Uropod 2 inner ramus constricted. Uropod 3 rami without plumose setae. Telson moderately to slightly cleft*." (from Kilgallen & Lowry 2014)



*Rimakoroga rima* male and female (from J. L. Barnard 1964)

**Rimakoroga –** Originally described as *Pseudokoroga rima* by J. L. Barnard (1964a) it was later transferred to a new genus *Rimakoroga* by J. L. Barnard and Karaman (1987). There is now a second species in the genus, *R. floridana* Lowry and Stoddart 1997. The two are closely related, if not cognates. They can be distinguished by the structure of the male G1. This genus has a considerable degree of sexual dimorphism in the gnathopods, which is visible in the illustrations above.

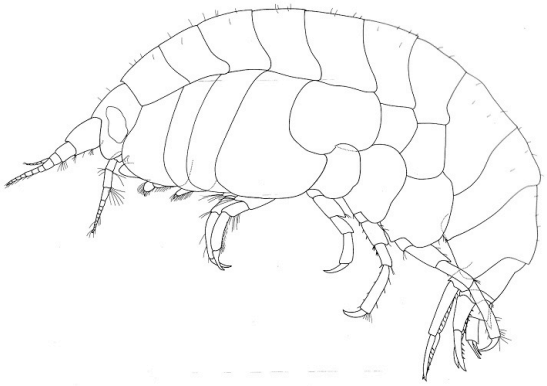
Diagnosis: "*Mouthparts forming quadrate bundle. Labrum and epistome prominent, separate, epistome slightly dominant in size and projection, blunt. Incisor ordinary, molar weakly triturative, of medium size, also setulose; palp attached strongly proximal to molar. Inner plate of maxilla 1 [?weakly (2) setose]; palp biarticulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxa 1 large and visible, not tapering. Gnathopod 1 in male strongly enlarged, strongly subchelate, palm transverse, article 5 much shorter than 6, lobate, dactyl large; article 6 of gnathopod 2 much shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle ordinary, inner ramus slightly shortened, outer ramus 2-articulate. Telson ordinary, weakly to deeply cleft."* (from J. L. Barnard & Karaman 1987)

**Schisturella –** The genus occurs world-wide, and had 12 species (J. L. Barnard and Ingram 1990), 9 of which were reported from the NEP. Those authors provide a key to species, including *Ventiella sulfuris*, a species that resembles *Schisturella* in most respects. We treat *S. cedrosensis* as a full species here, following McLaughlin et al (2005) rather than leaving it as a subspecies of *S. robusta* as do J. L. Barnard and Ingram. This was not followed by Larsen (2007) who retained it as a subspecies in his new key, which includes his newly described 13$^{th}$ species in the genus. With the removal of *Thrombasia* from the synonymy of *Schisturella* and its return to the Tryphosinae within the Lysianassidae by Lowry & Stoddart (2011) this number again stood at 12. Further revision by Kilgallen & Lowry (2014) removed several species to the revived genus *Pseudonesimus* (*abyssi*, *cedrosianus*, *robustus*, *zopa*) or to *Thrombasia* (*grabensis*), and synonymized *S. totorami* with *Thrombasia tracalero*.

The uristid ***Schisturella pulchra***, type species of the genus ***Schisturella***
(Photo by Zosia Joanna Legezynska)

Descriptions of the reported NEP species are located as follows: *abyssi* (J. L. Barnard 1967, but see also Chevreux 1926), *cedrosianus* (J. L. Barnard 1967), *cocula* (J. L. Barnard 1966), *dorotheae* (Hurley 1963 [as *Anonyx*]), *grabensis* (J. L. Barnard 1967), *hansgeorgi* (Larsen 2007), *spinirama* (Hendryckx and Conlan 2003), *totorami* (J. L. Barnard 1967), *zopa* (J. L. Barnard 1966).

Diagnostic description: "*Antenna 1 flagellum article 1 with robust seta on distal margin; accessory flagellum forming cap. Antenna 2 flagellum articles 3–5 slender, or article 4 slightly swollen in male; articles 4–5 with brush setae on the anterior margin. Mandible incisor curved; molar with reduced column and convex triturating surface (button); palp attached midway to distally. Maxilla 1 ST-7 serrate along distomedial margin; ST-D slender, serrate along distomedial margin. Maxilliped outer plate multiple apical robust setae present. Gnathopod 1 subchelate; coxa vestigial; carpus subequal to or longer than propodus; propodus palm acute, straight or slightly concave. Pereopod 4 coxa with well-developed posteroventral lobe. Uropod 2 inner ramus constricted. Uropod 3 rami with plumose setae in adult male, present or absent in adult female. Telson moderately to deeply cleft.*" (from Kilgallen & Lowry 2014)



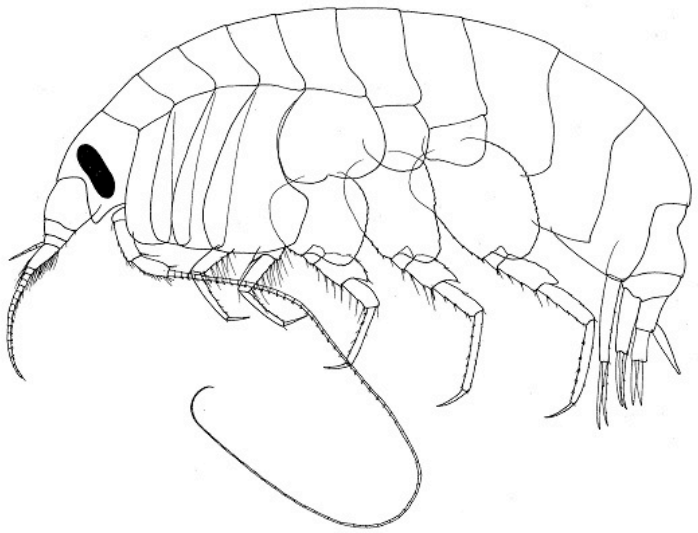
*Shoemakerella cubensis* (from Lowry & Stoddart 1989)

**Shoemakerella –** This small genus consists only of *S. lowryi* from Bermuda, and *S. cubensis*, a trans-isthmic species with populations in both the Caribbean/Gulf of Mexico, and in the Gulf of California/Baja California areas. The species appears to be rare in the western portion of its distribution. The genus is rather closely similar to *Aruga*, and was placed along with that genus in the synonymy of *Lysianopsis* Holmes 1905 by Hurley (1963, pg. 67). Barnard and Karaman (1991) and later Lowry and Stoddart (1997) consider all three valid and separable genera. All three occur in the Gulf of Mexico/Caribbean region, but only *Aruga* and *Shoemakerella* in the NEP. *Shoemakerella* differs from the two other very closely related genera in its broad inner plate of maxilla 2, and single article of the uropod 3 outer ramus.

Diagnosis: "*Antenna 1: callynophore absent in female, weak l-field in male. Antenna 2 in male: peduncular article 4 not enlarged, flagellum not elongate. Epistome not produced; upper lip produced. Mandible: without protuberance on midposterior margin; lacinia mobilis absent; molar a smooth flap with medial row of robust setae and finely setose margins. Maxilla 1: outer plate, left and right ST7 symmetrical, STA to STD apically bifurcate; palp apically serrate. Gnathopod 1 : simple, not sexually dimorphic. Peraeopods 3 and 4 in male: merus and carpus without plumose setae along posterior margin. Uropod 3: peduncle short, with lateral flange; male peduncle and rami without plumose setae; outer ramus l-articulate. Telson: entire*." (from Lowry & Stoddart 1997)

**Socarnes** – Two members of this genus are reported from the NEP, *S. hartmanae*, an endemic described from the SCB (Hurley 1963), and *S. vahlii*, a widely distributed form reported from the outer coast of Baja California (J. L. Barnard 1964a). The genus had five species in 1991 (J. L. Barnard and Karaman 1991) to which Lowry and Stoddart (1994) added another three. Hurley (1963) provides characters which separate his new species from other *Socarnes*, but does not provide a key. *Socarnes hartmanae* can be separated from *S. vahlii* easily on the basis of the third epimeron posterior margin; with a strong tooth in *S. hartmanae*, and rounded in *S. vahlii* (see description in Gurjanova 1962).

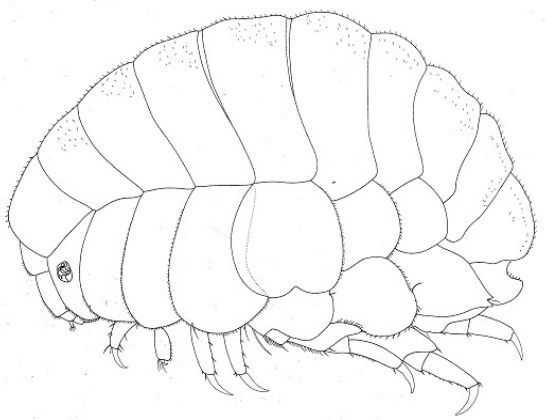
Diagnosis: **"***Mouthparts forming quadrate bundle. Labrum and epistome not differentially produced, prominent, separate, both produced together, blunt. Incisor ordinary, molar weakly triturative, or simple, large, somewhat conicolaminate, and setulose; palp attached proximal to molar. Inner plate of maxilla 1 [?weakly (?2)] setose; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp strongly*
*exceeding outer plate, dactyl well developed. Coxa l large and visible, not tapering. Gnathopod 1 short, simple, articles 5 and 6 subequal, dactyl large; article 6 of gnathopod 2 slightly shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 with small to large notch. Uropod 3 ordinary, peduncle elongate, inner ramus slightly shortened, outer ramus 2-articulate. Telson elongate, deeply cleft*." (from J. L. Barnard & Karaman 1991)



*Socarnes crenulatum*, a North Atlantic species (from Lincoln 1979)

**Socarnoides –** J. L. Barnard and Karaman (1991) place 4 species in this genus, excluding *S. indentata* Ledoyer 1986 ("not this genus"): the holotype *S. kergueleni* from the Subantarctic; *S. unidentatus* from the Magellanic region; *S. eugenovi* from the subarctic north Atlantic, and the Boreal NWP; and *S. illudens* from the NEP. Lowry & De Broyer (2015) place *indentata* of Ledoyer in *Pseudambasia*. The local species is infrequently taken although occurring relatively broadly at shelf depths. No whole animal figure of *S. illudens* is presented by Hurley (1963), but the appropriate parts are illustrated, the animal is described, and a key to some related genera is provided.

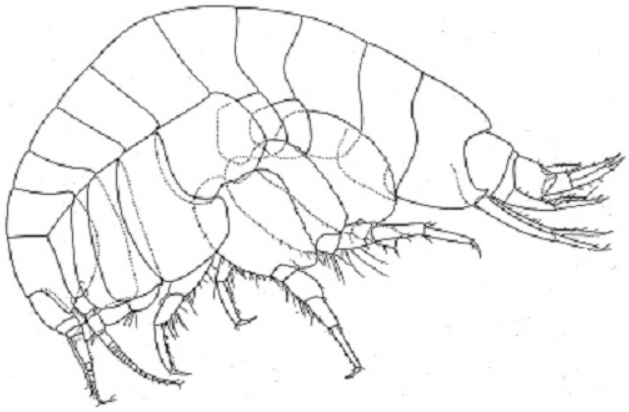
Diagnosis: "*Said to be of conicostomin form. Mouthparts said to be forming 'conical bundle'. Labrum and epistome prominent, separate, both large and strongly projecting, blunt. Incisor ordinary, molar weakly triturative, to some extent conicolaminate, setulose, palp attached strongly proximal to molar. Inner plate of maxilla1 weakly (0-1) setose; palp 2-articulate, large. Inner poorly and outer plate of maxilliped well developed palp not exceeding outer plate, dactyl small. Coxa 1 large and visible, slightly tapering. Gnathopod 1 short, simple, articles 5 and 6 subequal, dactyl small; article 6 of gnathopod 2 greatly shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 with large notch. Uropod 3 short, peduncle elongate, inner ramus slightly shortened, outer ramus 2-articulate. Telson ordinary, longer than broad, flat, weakly cleft.*" (from J. L. Barnard & Karaman 1991)



*Stomacontion pepini* type of the genus (from J. L. Barnard and Karaman 1991)

**Stomacontion –** A single species of a single unnamed taxon is known from the NEP. It was reported as *Acontiostoma* sp by Hurley (1963) based on a single small specimen taken among tunicates on rocky bottom on the San Pedro Seashelf at 20m. He declined to name or fully describe the taxon based on this inadequate material. His illustration shows a typical urosome for either *Acontiostoma* or *Stomacontion*, two genera which have frequently been synonymized. Unfortunately he neither illustrated nor described the head of the specimen, which would have made the generic choice more obvious. The record has been transferred to *Stomacontion* based on Hurley's statement that *Acontiostoma pepini* and *A. kergueleni* were the taxa most similar to the material at hand. *Acontiostoma pepini* is the generotype of *Stomacontion*, and *A. kergueleni* is a synonym of it. The two genera have been maintained valid since arguments in favor of that approach were made by Lowry and Stoddart (1983) in their review of the conicostomatid genera. In their allocation of species level taxa J. L. Barnard and Karaman (1991) did not place Hurley's record in either *Acontiostoma* or *Stomacontion*, both of which they retained as valid genera. No additional material of this animal has come to light since, and it remains an undersampled mystery. If the specimen can be located in the collections of the Allan Hancock Foundation now on deposit at the Natural History Museum of Los Angeles County, perhaps more light can be shed on the proper placement of this taxon.

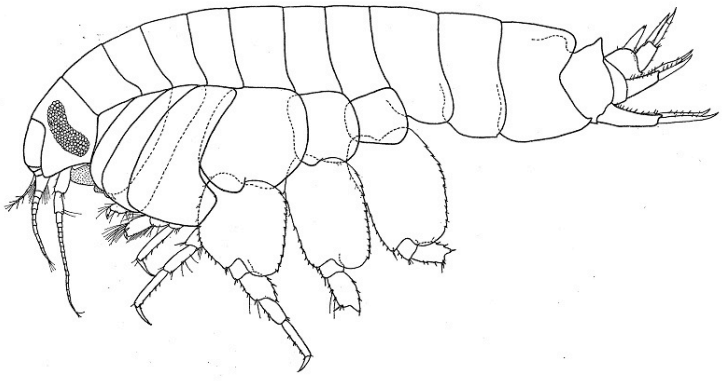
Diagnosis: **"***Of conicostomin form. Mouthparts forming conical bundle, some styliform. Labrum and epistome [?continuous, not differentially produced, prominent, coalesced, blunt]. Incisor ordinary, molar simple, small, conicolaminate or subconical, setulose; palp attached strongly proximal to molar. Inner plate of maxilla 1 weakly (0-1) setose; palp 1 or 2-articulate, large or small or absent. Inner poorly and outer plate of maxilliped well developed, palp scarcely exceeding outer plate, dactyl vestigial or absent. Coxa 1 large and visible, not tapering. Gnathopod 1 short, simple, article 5 shorter than 6, dactyl large; article 6 of gnathopod 2 slightly shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 without notch. Uropod 3 short, peduncle short, with 1 small ramus or none. Telson hemiacetabulate, incised*." (from J. L. Barnard & Karaman 1991)



*Thrombasia tracalero* (from J. L. Barnard 1966)

**Thrombasia -** Originally a monotypic genus based on *T. tracalero* J. L. Barnard 1966 from Santa Monica Bay, it now contains six species. It was placed in the synonymy of *Schisturella* by Barnard & Karaman 1991, but was reinstated as valid by Lowry and Stoddart (2011) in their review of *Tryphosella* and other tryphosines. It is very close to *Tryphosella*, differing in details of the mandibular palp attachment, maxillary dentition, and telson (Lowry & Stoddart 2011). This reemphasizes the difficulty in separation of the family Uristidae from the Lysianassidae, particularly those in the subfamily Tryphosinae.

Diagnosis: *"Basal articles of both flagella on antenna 1 elongated; upper lip very strongly lobate in front; molar of mandible rather· weak, palp attached level with molar, article 3 about 70 percent as long as article 2; inner plate of maxilla 1 with 2 apical setae, outer plate with long, well-developed spines; lobes of maxilla 2 not gaping, similar in shape; outer plate of maxilliped with small, imbedded medial spines, apex with 2 large spines; gnathopods 1 and 2 with transverse palms; coxa 1 not greatly shortened, triangular; ·as long as article 2 of gnathopod 1, partially hidden by coxa 2; inner ramus of uropod 2 incised; uropod 3 with biarticulate outer ramus; telson cleft halfway*." (from J. L. Barnard 1966b)



*Tryphosella index* (from J. L. Barnard 1966)

**Tryphosella –** A large genus badly in need of revision. J. L. Barnard and Karaman (1991) maintain it is not distinct from *Uristes*, which is now in another family

(see discussion under *Uristes* in Uristidae as well). Lowry and Stoddart (2011) have revisited all 79 species allocated to the genus worldwide, retaining 40, excluding 15 (mostly to Uristidae), and were unable to allocate 24 taxa with certainty. They also removed several species to a new genus, *Photosella*, which bears a photophore on the 5th leg basis. Lowry and Stoddart (1997) in their discussion of a new species of *Tryphosella* from Florida, casually transferred *Uristes californicus* Hurley 1963 to *Tryphosella*, then contrasted it with their new taxon. This lead was not followed by McLaughlin et al 2005, but is adopted here (and reiterated in Lowry & Kilgallen 2014b). With that addition there are four species currently assigned to the genus in the NEP. One of these is an unrecognizable provisional from off Oregon, so functionally there are three species; *T. californicus*, *T. index*, and *T. metacaecula*. Since the genus contained 54 species in 1991 (J. L. Barnard and Karaman 1991) and seven additional species were added by 2004 (Vader 2004), it is clear that the evolutionary center of the genus is not in the NEP.

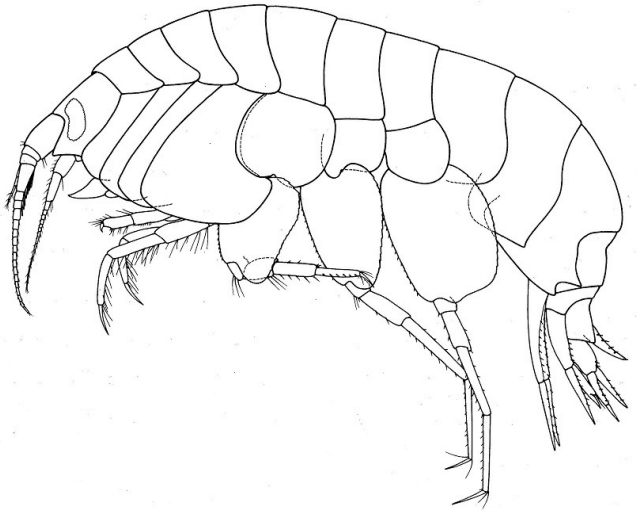
*Tryphosella* species are known from all over the world, and from the intertidal to the abyss. Interestingly, of the three local species, only the deepest dwelling (*T. index*, 1620m) bears noticeable eyes. The three species can be distinguished by the eyes (*T. index*), vs. eyes absent (*T. californica* and *T. metacaecula*); and the telson, which bears dorsal spines in *T. californica* and lacks them in *T. metacaecula*. In their review of the genus (2011), Lowry and Stoddart placed *T. californica* and *T. metacaecula* as definite members of their revised *Tryphosella*. *T. index*, however, was considered to be probably a tryphosine, but was lacking sufficient information on key characters to allow a firm assignment.

Diagnostic description**: "***Body not expanded to form a lateral bulge, without dorsal carina. Antenna 1 accessory flagellum not forming cap, terminal article not offset. Antenna 2 peduncular article 3 short; articles 4 and/or 5 sometimes enlarged in male.* ***Mandible molar with asymmetrically reduced column, proximally setose, distally triturating****; palp attached about midway.* ***Maxilla 1 setal-tooth 7, left and right asymmetrical*** *(rarely symmetrical), left cuspidate along most of curved inner margin, right cuspidate along most of sinusoidal inner margin.* ***Gnathopod 1*** *subchelate (occasionally simple in male);* ***coxa large, slightly or significantly shorter than coxa 2, tapering distally or subquadrate****;* ***carpus long (length 2 or more x breadth)****, (occasionally short); propodus margins subparallel (except when gnathopod 1 simple). Pereopod 4 with a well-developed posteroventral lobe. Pereopod 5 coxa without distinct lateral ridge; basis without photophore, posterior margin without mid-central spine, posteroventral lobe or posteroventral spine. Urosomite 1 not projecting over urosomite 2. Uropod 2 inner ramus without constriction (rarely with). Uropod 3 peduncle without dorsolateral flange; plumose setae on rami in male (occasionally also in female).* ***Telson deeply cleft (more than 64%)***." (from Lowry & Stoddart 2011)

**Tryphosites** – A single provisional member of this genus was reported from 8 sites along the US West Coast by Dickinson 1976. The genus has not otherwise been reported from the area, and consists of three species from the Northeast Atlantic, and two from austral waters (Lowry and Kilgallen 2014a). As Dickinson's specimens are not available, and his taxa not defined, this record remains dubious on zoogeographic grounds.

Diagnostic description: "*Antenna 1 accessory flagellum not forming operculum. Antenna 2 flagellum article 5 slender (with brush setae). Mandibular incisor curved;*

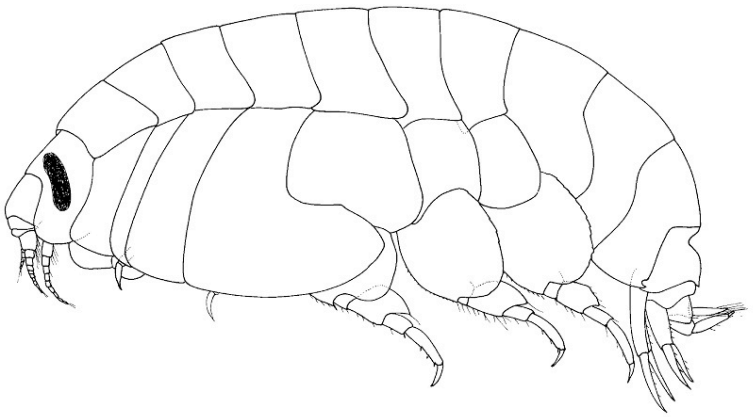
*palp attached midway. Maxilla 1 ST-7 serrate distally with smooth medial margin; ST-D slender, cuspidate along distal half of medial margin. Maxilliped outer plate apical robust setae present. Gnathopod 1 subchelate; coxa large, nearly as long as coxa 2, not tapering; carpus longer than propodus. Pereopod 4 coxa with well-developed posteroventral lobe. Uropod 2 inner ramus constricted. Uropod 3 rami with plumose setae. Telson moderate to deeply cleft*." (from Lowry & Kilgallen 2014a)



*Tryphosites alleni* from the Mediterranean (from Diviacco & Ruffo 1989)

**Waldeckia –** The only record of this genus in the NEP is the provisional species *Waldeckia sp a* established by Dickinson in his 1976 thesis. No definition or description of the animal was ever offered, so its identity remains a mystery. The genus is known from the NW Pacific (Hirayama 1985, Hirayama and Kikuchi 1980), but there are no NEP records other than that of Dickinson from the slope and abyssal plain off Oregon. It is possible that what Dickinson had was the species later described by Hirayama and Kikuchi, but this remains only speculation. Such trans-oceanic distributions are not uncommon in gammarid amphipods, particularly in bathyal and abyssal forms. The genus was revised, and a new species flock from Australia described by Lowry and Kilgallen 2014c). They placed *W. elephas* of Hirayama and Kikuchi in the synonymy of *W. nudus* Imbach. As the latter is known from Viet Nam and southeast Asian waters, the affinities of Dickinson's provisional are unlikely to lie with that taxon. As presented by Lowry & Kilgallen (2014c) the genus is not distributed outside the western Pacific and eastern Indian Ocean, except for a single species in the Falkland Islands in the south Atlantic.

Diagnosis: "*Antenna 1 with well developed callynophore in both sexes. Antenna 2 of adult male longer than the body, peduncular articles 4 and 5 enlarged; antenna 2 of female subequal in length to or slightly longer than antenna 1, without peduncular brush setae, geniculate between peduncular articles 3 and 4. Mandibular molar a setose tongue with a vestigial distal triturating patch; palp attached proximally or extremely proximally. Maxilla 1 with 8/3 setal-tooth arrangement with broad setal-teeth and ST-7 slightly displaced from ST-6. Maxilla 2 without oblique setal row. Gnathopod 1 usually parachelate, occasionally subchelate. Pereopod 4 coxa with very large posteroventral lobe. Uropod 3 rami with plumose setae in both sexes, outer ramus 2-articulate. Telson deeply cleft.*" (from Lowry & Kilgallen 2014c)



*Waldeckia dempseyae*, an Australian species (from Lowry & Kilgallen 2014c)

**Family Opisidae** - **Description "Head** free, not coalesced with pereonite 1; exposed**;** deeper than long**;** rostrum absent**;** 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; peduncle with sparse robust and slender setae; 3-articulate; peduncular article 1 longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present; antenna 1 callynophore present. *Antenna 2* present; short, or long; 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, or less than 5-articulate; not clavate; *calceoli* present, or absent.

*Mouthparts* well developed. *Mandible* incisor smooth, or left minutely dentate, right smooth (?); lacinia mobilis present on left side only, or absent; accessory setal row without distal tuft; molar present or absent, medium, non-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, very large or large; palp 4-articulate or 3-articulate, article 3 without rugosities. *Labium* smooth.

**Pereon**. Pereonites 1-7 separate; complete; sternal gills absent; pleurae absent. *Coxae 1-7* well developed, none fused with pereonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. *Coxae 1-3* not successively smaller, none vestigial or coxa 1 reduced. *Coxae 2-4* none immensely broadened.

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

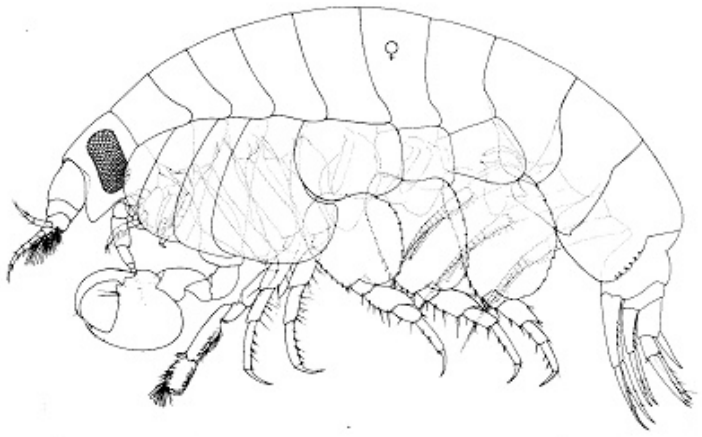
*Pereopods* heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Pereopod 3* well developed. *Pereopod 4* well developed. 3-4 not glandular; 3-

7 without hooded dactyli, 3-7 propodi without distal spurs. Coxa well developed, longer than broad; carpus shorter than propodus, not produced; dactylus well developed. Coxa larger than coxa 3, not acuminate, with well developed posteroventral lobe; carpus not produced. *Pereopods 5-7* with few robust or slender setae; dactyli without slender or robust setae. *Pereopod 5* well developed; shorter than pereopod 6, or subequal in length to pereopod 6; coxa smaller than coxa 4, with ventrally produced posterior lobe; basis expanded or slightly expanded, subovate; merus/carpus free; carpus linear; setae absent. *Pereopod 6* subequal in length to pereopod 7; merus/carpus free; dactylus without setae. *Pereopod 7* with 6-7 well developed articles; subequal to pereopod 5, or longer than pereopod 5; similar in structure to pereopod 6; with 7 articles; basis 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 longer than urosomite 2, or much longer than urosomite 2; urosome urosomites not carinate; urosomites 1-2 without transverse dorsal serrations. *Uropods 1-2* apices of rami without robust setae. *Uropods 1-3* similar in structure and size. *Uropod 1* peduncle without long plumose setae, without basofacial robust seta, without ventromedial spur. *Uropod 2* well developed; without ventromedial spur, without dorsal flange; inner ramus shorter than outer ramus, or subequal to outer ramus. *Uropod 3* not sexually dimorphic; peduncle short or elongate; outer ramus shorter than peduncle or longer than peduncle, 1-articulate or 2-articulate, without recurved spines. *Telson* laminar; deeply cleft, or entire; longer than broad; apical robust setae present, or absent." (Lowry and Springthorpe 2001)

**Opisa –** Species of *Opisa* are easily recognized in samples. They have very large first gnathopods, with an oval, almost circular propodus sporting a large defining tooth. Against this closes a large curved dactyl. The palm is excavate behind the defining tooth, leaving a large gape when the dactyl is closed. This is well illustrated by Hurley (1963) and by Bousfield (1987). This dactylar structure alone will identify them as *Opisa* in the



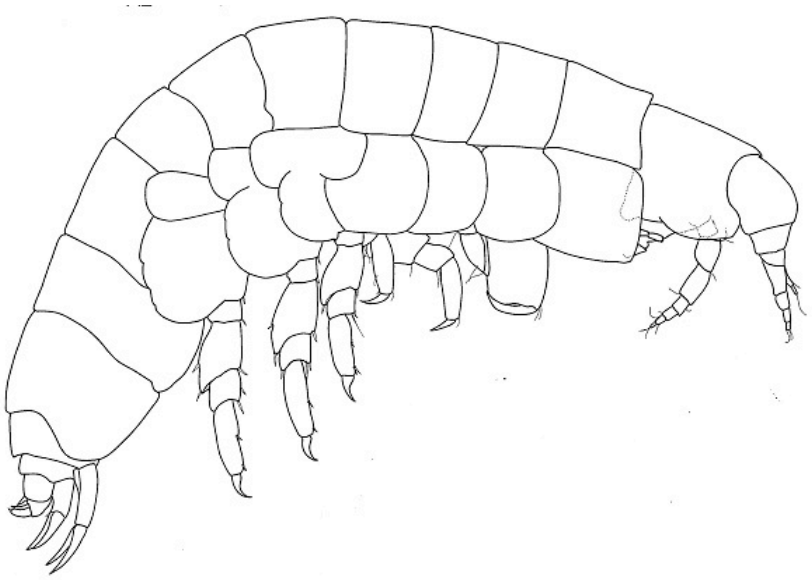
*Opisa tridentata* (from Bousfield 1987)

NEP. In other areas another family, the Trischizostomatidae, has similar gnathopod 1 structure, and can be confused with *Opisa*. There are two species known from the NEP, *O. odontochela* from SE Alaska, and *O. tridentata* from the entire coast – from the

Aleutians to the SCB. In the south, any *Opisa* is *tridentata* (but check against the description anyway). In the north, where the distribution of the two species overlaps, they can be differentiated without much difficulty by: 1) epimeron 3 posterior margin serrate (*O. tridentata*) or smooth (*O. odontochela*); and 2) G1 palm strongly excavate, dactylar gape pronounced (*O. tridentata*) vs. G1 palm hardly excavate, dactylar gape obscure, nearly lacking (*O. odontochela*). A key separating the species in the genus in North America is presented by Bousfield (1987). While members of the genus are known fish ectoparasites, we usually see them in benthic samples separated from the hosts. It is assumed that, like some other blood parasites, the animals drop off the host for bouts of digestion on the bottom, locating new hosts when they are again hungry.

Diagnosis: "*Side plate 1 short, partly concealed by 2nd; 4th deeply excavate behind. Upper lip rather broadly rounded. Mandible, cutting edge smooth, spine-row feeble, molar obscure, in any event without triturating surface; palp rather far back, 2nd segment strongly setiferous. Maxilla 1 normal, has 2 setae on narrow inner plate. Maxilla 2, plates have setae apically only. Maxillipeds, inner plates normal, outer plates angular at apex, have toothed inner margin ; palp normal, rather short. Gnathopod 1 chelate, seg. 5 small, seg. 6 greatly widened, the thumb acute, not very long, leaving a great cavity between itself and the much curved dactylus. Gnathopod 2 minutely subchelate. Peraeopods 1-5 not elongate, segments generally slender except for seg. 2 in peraeopods 3-5 which is greatly expanded. Uropod 3 elongate. Telson elongate, deeply cleft*." (from Hurley 1963)

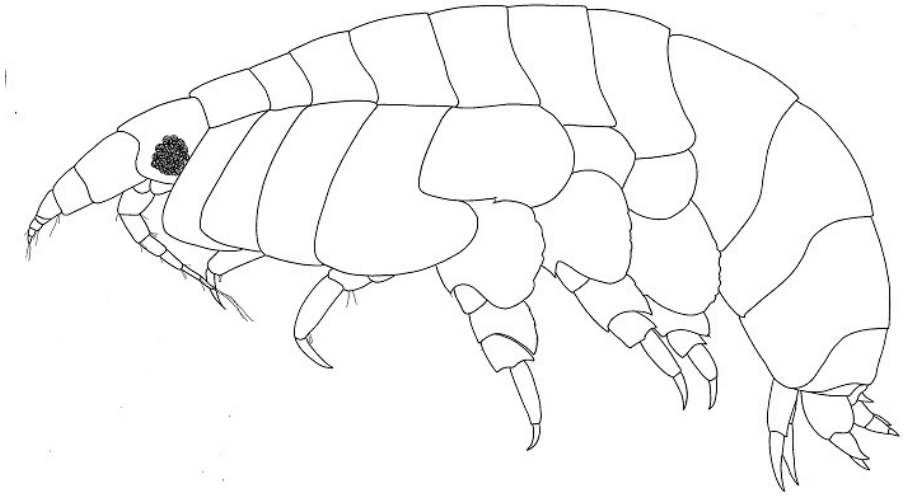
Family Pachynidae – Description *" ...characterized by gnathopod 1, which has a peculiarly compressed carpus and enlarged propodus. The proximal articles of the flagellum of antenna 1 are usually fused and bear rows of aesthetascs; calceoli are never present on either antenna. On the mandible, the molar is always absent, the incisor has a smooth cutting edge, and the left lacinia mobilis and the accessory spines may or may not be present or a serrate blade (lamina dentata) may be present. The mandibular palp is always 3-articulate. On maxilla 1 the inner plate is usually small and may or may not have terminal setae, the outer plate has from 11 to 4 spine-teeth. The palp may be present or absent; if present it bears either terminal articulating spines or setae. The maxillipeds may or may not have inner plates, the outer plates are always at least moderately enlarged and the palp is usually 4-articulate, occasionally 4-articulate. Gnathopod 1 may be subchelate, parachelate or chelate and the palm may be defined by a simple spine, a complex spine, a projecting tooth or not at all, but the carpus is always compressed and the propodus is always enlarged. Gnathopod 2 is a typical lysianassoid mitten which is usually minutely subchelate, but occasionally the dactyl and palm are enlarged. Coxa 4 usually has a well developed posteroventral lobe but occasionally this lobe is absent or poorly developed. Article 4 of pereopods 5 and 6 is usually expanded posteriorly. Uropods 1 and 2 are biramus. Uropod 3 is usually biramus, occasionally uniramus, with the outer ramus always 2-articulate. The telson is small, entire, and slightly broader than long.*" (Lowry 1984)



*Pachychelium fucaensis* (from Lowry & Stoddart 2012)

**Pachychelium –** The provisional species in this genus recorded at several sites in the SCB, *Pachychelium* sp SD1 has been described by Lowry and Stoddart (2012a) as *Pachychelium fucaensis*, known now to range from near San Francisco to off San Diego in 40-220m depths. It remains the only known species in the region.

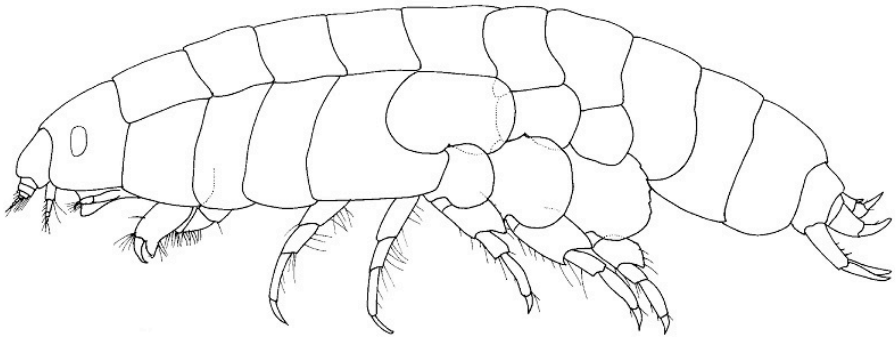
Diagnostic description: ***"****Body shape slender.* ***Head lateral cephalic lobe large, narrowly rounded****. Antenna 1 peduncular article 1 without posterodistal spine; accessory flagellum article 1 long; [callynophore not known for female]. Mandible with accessory setal row absent; left lamina dentata absent; palp attached distally; palp article 2 broad, article 3 with subparallel margins or distally tapered. Maxilla 1 outer plate setal-teeth smooth, at least one inner row setal-tooth absent; palp absent.* ***Maxilliped inner plate absent****; outer plate medium size;* ***palp 3-articu-late (article 4 absent)****.* ***Gnathopod 1 ischium smaller than propodus****; corner of palm with simple robust seta or without any robust seta. Gnathopod 2 palm obtuse.* ***Epimeron 3 posteroventral corner broadly rounded****. Uropod 3 biramous."* (from Lowry & Stoddart 2012a)



*Pachynus obsolescent* from Australian waters (from Lowry 1984)

**Pachynus** – Bulycheva (1955) established the genus for *P. chelatum* from the shallow shelf of the Japan Sea in the NWP. Hurley (1963) described the second species, *P. barnardi,* from local waters. The two other members of the genus were described from Australian waters by Lowry (1984). As in most other genera of the family, the structure of gnathopod 1 is characteristic, separating *P. barnardi* from *Pachychelium* and *Prachynella* in the NEP.

Diagnostic description: ***"****Body shape compact. Head lateral cephalic lobe usually small, subacute. Antenna 1 peduncular article 1 without posterodistal spine; accessory flagellum article 1 short (when present); flagellum with or without callynophore in female. Mandible with accessory setal row present on both sides or absent; left lamina dentata absent; palp attached midway or distally; palp article 2 slender, article 3 with subparallel margins or with anterior margin convex, not distally tapered.* ***Maxilla 1*** *outer plate setal-teeth smooth, at least one inner row setal-tooth absent;* ***palp well developed, broad****, 2-articulate.* ***Maxilliped*** *inner plate small;* ***outer plate small****; palp 4- articulate, article 4 small. Gnathopod 1 ischium smaller than propodus; corner of palm with simple or complex robust seta. Gnathopod 2 palm obtuse or transverse. Epimeron 3 posteroventral corner broadly rounded or sub-quadrate or projecting, apically acute. Uropod 3 biramous*." (from Lowry & Stoddart 2012a)



*Prachynella lodo* (from Lowry & Stoddart 2012)

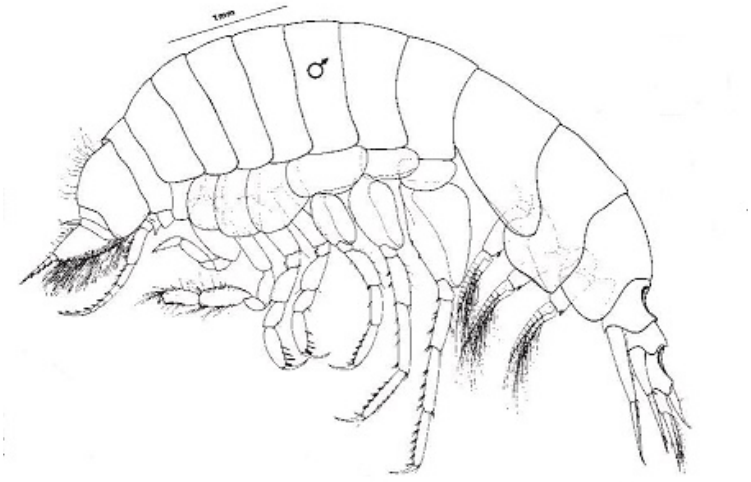
**Prachynella** – Lowry (1984) noted the differences between the anoculate deep-water *Prachynella* described by J. L. Barnard 1967, and the oculate shallow-water form he described in 1964. He suggested that there were probably several species of *Prachynella* in Californian waters, and two new species were described in 2012 from the region by Lowry and Stoddart ( *P. epa* and *P. oculata*). The three species can be separated relatively simply by presence of eyes (absent in *P. epa*, present in the other two), and presence of a bluntly pointed cusp on the posteriodorsal margin of pereonite 5 in *P. lodo*, rounded in *P. oculata*. A fourth species is likely to be separated later because a specimen taken by Barnard from deep water on the Baja Abyssal plain and identified as *P. lodo* lacks cusps on either pereonite 4 or 5, thus excluding all three local described species. Evaluation of this taxon awaits more material collected from deeper water.

Diagnostic description: ***"****Body shape slender. Head lateral cephalic lobe large, broadly or narrowly rounded. Antenna 1 peduncular article 1 with posterodistal spine; accessory flagellum article 1 short; flagellum with callynophore in female.* ***Mandible*** *with accessory setal row present on both sides or absent;* ***left lamina dentata vestigial or absent****; palp attached midway or distally;* ***palp*** *article 2 broad,* ***article 3 with subparallel***

***margins or with anterior margin convex, not tapered distally. Maxilla 1 outer plate setal-teeth with medial cusps, at least one inner row setal-tooth absent; palp vestigial, 1-articulate. Maxilliped*** *inner plate small; outer plate large;* ***palp 3- articulate (articles 1–2 fused)****. Gnathopod 1 ischium smaller than propodus; corner of palm with complex robust seta. Gnathopod 2 palm obtuse or transverse. Epimeron 3 posteroventral corner broadly rounded. Uropod 3 biramous*." (from Lowry & Stoddart 2012a)

**Family Scopelocheiridae** – Members of this family have very peculiar first gnathopods, which are simple, and characteristically end in a sheaf of setae or spines which obscures the dactyl. In some forms the dactyl itself is displaced ventrally, and inserted subterminally on the propod. The dactyls also frequently bear accessory teeth (see for instance the structure of the G1 dactyl in *Anisocallisoma armifera*). There are eight genera in the family, three of which occur in the NEP**.**

Diagnosis "*Head: as long as or longer than deep. Antennae: calceoli present or absent. Epistome and upper lip separate. Mandible: incisors usually symmetrical, sometimes asymmetrical, large, with straight or convex margins; left lacinia mobilis a stemmed, distally expanded, smooth or irregularly cusped blade, occasionally a cusped pad; accessory setal row without distal setal tuft; molar present or absent, if present, a narrow column with small triturating surface or a small non-setose triangular flap. Maxilla 1: inner plate usually strongly setose, always more than 2 pappose setae; outer plate broad, with 6-11 setal-teeth in a 7/4 or modified 7/4 arrangement; palp large, 2-articulate. Maxilliped outer plate with or without apical slender simple or pappose setae, with or without apical robust setae. Gnathopod 1: simple, dactylus reduced, complex, setose. Coxae 1 to 4: large, longer than broad, overlapping. Pereopods 3-7: usually simple, sometimes prehensile, propodus without distal spur. Telson: moderately to deeply cleft.*" (Lowry and Stoddart 1997)

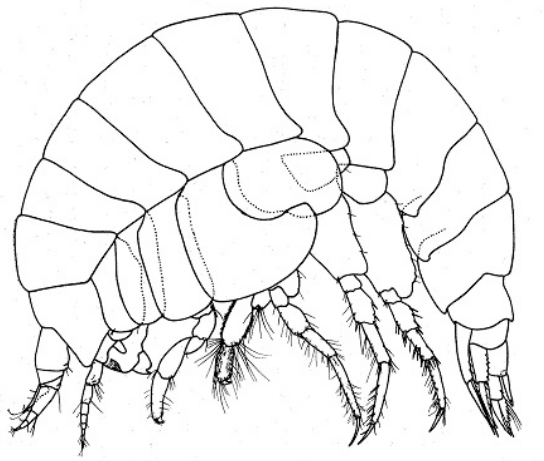



*Anisocallisoma armigera* (from Hendrycks & Conlan 2003)

**Anisocallisoma –** Erected by Hendrycks and Conlan (2003) for the NEP species *armigera*, the genus has closest resemblances to *Eucallisoma*. The two genera can be easily separated by the characters tabulated by Hendrycks and Conlan (Pg. 2315). The species has only been collected in sediment traps in very deep water off Pt. Conception,

but may eventually prove to be more widespread as additional material becomes available.

Diagnosis: "*Head much deeper than long; lateral cephalic lobe small, rounded, situated near ventral margin of head; eye absent; antenna 1, peduncle 1 short and deep, accessory flagellum one-articulate, conical, lacking distal brush setae; mandibular molar, broadly triangular, non-triturative; maxilla 1, palp one-articulate, inner plate with one subapical seta; maxilla 2, plates subequal, ovate, inner plate with few medial setae; maxilliped, outer plate, medial margin crenate with four to six small spines; gnathopod 1, coxa small, tapering distally, basis swollen, propodus simple, dactylus minute; gnathopod 2, propodus palm weakly oblique; coxae 1–4 shallow, much less than corresponding peraeonite; coxa 4, ventral margin slightly tapering, rounded, posteroventral lobe weakly developed, posterior margin shallowly excavate; peraeopods 3–4, propodus slightly expanded, weakly prehensile; peraeopods 5–7, dissimilar, peraeopod 5 much shorter than peraeopods 6–7; urosomites 1 and 3 with a dorsal concavity; pleopods 1–3, anterior margin of inner ramus with fan-shaped clusters of setae on the distal segments; uropods 1–2, rami lacking spines; epimeron 2, ventral margin shallowly concave, with fringe of setae; telson broadest at mid-point, cleft 52%."* (from Hendrycks & Conlan 2003)



*Paracallisoma coecum* female (from J. L. Barnard 1964)

**Paracallisoma –** Two NEP species are recorded in this genus; *P. coecum*, and *P. spinipoda*. Hurley (1963, pg. 62-64) considers the case presented by Birstein and Vinogradov (1960) and adopted by Gurjanova (1962) that *P. coecum* is a junior synonym of *P. alberti*. He declined to accept the case, feeling that additional information was needed. J. L. Barnard and Karaman (1991) follow this same path, treating both as valid taxa. Holmes (1908) described the female, and J. L. Barnard (1954) described a male *P. coecum* as well. Hendrycks and Conlan (2003) described only the male and an unsexed juvenile of their species *P. spinipoda*. They felt it could be clearly differentiated from the other species in the genus by the presence of subchelate pereopods 3-6 (among other characters), the elongate spinose propodi of which appear almost prehensile. This is very different from the condition described for *P. coecum*, and should allow the two taxa to be separated with ease. Distribution of *P. coecum* vertically off California is documented by Brusca (1967).

Diagnosis: **"***Of scopelocheirin form. Mouthparts forming quadrate bundle. Labrum and epistome each weakly produced, separate, epistome strongly dominant in size, blunt. Incisor ordinary, molar simple, small subconical; palp attached slightly proximal to molar. Inner plate of maxilla 1 strongly setose medially; palp 2 articulate, large. Inner and outer plates of maxilliped well developed, palp strongly exceeding outer plate, dactyl well developed. Coxa 1 slightly shortened and partly covered by coxa 2, tapering. Gnathopod l short, simple, article 5 longer than 6, dactyl vestigial, shrouded in setae; article 6 of gnathopod 2 greatly shorter than article 5, ordinary, propodus minutely subchelate. Inner ramus of uropod 2 without notch. Uropod 3 almost equiramous, ordinary, peduncle ordinary, outer ramus 2-articulate. Telson elongate. deeply cleft.*" (from J. L. Barnard & Karaman 1991)

**Scopelocheiropsis –** The monotypic *S. abyssalis*, previously known from the Atlantic and the Antarctic (J. L. Barnard and Karaman 1991), was reported from off Pt. Conception by Hendrycks and Conlan (2003). Their material consisted of a single female from a sediment trap, but the condition of the specimen allowed confident allocation to this species. Not only was the specimen the first known from the Pacific, but it also represented a new depth record of 4000m. More complete illustrations of the species are found in Schellenberg (1926a, b).

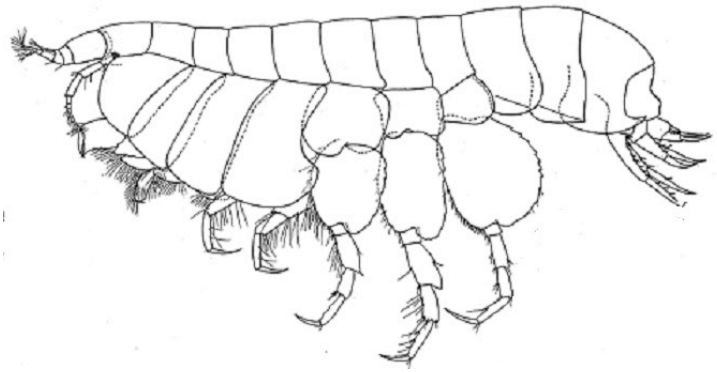
Diagnosis: **"***Of scopelocheirin form. Mouthparts forming quadrate bundle. Labrum and epistome differentially produced, prominent, separate, both strongly produced, blunt. Incisor ordinary, molar absent; palp attached strongly distal. Inner plate of maxilla 1 strongly (9) setose; palp 2-articulate, large. Inner and outer plates of maxilliped well developed, palp slightly exceeding outer plate, dactyl vestigial. Coxa 1 large and visible, not tapering. Gnathopod 1 elongate, nearly simple, palm oblique, articles 5 and 6 subequal, dactyl vestigial, shrouded in setae; article 6 of gnathopod 2 slightly shorter than article 5, ordinary, propodus minutely chelate. Inner ramus of uropod 2 without notch. Uropod 3 ordinary, peduncle ordinary, inner ramus slightly shortened, outer ramus 2-articulate. Telson ordinary, deeply cleft.*" (from J. L. Barnard & Karaman 1991)

**Family Sophrosynidae** - Description "*Head* exposed, slightly longer than deep, without cheek notch. *Antennae* calceoli absent in male and female. *Antenna 2* peduncular article 3 without distal hook. *Epistome and upper lip* fused. *Mouthpart bundle* subquadrate. *Mandible* incisors present, well developed, symmetrical, straight, smooth; left lacinia mobilis rod-like, right lacinia mobilis absent; accessory setal row absent, without distal setal tuft; molar absent; palp present, inserted distally to extremely distally. *Maxilla 1* inner plate with 2 or less apical pappose setae; outer plate with 2 apical primary setal-teeth and vestigial setal-teeth down medial face; palp large, with apical robust setae. *Maxilla 2* inner plate subequal to or slightly shorted than outer plate, or inner plate significantly shorter than outer plate; inner plate without oblique row of facial setae. *Maxilliped* coxa and basis normal; outer plate present, medial setae absent, apical slender setae present; palp 4-articulate, article 4 well developed.

*Gnathopod 1* slightly chelate; coxa large, about as long as coxa 2; merus and carpus not rotated; ischium short; carpus compressed; propodus large; dactylus slightly curved. *Gnathopod 2* coxa large, subequal in size to coxa 3; propodus subquadrate to rectangular (less than 4 x as long as broad), with complex setae; dactylus minute.

*Pereopods* all simple; distal spurs absent. *Pereopod 4* coxa with well developed or weak posteroventral lobe. *Pereopod 5* coxa anterior and posterior lobes subequal. *Pereopod 6* coxa posterior lobe subequal to, slightly longer than or much deeper than anterior lobe.

*Uropod 2* inner ramus without constriction. *Uropod 3* rami biramous; outer ramus 2-articulate. *Telson* present, cleft or entire." (from Lowry and Stoddart 2010b)



*Sophrosyne californica* (from J. L. Barnard 1966)

**Sophrosyne –** J. L. Barnard and Karaman (1991) list three species in the genus; *S. hispana* from the temperate east Atlantic, *S. murrayi* from the sub-Antarctic Kerguelen Islands, and the widely distributed *S. robertsoni*. Kilgallen, Myers, and McGrath (2007) examined new material and clarified the characters separating *S. hispana* and *S. robertsoni*. The genus was expanded to 14 taxa worldwide by Lowry and Stoddart (2010b). Much of the increase came from discrimination of sibling taxa from records of *S. robersoni* and *S. hispana*. This was the case in Southern California, where specimens attributed to *S. robertsoni* by Barnard (1966), were described as *S. californica* by Lowry and Stoddart. The male of this species is currently not known, but is presumed similar to the male of *S. robertsoni* as described by Moore (1983) The NEP representative of the genus can be separated from *Schisturella* and similar local forms by its unreduced coxa 1.

Diagnosis: as for the family

**Family Uristidae** – Lowry & Kilgallen (2014b) while reviewing all of the individual genera included, did not rediagnose the family**.**

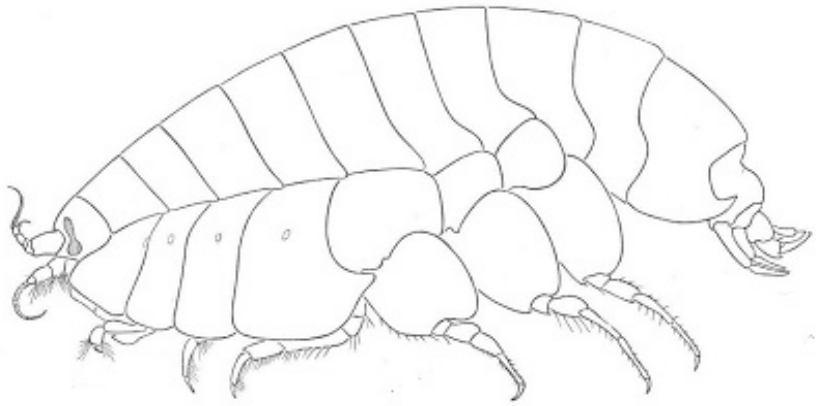
Description "*Body smooth, not carinate or rostrate, first segment not produced in cap or spine over head. Eyes normal or absent, may sometimes meet in midline. Urosome segments 2 and 3 not fused. Telson present, entire to deeply cleft. Pereopod 3 basis not produced in long spine or process posteriorly. Mouthparts not styliform. Antenna 1, peduncle generally not carinate. Antenna 2 peduncle, none of segments noticeably dilated. Mandible has distinct cutting edge which is not strongly dentate; molar process small or obsolete, palp of 3 segments. Maxilla 1, palp of 2 distinct segments. Maxilliped, inner plates well developed, may be almost as long as outer; outer plates , inner margin straight, crenulate, outer margin convex, distally rounded, generally not toothed; palp of 4 segments, 4$^{th}$ usually well-developed but may be rudimentary. Side plates 1 and 2 not appreciably smaller than 3 and 4; side plate 1, lower front angle not hidden by side plate 2. Gnathopod 1, not enormously developed, subchelate or imperfectly subchelate, finger not concealed amongst setae. Gnathopod 2, minutely chelate or minutely subchelate, dactylus present. Pereopods not prehensile,*

*segment 7 generally not noticeably long; pereopods 3-5 segments 3 to 7 not greatly expanded. Uropod 3 biramus*." (Hurley 1963).

**Abyssorchomene** – Created by De Broyer based on a cladistic analysis of the complex of species centered on *Orchomene*, this genus has two members in the NEP, and at least three others elsewhere (Bellan-Santini 1990). The NEP taxa are treated in J. L. Barnard and Ingram (1990) as *Orchomene* species, with *Abyssorchomene* relegated to subgeneric status. This placement is rejected here based on De Broyer's findings, and *Abyssorchomene* is viewed as a valid generic level taxon (see discussion under *Orchomene*). They characterize the taxon as having a mandibular molar like that of *Orchomene*, a maxilliped like that of *Orchomenella* and a gnathopod 1 like that of *Orchomenopsis*. This sort of structural convergence is one of the factors that convinced J. L. Barnard that more information was needed before the systematics of the lysianassids could be firmly established. His untimely death prevented further contributions by him to this resolution. The effort has been ongoing in the group of researchers led by Jim Lowry in Australia. The fact that both *Orchomene* and *Abyssorchomene* species have been regarded as congeneric at some point, highlights the difficulty of handing the lysianassoids at a family level. *Orchomene* and *Orchomenella* are currently placed among the tryphosine Lysianassidae, while *Abyssorchomene* is among the uristids. Other genera have provided similar difficulties, and Lowry & Kilgallen (2014c) characterized the genus *Waldeckia* as being intermediate between the uristids and the tryphosines, having some characters of each. Both *A. abyssorum* and *A. distinctus* occur on abyssal plains, and were taken in association with hydrothermal venting areas in the NEP. A key to the genus worldwide is provided by Lowry & Kilgallen (2014b)

It is not clear if either of the three reported species are identical with the forms reported by France (1994) from the San Clemente Basin. His maintenance of two morphologically separable forms, *Abyssorchomene* sp. 1 and *Abyssorchomene* sp. 2 is suggestive, but must remain inconclusive. Since both were taken at significantly shallower depths than either of the three other species reported from the NEP, and in a different ecological context, it is more likely that they represent as yet unnamed species in the genus from the area.

Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum with an elongate article 1 (at least twice as long as article 2) partially covering callynophore. Antenna 2 with brush setae. Mandible molar setose with a triturating surface. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate slightly to significantly shorter than outer plate. Gnathopod 1 subchelate or parachelate; coxa 1 large, about as long as coxa 2, subrectangular with concave anterior margin or adze-shaped; ischium short (length less than 2 × breadth); carpus compressed; propodus margins subparallel. Uropod 2 inner ramus not constricted. Telson moderately to deeply cleft*." (from Lowry & Kilgallen 2014b)



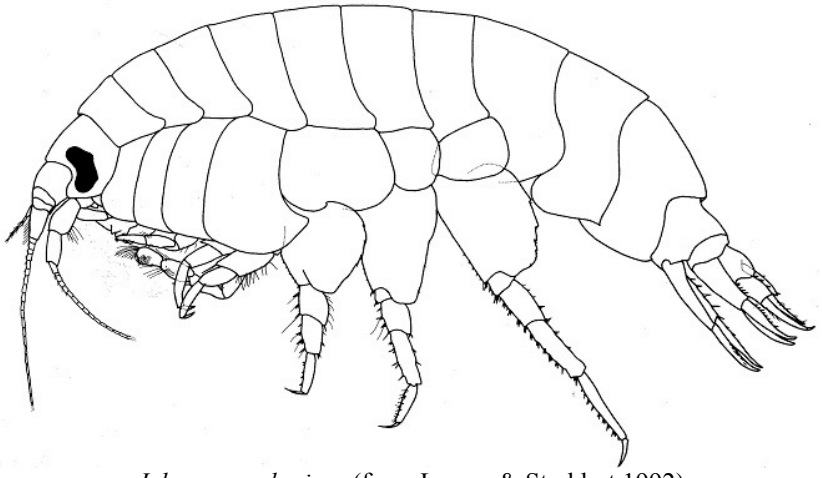
*Anonyx bispinosus* (from Steele 1967)

**Anonyx –** A large genus, with 50 species (Lowry & Kilgallen 2014. A number of investigators, most prominently D. J. Steele, have worked with the group. The genus was treated extensively by Gurjanova (1962), who described several new *Anonyx* species, predominantly from the NWP. Steele (1979c) summarized the distribution of the genus in the NWP, NEP, and Arctic and indicated the north Pacific as the apparent center of origin of the genus. Work with Alaskan *Anonyx* material began with Steele and Brunels (1968) investigation of the Arctic and western North Atlantic species in the genus. Several forms which range into the boreal and even temperate waters of the NEP are included there. He added additional comments to that work (Steele 1969) before producing a series of papers on the taxonomy and zoogeography of *Anonyx* species from the North Pacific (Steele 1982, 1983, 1986, 1989, 1991). He has also commented on variability in some meristic characters within members of the genus (Steele 1979b). A relatively large number of forms are listed in McLaughlin et al (2005) as being distributed in the NEP, but *A. barrowensis* and *A. bispinosus* apparently have distributions only within the Arctic zone above the Aleutians in the Bering Sea and are not represented in the present study area. Others should not be included in *Anonyx*. Lowry and Stoddart (2002a) treated *A. filiger* as a *Lepidepecreum*, designating it a nomen dubium and unrecognizable.

Among the uristids *Anonyx* is most closely related to *Kyska* (see below) and to *Ichnopus* in having a mandibular molar consisting of a setose tongue with no triturative surface (Lowry and Stoddart 1992). NEP species of *Anonyx* are mostly arctic-boreal or boreal in distribution. Of the 24 species reported from the NEP, only seven range south of British Columbia, and only three into California waters. In the latter group only *A. lilljeborgi* has been placed on the SCAMIT list. [please note: the spelling of species named after Dr. Liljeborg can be correct either with or without the double "l", depending on their original formulation. Since the difference stems from conventions of transliteration in different languages, there is no single correct way.] A key to the California forms is available in Hurley (1963, pg. 103). His *Anonyx dorotheae* has been removed to the genus *Schisturella.*

Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum forming cap covering callynophore. Antenna 2 with brush setae. Mandible molar setose with vestigial triturating surface. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate slightly to significantly shorter than outer*

*plate. Gnathopod 1 subchelate (occasionally parachelate); coxa 1 large, about as long as coxa 2, subrectangular with straight or concave anterior margin; ischium short (length less than 2 × breadth); carpus short (length 1 to 2 × breadth) or long; propodus margins slightly tapering distally. Uropod 2 inner ramus constricted (weak to strong). Telson moderately to deeply cleft*." (from Lowry & Kilgallen 2014b)



*Ichnopus pelagicus* (from Lowry & Stoddart 1992)

**Ichnopus –** A predominantly Indo-Pacific genus of sixteen species (Lowry and Stoddart 1992) with a single species reported from the NEP, *Ichnopus pelagicus*. Most of the species are from the tropical Pacific, with Tethyan relicts in the eastern North Atlantic and Mediterranean. Barnard (1964c) illustrates *I. pelagicus*, and provides the record which places the species into the NEP. It is fully redescribed by Lowry and Stoddart (1992), who also provide a key to the genus worldwide. It is related to *Kyska* and *Anonyx*, but has gnathopodal characters which are of scopelocheirid form. In the NEP generic key it is found along with the other genera with vestigial or obscured dactyl on the first gnathopod. In the case of *I. pelagicus*, however, the dactyl is mostly visible, with some setae and accessory dactylar teeth serving to obscure it slightly. Most species with this gnathopod type are deep water and blind. *Ichnopus pelagicus* has well defined prominent eyes, and is found in the upper 200 m of the water column over off-shore deep bottoms.

Description: "*Head: slightly deeper than long, lateral cephalic lobe well developed, narrowly to broadly rounded; rostrum absent; eyes reniform, very slightly enlarged to enlarged and meeting dorsally in reproductive male. Antenna 1: medium length, about 0.3 times as long as body, subequal to or up to 0.5 times as long as antenna 2; peduncular article 1 short, from as long as deep to 1.8 times as long as deep, with long posterodistal tooth; accessory flagellum 6- to 10articulate, not forming cap; callynophore, well-developed 2-field in female and male, with posterodistal setae or spines; flagellum 19n9, 10- to 90-articulate; calceoli present in female and male or in male only. Antenna2: about 0.4 times as long as body, occasionally as long as body in male; peduncle with brush setae in female and male, peduncular articles 4 and 5 not swollen in female or male; calceoli present in female and male or in male only.*

*Mouthpart bundle: subquadrate. Epistome and upper lip: separate, upper lip produced, rounded, subacute or acute. Mandible: incisors symmetrical with slightly*

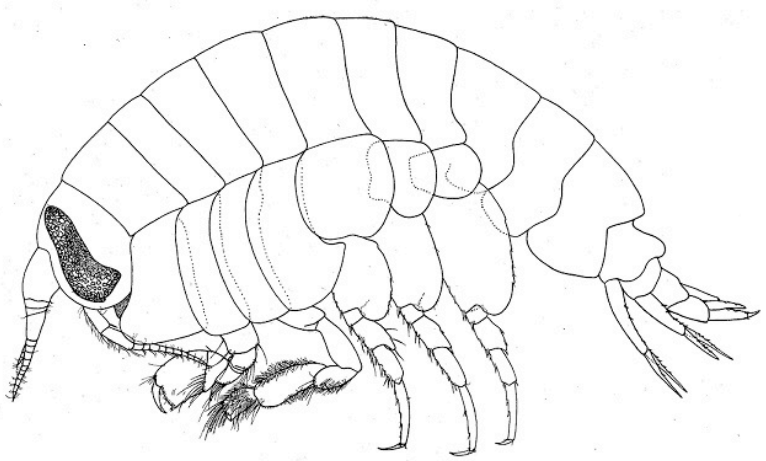
*convex margins; left lacinia mobilis a small slender spine or .absent; accessory spine row, left with 3 or 4 spines, right with 4 spines, rarely more variable; molar a setose tongue with spines absent to well developed, without triturating surface; mandibular palp attached midway; article 1 short, about as long as broad or twice as long as broad; article 2 elongate, slender to strongly broadened distally, with setae along distal third of medial margin and on distolateral corner; article 3 slender, falcate, without A- or B-setae, with D-setae weakly to strongly developed but always proximal, with E-setae. Maxilla 1: inner plate small, narrow with 2 apical plumose setae; outer plate extremely narrow, with 11spine-teeth in a 7/4 crown arrangement, ST1 to ST3 large, stout, without cusps or weakly cuspidate, ST4 to ST6 large, slender, multicuspidate, ST7 short or long, displaced from ST6, multicuspidate medially or distally, STA 0- to 4-cuspidate, STB-STC 2- to 5- cuspidate, STD 1- to 6-cuspidate; palp large, 2-articulate, with 4-9 terminal spines and 1 or 2 flag setae. Maxilla 2: inner plate about three quarters as long as outer plate. Maxilliped: inner plate large, subrectangular, with 2, or 3 well-developed nodular spines, oblique setal row reduced, with 3-9 plumose setae; outer plate small to medium in size, subovate, distomedially truncated, apical setae and spines absent, medial spines reduced in size, bead-shaped, submarginal setae vestigial; palp well developed, with article 2 weakly to strongly broadened, dactylus well developed, unguis present.*

*Gnathopod 1: simple; coxa large, anterior margin concave, forming anteroventrally produced corner; ischium long to ·very long (2.0-4.5 times as long as broad); carpus long (2.4-2.7 times as long as broad) or very long (4.0-5.8 times as long as broad); carpus about 1.4 times as long as propodus; propodus long, subrectangular, about 4 times as long as broad, margins subparallel or slightly tapering, posterior margin smooth, straight, without spines; dactylus with large subterminal tooth, a row of medial spines and a row of cuticular teeth along posterior margin. Gnathopod 2: minutely subchelate, occasionally greatly expanded in female; coxa large, subequal in size to coxa 3; carpus long, posterior margin broadly lobate; propodus subrectangular; palm slightly acute, occasionally broadly transverse and concave; posterodistal corner without spines or occasionally with a minute spine.*

*Peraeopods 3 to 7: with short, slender dactyli. Peraeopod 4: coxa with well-developed posteroventral lobe; male, and sometimes female, merus/carpus with plumose setae. Peraeopod 5: coxa bilobate; basis expanded with posterior margin minutely crenate to deeply serrate. Peraeopod 7: basis, posterior margin slightly rounded with rounded posteroventral corner and rounded to straight posteroventral margin; merus slender, not expanded posteriorly.*

*Oostegites: from gnathopod 2· to peraeopod 5. Gills: from gnathopod 2 to peraeopod 7, strongly pleated with an expanded sac-like distal end, gill on peraeopod 7 tiny, not pleated.*

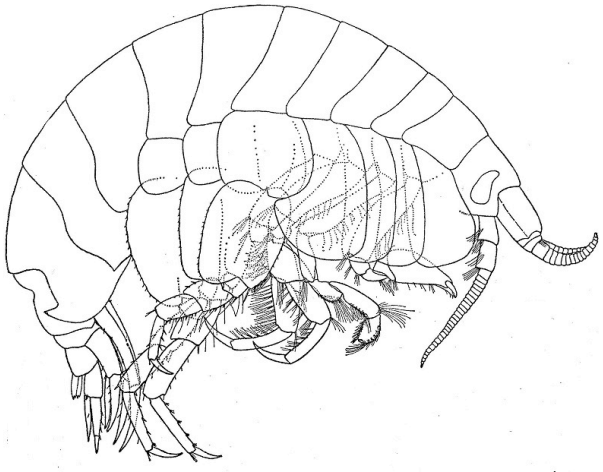
*Epimeron 3: usually with a notched posteroventral corner, notch occasionally absent. Urosomite 3: with small dorsolateral spines. Uropod 1: with long fine setae; rami subequal in length. Uropod 2: with few long fine setae; rami subequal in length, inner ramus with or without constriction. Uropod 3: peduncle short, 1.3-1.8 times as long as broad, without lateral flange; rami lanceolate, subequal in length, with long fine setae and minutely serrate margins; plumose setae absent in female and male; outer ramus 2-articulate. Telson: longer than broad, deeply cleft, without dorsal spines, distal margins rounded, with 1 large spine on each margin*." (from Lowry & Stoddart 1992)



*Koroga megalops* (from J. L. Barnard 1964b)

**Koroga –** A monotypic cosmopolitan genus containing *Koroga megalops*. J. L. Barnard (1964b) illustrates the animal well, providing views of all the appendages and mouthparts illustrated in the original description (Holmes 1908) and adding more. Additional redescription and discussion is presented in Lowry & Kilgallen 2014b. The species was originally taken in deep-water in SE Alaska, but is now known virtually worldwide. J. L. Barnard and Karaman (1991) characterize it as abysso-/bathypelagic, with a reported depth range of 500-2200m.

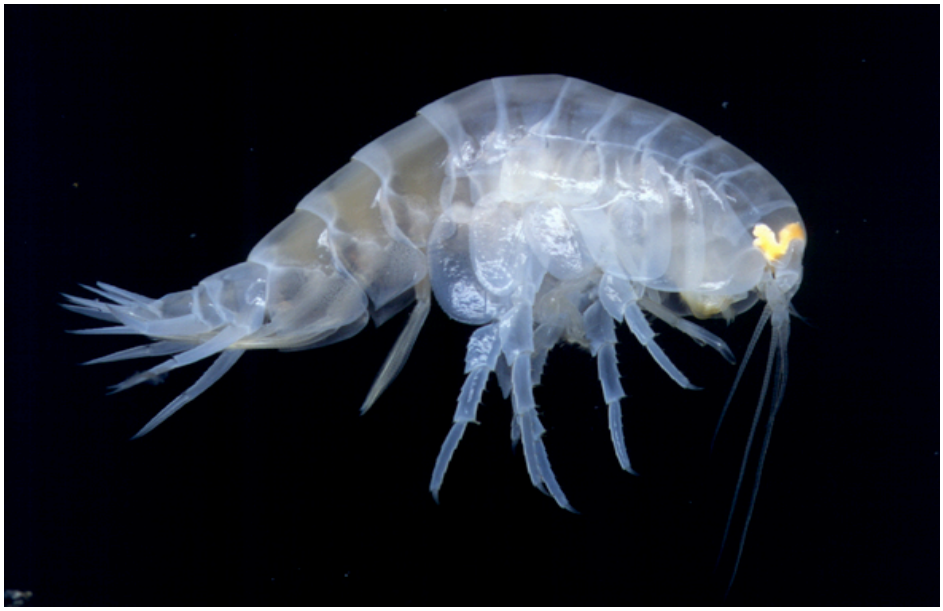
Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum with an elongate article 1 (at least twice as long as article 2) partially covering callynophore. Antenna 2 with brush setae. Mandible molar a setose tongue with strongly spinose triturating area. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate slightly shorter than outer plate. Gnathopod 1 subchelate; coxa 1 large, about as long as coxa 2, subrectangular with concave anterior margin; ischium short (length less than 2 × breadth); carpus compressed; propodus margins subparallel. Uropod 2 inner ramus not constricted. Telson notched*." (from Lowry & Kilgallen 2014b)



*Kyska dalli* (from Shoemaker 1964)

**Kyska -** Consisting only of *Kyska dalli*, the genus is restricted to the NEP, in the shallows around Kyska Island in the Aleutians. Shoemaker (1964) fully illustrates the species, commenting that it is very like *Anonyx nugax* in general aspect. The genus is separated from other similar forms, including *Anonyx*, by the chelate G1 in both sexes, the short robust antennae, and the absence of calceoli in the male. Lowry and Stoddart (1992) characterize this as a member of the anonychine group within the uristids, which includes only the genera *Anonyx*, *Ichnopus*, and *Kyska*, and is characterized by a mandibular molar consisting of a setose tongue with no triturative surface.

Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum forming cap covering callynophore. Antenna 2 with brush setae. Mandible molar a setose tongue. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate significantly shorter than outer plate. Gnathopod 1 chelate; coxa 1 large, about as long as coxa 2, subrectangular with concave anterior margin; ischium short (length less than 2 × breadth); carpus compressed; propodus margins tapering distally. Uropod 2 inner ramus not constricted. Telson notched*." (from Lowry & Kilgallen 2014b)

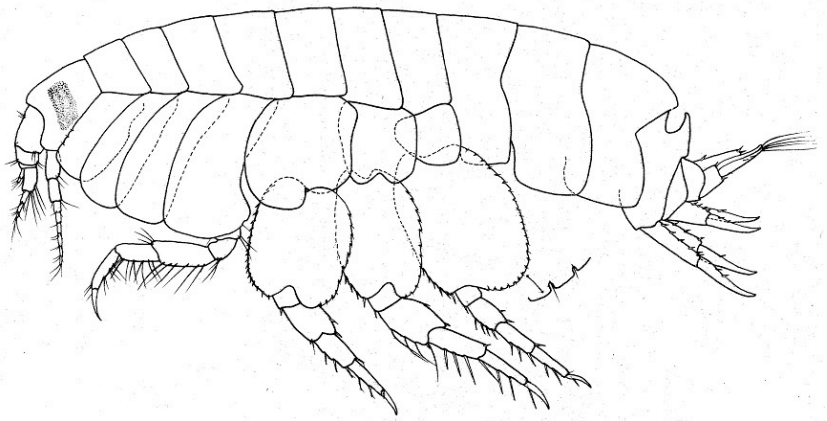


The uristid ***Stephonyx laqueus*** photographed from the 13°N area of the East Pacific Rise. The specimen was collected in the vicinity of hydrothermal vents (Photo: T. Haney)

**Stephonyx -** A modest sized genus of 13 species ( Senna and Sereno 2007, and Diffenthal and Horton 2007 each added one to the 9 listed by J. L. Barnard and Ingram in 1990). Two additional species were added by Lowry & Kilgallen (2014b). Two of these, *S. laqueus* (see photo below) and *S. mytilus* occur in the NEP. There is not currently a comprehensive key to the genus. Keys provided by Senna and Sereno and by Diffenthal and Horton each omit the species described by the other. The key of Narahara et al 2012 is nearly complete, missing only the new taxa described by Lowry & Kilglllen (2014) from Australia. All of their keys, however, include the NEP species. *S. mytilus* is described in J. L. Barnard and Ingram 1990. J. L. Barnard (1967) describes and figures *S. laqueus*. France (1994) reported *S. laqueus* from trawls in the San Clemente Basin at a

depth of 1875m. Both *S. laqueus* and *S. mytilus* were redescribed by Narahara et al (2012) based on additional material from the North West Pacific. The two NEP species are most easily separated grossly by the presence of a posteroventral tooth on the second epimeron of *S. mytilus*, absent in *S. laqueus*. Members of the genus are not easily distinguished from members of other similar genera, and the generic key should be used to place them in *Stephonyx*. Lowry and Stoddard (1989) created the genus, differentiating its scavenging members from the commensal genus *Euonyx*, where they had previously been placed. No members of the latter genus are known from the NEP.

Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum not forming cap covering callynophore. Antenna 2 with weakly developed brush setae. Mandible molar a setose tongue with vestigial triturating area, a reduced column with a triturating surface or occasionally a raised weakly setose plate. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate slightly shorter than outer plate. Gnathopod 1 chelate; coxa 1 reduced, significantly shorter than coxa 2, subquadrate or tapering distally; ischium long (length 2 × to 4 × breadth) to very long (length 4 × to 6 × breadth); carpus very long (length more than 4 × breadth); propodus margins subparallel. Uropod 2 inner ramus not constricted. Telson deeply cleft*." (from Lowry & Kilgallen 2014b)



"*Uristes" entalladurus*" with detail of P7 basal lobe setation (from J. L. Barnard 1963)

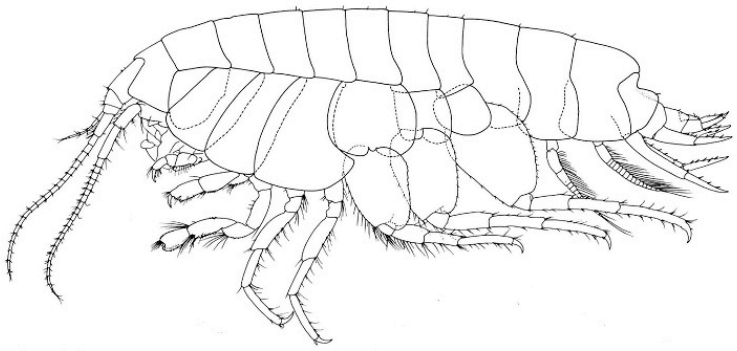
**Uristes –** As remarked under *Tryphosella* in Lysianassidae, J. L. Barnard and Karaman (1991) recommend that the species of *Tryphosella* and *Uristes* be pooled as species inquirenda pending reanalysis. Since this places together members of two genera now in separate families it presents us with a conundrum. The question which must be answered is whether or not a better method of separating these two genera has been found in the intervening years. The above authors present the "traditional" and presumably inadequate method as "(1) small head in *Uristes*, large in *Tryphosella*; (2) short carpus of gnathopod 1 in *Uristes*, longer in *Tryphosella*; and (3) small and ordinary prebuccal region in *Uristes*, large and protuberant epistome in *Tryphosella*.". A narrower definition of *Uristes* used by Lowry & Kilgallen (2014b) allows this separation, and removes much of the confusion between *Tryphosella* and *Uristes*, although some species require further investigation to clarify details of their morphology.

The genus had 22 species allocated to it by J. L. Barnard and Karaman (1991), of which four were from the NEP. One of these, *U. californicus*, has since been removed to *Tryphosella* (Lowry and Stoddart 1997). J. L. Barnard (1967) mentions the close

similarity in many characters of his *Orchomene tabasco* (now *Orchomenella*) and *Uristes dawsoni*. While the two do offer close resemblance, he provides a series of characters in which they differ. Since SCAMIT members have yet to record *U. dawsoni* from sampling off our coast, the most likely species we might encounter is *U. entalladurus* (J. L. Barnard 1963b). This is normally found on very shallow wave-swept sandy bottoms, and has been encountered in the most shallow samples taken in environmental monitoring surveys in the SCB. *U. entalladurus* can be easily distinguished from both *U. dawsoni* and *U. perspinis* by having a large acute reflexed process on the first urosomite (J. L. Barnard 1963b, Figure 5).

The status of these last three taxa has recently been reviewed by Lowry & Kilgallen (2014b), who restricted the genus to only two species. Two the NEP taxa were deemed *Incertae Sedis*, with *U. dawsoni* being moved to an unnamed genus of unknown family affinity, and *U. entalladurus* being placed in an unnamed genus within the Lysianassidae Tryphosinae. The remaining species *U. perspinis* was removed to the Lysianassidae Tryphosinae genus *Cedrosella*. This leaves no valid members of the genus currently known from the NEP, but does not allow further placement of the two of the three species until recently placed in *Uristes* from this area. In their remarks Lowry & Kilgallen (loc. cit.) indicate that the original descriptions of the taxa viewed as of uncertain affinities are not complete enough to allow further placement at this time.

Diagnostic description: [based on type species] "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum not forming cap covering callynophore or flagellum with an elongate article 1 (at least twice as long as article 2) partially covering callynophore. Antenna 2 without brush setae. Mandible molar ridge-like, narrow, setose with narrow distal triturating surface. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate slightly shorter than outer plate. Gnathopod 1 subchelate; coxa 1 large, about as long as coxa 2, subrectangular with straight anterior margin or distally subovate; ischium short (length less than 2 × breadth); carpus short (length 1 to 2 × breadth) to long (length 2 to 4 × breadth); propodus margins subparallel or slightly tapering. Uropod 2 inner ramus not constricted. Telson deeply cleft*." (from Lowry & Kilgallen 2014b)



*Ventiella sulfuris* (from J. L. Barnard & Ingram 1990)

**Ventiella –** Newly established by J. L. Barnard and Ingram (1990) it remains monotypic. *Ventiella sulfuris* is present at NEP vent sites in huge numbers, forming over 99% of the amphipods sampled around vents (J. L. Barnard and Ingram 1990). Those authors studied material from both the Galapagos Rift zone, and from the East Pacific Rise, and did not detect sufficient morphological variability to establish two species.

Genetic information (France *et al.* 1992) suggests that the populations in the two geographically separate areas are also genetically separate, and show virtually no evidence of gene flow between them. Within an area, such as at various sites along an axial ridge separated by up to 1200 km, genetic differences were very slight (France *et al.* 1992). This low level of genetic difference in contiguous or nearly contiguous portions of the population emphasizes the genetic differences between the populations of this "species" at the Galapagos and East Pacific Rise vent systems. No second species has yet been differentiated, but the genetic data suggest that perhaps new morphological characters might yield a separation which reflects the genetic makeup of the two populations. The genus bears considerable similarity in appearance to *Schisturella*, and is keyed with species of that genus in J. L. Barnard and Ingram (1990)(see under **Schisturella** above). Additional distributional information is presented by Vinogradov (1993).

Diagnostic description: "*Antenna 1 peduncle article 1 without anterodistal lobe; accessory flagellum forming cap covering callynophore. Antenna 2 brush setae [unknown]. Mandible molar a reduced column with convex, fully triturating surface. Maxilla 1 outer plate a well developed 7/4 crown. Maxilla 2 inner plate subequal to or slightly longer than outer plate. Gnathopod 1 subchelate; coxa 1 reduced, significantly shorter than coxa 2, tapering distally; ischium short (length less than 2 × breadth); carpus long (length 2 to 4 × breadth); propodus margins subparallel. Uropod 2 inner ramus not constricted. Telson notched*." (from Lowry & Kilgallen 2014b)

**Family Valettiopsidae** - The composition of this group, and its placement, have been in dispute. Thurston (1989), for instance, has recommended that the genera *Valettiopsis* and *Valettietta* be removed from the lysianassoids because of their possession of a toothed incisor process. Lincoln and Thurston (1983) used the shared possession of a toothed incisor to place *Alicella* with *Valettiopsis*, *Valettietta*, and *Valettia*. While they viewed all these genera with a toothed incisor as having a "broadly similar facies", they suggested that *Valettia* was not closely affiliated with the others. De Broyer (1985a) also raised the same concerns, stating that the group would be removed from the lysianassoids and placed in their own family. Lowry and De Broyer (2008) formally separated and described the family, reallocating some genera formerly assigned to the "valletiopsid group" to the Alicellidae. Relationships remain controversial, but the group is retained here within the lysianassoids pending further resolution. It is explicitly referred to as "not lysianassoid" by Lowry and De Broyer (2008), who compare it to eusiroids, but do not ultimately place the family within a superfamily.

Description. "**Head** free, not coalesced with pereonite 1; exposed; as long as deep, or deeper than long; anteroventral margin weakly recessed, anteroventral margin moderately excavate, anteroventral corner subquadrate; **rostrum absent**; eyes absent. Body laterally compressed; cuticle smooth.

*Antenna 1* subequal to antenna 2; peduncle with sparse robust and slender setae; 3-articulate; peduncular article 1 longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present; antenna 1 callynophore present. *Antenna 2* present; short, or medium length; articles not folded in zigzag fashion; without hook-like process; flagellum longer than peduncle; 5 or more articulate; not clavate; *calceoli* present, or 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, strongly setose along medial margin; 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, small; palp 4-articulate, article 3 without rugosities. *Labium* smooth.

**Pereon**. Pereonites 1-7 separate; complete; sternal gills absent; pleurae absent. *Coxae 1-7* well developed, none fused with pereonites. *Coxae 1-4* longer than broad, overlapping, coxae not acuminate. *Coxae 1-3* not successively smaller, none vestigial or coxa 1 reduced. *Coxae 2-4* none immensely broadened.

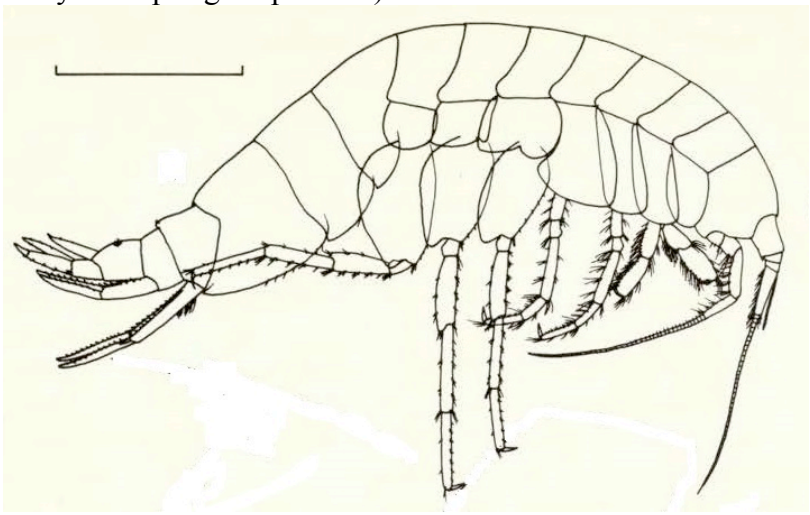
*Gnathopod 1* not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2; smaller than coxa 2, or subequal to coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus; gnathopod 1 not produced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

*Pereopods* heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. *Pereopod 3* well developed. *Pereopod 4* well developed. 3-4 not glandular; 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, or small or poorly developed. **Coxa** larger than coxa 3, not acuminate, **with small posterior lobe**; carpus not produced. *Pereopods 5-7* with few robust or slender setae; dactyli without slender or robust setae. *Pereopod 5* well developed; shorter than pereopod 6, or subequal in length to pereopod 6; coxa smaller than coxa 4, without posterior lobe or equilobate; basis expanded, subrectangular or subquadrate, with posteroventral lobe or without posteroventral lobe; merus/carpus free; carpus linear; setae absent. *Pereopod 6* subequal in length to pereopod 7, or longer than pereopod 7; merus/carpus free; dactylus without setae. *Pereopod 7* with 6-7 well developed articles; longer than pereopod 5; similar in structure to pereopod 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* setose.

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

without recurved spines. *Telson* laminar; deeply cleft; longer than broad; apical robust setae present." (Lowry and Springthorpe 2001)



*Valettietta lobata*, scale line is 5mm (from Lincoln & Thurston 1983)

**Valettietta -** The genus is only represented within the NEP fauna by a single species, *V. cavernicola*, an anchihaline form from the Galapagos (Stock and Iliffe 1990). The authors acknowledge that all other members of the genus are from deep water, but note that such deep-water/cave faunal connections are not uncommon. The species is known from a few small individuals, and is presumably restricted to its anchihaline habitat. It should not be taken in either fully saline waters, or outside caves.

Diagnosis: "*Body robust, compressed, pleosome well developed; urosome segment 1 with large, acute, mid-dorsal tooth, segment 3 broad and dorsally flattened with lateral margins raised. Antenna 1 and 2 elongate, slender, subequal length, peduncle articles 2-3 of antenna 1 compressed, flagellum article 1 conjoint, accessory flagellum well developed, multi-articulate. Upper lip weakly notched; lower lip without inner lobes, mandibular lobes elongate. Mandible having robust incisor, strong spine row interspersed with plumose setae, and large triturative molar; palp attached level with molar, article 2 elongate with only distomarginal setae. Maxilla 1 inner plate densely setose along entire inner margin, palp robust, 2-articulate. Maxilla 2 inner and outer plates subequal length, inner plate with dense mediodistal and facial setae. Maxilliped basic, outer plate with short inner marginal spines grading distally to robust elongate spines. Coxal plate 1 much shorter than 2 and partly concealed; plate 4 with only shallow posterior emargination. Coxal plate 5 anterior lobe deeper than posterior lobe. Epimeral plate 2 distal angle with tooth. Gnathopods 1 and 2 subchelate; gnathopod 1 palm transverse. Pereopod 7 basis expanded, lacking posterodistal lobe. Uropods biramous, lanceolate, spinose; uropod 3 outer ramus 2-articulate. Telson deeply cleft, each lobe with several large apical spines. Branchial lobes bearing small accessory lobe at the base*." (from Lincoln & Thurston 1983)

***Valettiopsis concava*** Hendrycks 2007 (Photo courtesy MBARI)

**Valettiopsis –**Two recent treatments of the genus have appeared, that of Serejo and Wakabara (2003) and that of Horton (2004). Each described new taxa, bringing the total number of species in the genus to seven. Horton provides a key to all species. Hendrycks (2007) adds another species to the genus, and provides a new key which supersedes those of recent revisions. The best known species recorded from the NEP is *V. dentata* of Holmes. Horton reexamined the holotype, and provides some additional illustrations to augment those provided in the original description (Holmes 1908). Hurley (1963) examined a large lot of specimens from the Coronado Submarine Canyon, finding minor differences (not specified) from Holmes' description.

J. L. Barnard (1967) illustrates material taken off Baja California. Hendryck's new species is easily separable from Holme's species by the dorsal carinations of the pereonites and pleonites in *V. concava*, lacking in *V. dentata*.

Perhaps complicating this is the detection in the Bight '13 regional monitoring program of another species seemingly closely allied with *Valettiopsis*. This species, provisionally designated *Valettiopsis* sp DC1 was taken from a single canyon bottom sample in Dume Submarine Canyon at a depth of 564m. The lot contained numerous females and one mature male, allowing examination of sexual dimorphism. It differs from the diagnosis of *Valettiopsis* in several characters, most notably in the structure of the first gnathopod, but also in a relatively short ischium on gnathopod 2, in having a very reduced callynophore, and in characteristics of several of the mouthparts. It does have a toothed incisor process on both mandibles, and also a lacinia mobilis on both mandibles, although the right mandible lacinia is reduced. The legs are also quite different from other species in *Valettiopsis*, being very elongate with long narrow propods, and straight dactyls nearly half the propod length.

*Valettiopsis* sp DC1 lateral view of female, 564m Dume Submarine Canyon
(photo L. Lovell, LACSD)

The specimens are being forwarded to Dr. Ed Hendrycks (Canadian Museum of Nature) for examination, as he continues his investigations of the group.

Diagnosis: "*Antennae 1 and 2 elongate, slender, subequal length, peduncle articles 2–3 of antenna 1 compressed, callynophore in both male and female, accessory flagellum well developed, multiarticulate. Mandible, incisor robust, widely toothed; strong spine row interspersed with plumose setae; molar triturative; palp attached level or distal to molar. Maxilla 1, outer plate with 11 large multicuspidate spine-teeth in a 7:4 arrangement; inner plate densely setose along inner margin; palp robust, two-articulate. Maxilla 2, inner and outer plates subequal. Maxilliped, inner and outer plates well developed; palp strongly exceeding outer plate; dactyl well developed. Coxa 1 shortened, partly concealed, tapering; coxa 4 posteroventral lobe weak. Gnathopods 1 and 2 elongate and subchelate. Pleosome well developed; urosomite 1 with mid-dorsal tooth. Uropods biramous, lanceolate, spinose; uropod 3, outer ramus two-articulate. Telson elongate, deeply cleft.*" (from Horton 2004)

References Cited

**Alonso de Pina, Gloria María. 1993**. *Pachychelium barnardi*, new species, from Argentina, and the occurrence of other lysianassids on the Argentine continental shelf (Amphipoda: Lysianassidae). *Journal of Crustacean Biology* 13(2): 377-382.

**Ansell, Alan D. 1969**. Association of the amphipod *Acidostoma neglectum* Dahl with the anthozoan *Peachia hastata* Gosse. *Journal of Natural History* 3(5): 345-347.

**Arndt, Carolin E., Jørgen Berge, and Angelika Brandt. 2005.** Mouthpart-atlas of Arctic sympagic amphipods – trophic niche separation based on mouthpart morphology and feeding ecology. *Journal of Crustacean Biology* 25(3): 401-412.

**Barnard, J. Laurens. 1954.** Four species of bathypelagic Gammaridea (Amphipoda) from California. *Allan Hancock Foundation Occasional Paper* 13:52-69.

**---------. 1955**. Notes on the amphipod genus *Aruga* with the description of a new species. *Bulletin of the Southern California Academy of Sciences* 54(2): 97-103.

**---------. 1959.** Epipelagic and under-ice Amphipoda of the central Arctic Basin. *Geophysical Research Papers* No. 63 "Scientific Studies at Fletcher's Ice Island, T-3, 1952-1955," Volume I: 115-152.

**———. 1961**. Gammaridean Amphipoda from Depths of 400 to 6000 Meters. IN: *Galathea Report* 5: 23-128. Copenhagen: Danish Science Press, Ltd.

**---------. 1963a**. Los Anfipodos Bentonicos Marinos de la Costa Occidental de Baja California. *Revista De La Sociedad Mexicana De Historia Natural* XXIV: 205-251.

**———. 1963b**. Relationship of benthic Amphipoda to invertebrate communities of inshore sub-littoral sands of Southern California. *Pacific Naturalist* 3(15): 439-468.

**———. 1964a**. Marine Amphipoda of Bahia de San Quintin, Baja California. *Pacific Naturalist* 4(3): 55-139.

**———. 1964b**. Some Bathyal Pacific Amphipoda Collected by the U.S.S. *Albatross*. *Pacific Science* 18: 315-335.

---------. **1964c**. Deep-sea Amphipoda (Crustacea) collected by the R/V "Vema" in the Eastern Pacific Ocean and the Caribbean and Mediterranean Seas. *Bulletin of the American Museum of Natural History* 127(1):1-46.

**———. 1966a**. Benthic Amphipoda of Monterey Bay, California. *Proceedings of the United States National Museum* 119(3541): 1-41.

**———. 1966b**. Submarine Canyons of Southern California. Part V. Systematics: Amphipoda. *Allan Hancock Pacific Expeditions* 27(5): 1-166.

**---------. 1967.** Bathyal and Abyssal gammaridean Amphipoda of Cedros Trench, Baja California. *United States National Museum Bulletin* 260: 1-205.

**———. 1969a**. Gammaridean Amphipoda of the Rocky Intertidal of California: Monterey Bay to La Jolla. *United States National Museum Bulletin* 258: 1-230.

**---------. 1969b.** The families and genera of marine gammaridean Amphipoda. *United States National Museum Bulletin* 271: 1-535.

**———. 1971**. Gammaridean Amphipoda from a Deep-Sea Transect off Oregon. *Smithsonian Contributions to Zoology* 61: 1-86.

**---------, and Camilla L. Ingram. 1986.** The supergiant amphipod *Alicella gigantea* Chevreux from the North Pacific Gyre. *Journal of Crustacean Biology* 6(4): 825-839.

**---------, and ---------. 1990**. Lysianassoid Amphipoda (Crustacea) from deep-sea thermal vents. *Smithsonian Contributions to Zoology* 499: 1-80.

**---------, and Gordan S. Karaman. 1987**. Revisions in classification of gammaridean Amphipoda (Crustacea), Part 3. *Proceedings of the Biological Society of Washington* 100(4): 856-875.

**---------, and ---------. 1991** The Families and Genera of Marine Gammaridean Amphipoda (except marine gammaroids). *Records of the Australian Museum* Supplement 13 (Parts 1 and 2): 1-866.

**---------, and Eric Shulenberger. 1976**. Clarification of the abyssal amphipod, *Paralicella tenuipes* Chevreux. *Crustaceana* 31(3): 267-274.

**---------. and James Darwin Thomas. 1990.** *Ensayara jumanae*, a new species from Belize, Caribbean Sea (Amphipoda, Lysianassidae). *Proceedings of the Biological Society of Washington* 103(1): 120-126.

**Barnard, Keppel Harcourt. 1925.** Contributions to the crustacean fauna of South Africa. No. 8. Further additions to the list of Amphipoda. *Annals of the South African Museum* 20: 319-380.

**Bellan-Santini, Denise. 1990**. Nouvelles espèces d'*Orchomene* s.l. (Crustacea-Amphipoda) des fonds abyssaux. Affinites avec les autres *Orchomene* profonds. *Beaufortia* 41(3): 15-23.

**---------, and Michael H. Thurston. 1996**. Amphipoda of the hydrothermal vents along the mid-Atlantic ridge. *Journal of Natural History* 30: 685-702.

**Berge, Jørgen, Geoffrey Boxshall, and Wim Vader. 2000.** Cladistic analysis of the Amphipoda, with special emphasis on the origin of the Stegocephalidae. *Polskii Archiwum Hydrobiologii* 47(3): 379-400.

**---------, Wim Vader, and Susanne Lockhart. 2004**. A survey of amphipod associates of sea urchins, with description of new species in the genera *Lepidepecreela* (Lysianassoidea: Lepidepecreellid group) and *Notopoma* (Photoidea: Ischyroceridae) from Antarctic cidarids. *Deep-Sea Research II* 51: 1717-1731.

**Biernbaum, Charles K., and Elizabeth L. Wenner. 1993**. Trapping of necrophagous crustaceans on the upper continental slope off South Carolina, U.S.A. *Journal of Crustacean Biology* 13(3): 601-608.

**Birstein, Yakov Avand'Evich, and M. E. Vinogradov. 1958.** Pelagicheskie gammaridy (Amphipoda, Gammaridea) severo-zapadnoi chasti Tikogo Okeana. *Trudy Instituta Okeanologii, Akademiia Nauk SSSR* 27: 219-257.

**---------, and ---------. 1960.** Pelagicheskie gammaridy tropicheskoi chasti Tixogo Okeana. *Trudy Instituta Okeanologii, Akademiia Nauk SSSR* 34: 165-241.

**---------, and ---------. 1970**. On the fauna of pelagic gammarids in the Kurile-Kamchatka area of the Pacific Ocean. *Academy of Sciences of the USSR, Proceedings of the Shirshov Institute of Oceanology* 86: 419-438.

**Blake, James A., Joann Muramoto, Birgitte Hilbig, and Isabelle P. Williams. 1993**. July 1991 Survey (R/V Wecoma) Final Report. Benthic Biology and Sediment Characterization. Woods Hole, Massachusetts, U.S.A., Science Applications International Corporation**:** 130pp. + appendices.

**Blankenship, Lesley E., A. Aristides Yayanos, Donald B. Cadien, and Lisa A. Levin. 2006**. Vertical zonation patterns of scavenging amphipods from the Hadal zone of the Tonga and Kermadec Trenches. *Deep-Sea Research, Part I* 56(1): 48-61.

**Bousfield, Edward L. 1979.** A revised classification and phylogeny of the amphipod Crustacea. *Transactions of the Royal Society of Canada* 4(14): 343-390.

**---------. 1982.** Amphipoda. Gammaridea. Pp. 254-285, 293-294 IN: Parker, Sybil P. (ed.). *Synopsis and Classification of Living Organisms*, Volume 2. McGraw Hill, New York, New York.

**---------. 1987**. Amphipod parasites of fishes of Canada. *Canadian Bulletin of Fisheries and Aquatic Sciences* 217: 1-37.

**---------. 2001.** An updated commentary on phyletic classification of the amphipod Crustacea and its application to the North American fauna. *Amphipacifica* 3(1): 49-119.

**---------, and Zbigniew Kabata. 1988**. Amphipoda. Pp. 149-163 IN: Margolis, Leo and Zbigniew Kabata (eds.). *Guide to the parasites of fishes of Canada. Part II. Crustacea.*. Canadian Special Publications in Fisheries and Aquatic Sciences. Ontario: National Museums of Canada.

**---------, and C.-t. Shih. 1994.** The phyletic classification of amphipod crustaceans: problems in resolution. *Amphipacifica* 1(3): 76-134.

**Bowman, Thomas E. 1967**. Bioluminescence in two species of pelagic amphipods. *Journal of the Fisheries Research Board of Canada* 24(3): 687-688.

**---------, and Raymond B. Manning. 1972**. Two arctic bathyal crustaceans: the shrimp *Bythocaris cryonesus*, new species, and the amphipod *Eurythenes gryllus*, with in situ photographs from Ice Island T-3. *Crustaceana* 23: 187-200.

**---------, and John C. McCain. 1967**. Variation and distribution of the pelagic amphipod *Cyphocaris challengeri* in the northeast Pacific (Gammaridea: Lysianassidae). *Proceedings of the United States National Museum* 122(3588): 1-14.

**---------, and Robert A. Wasmer. 1984**. The deep-sea amphipod *Paracyphocaris predator* (Gammaridea: Lysianassidae) associated with the pelagic shrimp *Oplophorus novaezeelandiae* as an egg-mimic. *Proceedings of the Biological Society of Washington* 97(4): 844-848.

**Brusca, Gary J. 1967**. The ecology of pelagic Amphipoda, I. Species accounts - vertical zonation and migration of Amphipoda from the waters off Southern California. *Pacific Science* 21(3): 382-393.

**Bucklin, A., R. R. Wilson, and Ken L. Smith Jr. 1987.** Genetic differentiation of sea-mount and basin populations of the deep-sea amphipod *Eurythenes gryllus*. *Deep-Sea Research* 34: 1795-1810.

**Budnikova, L. L. 2005**. Two new species of *Psammonyx* and the identity of the genus *Wecomedon* (Amphipoda, Gammaridea). *Publications of the Seto Marine Biological Laboratory* 40(3/4): 179-197.

**Bulycheva, A. I. 1955**. Novye vidy bokoplavov (Amphipoda, Gammaridea) iz Japonskogo Morja II. *Akademia Nauk SSSR, Trudy Zoologicheskogo Instituta* 21: 193-207.

**Busdosh, Michael, Gordon A. Robilliard, K. Tarbox, and C. L. Beehler. 1982**. Chemoreception in an Arctic amphipod crustacean: a field study. *Journal of Experimental Marine Biology and Ecology* 62: 261-269.

**Cadien, D. B. and L. L. Lovell. 2014**. A Taxonomic Listing of Benthic Macro- and Megainvertebrates from Infaunal & Epifaunal monitoring and research programs in the Southern California Bight. Los Angeles, California, USA**:** 186pp.

**Conlan, Kathleen E. 1991**. Precopulatory mating behavior and sexual dimorphism in the amphipod Crustacea. *Hydrobiologia* 223: 255-282.

**Dahl, Eric. 1959**. Amphipoda from depths exceeding 6000m. *Galathea Reports* 1: 211-241.

**---------. 1979**. Deep-sea carrion feeding amphipods: evolutionary patterns in niche adaptation. *Oikos* 53: 167-175.

**Dalkey, Ann. 1998**. A new species of amphipod (Crustacea: Amphipoda: Lysianassoidea) from the Pacific Coast of North America. *Proceedings of the Biological Society of Washington* 111(3): 621-626.

**De Broyer, Claude. 1985a**. Description de *Falklandia* gen. n. de l'Océan Austral et définition des Lysianassoidea uristidiens. *Zoologica Scripta* 14: 303-312.

**———. 1985b**. Évolution du complexe *Orchomene* Boeck (Amphipoda, Lysianassidae). *Annales De La Société Royale Zoologique De Belgique* 114, Supplement 1: 197-198.

**---------, Fabienne Nyssen, and Patrick Dauby. 2004**. The crustacean scavenger guild in Antarctic shelf, bathyal and abyssal communities. *Deep Sea Research Part II Topical Studies in Oceanography* 51(14-16): 1733-52.

**----------, and Wim Vader. 1990**. Revision and notes on the biology of *Orchomenella recondita* (Stasek, 1958) (Amphipoda, Lysianassoidea) an associate of sea anemones. *Beaufortia* 41(5): 31-38.

**De Robertis, Alex, Ketil Eiane, and Greg H. Rau. 2001**. Eat and run: anoxic feeding and subsequent aerobic recovery by *Orchomene obtusus* in Saanich Inlet, British Columbia, Canada. *Marine Ecology Progress Series* 219: 221-227.

**Dickinson, John J., and Andrew G. Carey Jr. 1978**. Distribution of gammarid Amphipoda (Crustacea) on Cascadia Abyssal Plain (Oregon). *Deep-Sea Research* 25: 97-106.

**Diffenthal, Mark, and Tammy Horton. 2007**. *Stephonyx arabiensis* (Crustacea: Amphipoda: Lysianassoidea: Uristidae), a new deep-water scavenger species from the Indian Ocean, with a key to the genus *Stephonyx*. *Zootaxa* 1665:31-41.

**Diviacco, Giovanni and Sandro Ruffo. 1982**. Family Lysianassidae. Pp. 469-576 IN: The Amphipoda of the Mediterranean. Part 2. Gammaridea (Haustoriidae to Lysianassidae). *Memoires de l'Institut Océamographique du Monaco* **13**(2): 365-576.

**France, Scott C. 1993.** Geographic variation among three isolated populations of the hadal amphipod *Hirondellea gigas* (Crustacea: Amphipoda; Lysianassoidea). *Marine Ecology Progress Series* 92: 277-287.

**---------. 1994**. Genetic population structure and gene flow among deep-sea amphipods, *Abyssorchomene* spp. from six California Continental Borderland basins. *Marine Biology* 118:67-77.

**---------, and T. D. Kocher. 1996**. Geographic and bathymetric patterns of mitochondrial 16S rRNA sequence divergence among deepsea amphipods, *Eurythenes gryllus*. *Marine Biology* 126(4): 633-643.

**---------, Robert R. Hessler, and R. C. Vrijenhoek. 1992**. Genetic differentiation between spatially-disjunct populations of the deep-sea, hydrothermal vent-endemic amphipod *Ventiella sulfuris*. *Marine Biology* 114: 551-559.

**Gable, Michael S. and Eric A. Lazo-Wasem. 1990.** Lysianassidae (Amphipoda: Lysianassoidea) of Bermuda. *Journal of Crustacean Biology* 10(4): 721-734.

**Graeve, M., Patrick Dauby, and Yves Scailteur. 2001**. Combined lipid, fatty acid and digestive tract content analyses: a penetrating approach to estimate feeding modes of Antarctic amphipods. *Polar Biology* 24(11): 853-862.

**Griffiths, C. L. 1977.** Deep-sea amphipods from west of Cape Point, South Africa. *Annals of the South African Museum* 73(4): 93-104.

**Gurjanova, Eupraxie F. 1962**. *Scud Shrimps (Amphipoda- Gammaridae) of the Northern Part of the Pacific Ocean*. Leningrad: Academy of Sciences of the U. S. S. R. Publishing House.

**Haggitt, T. R., and R. C. Babcock. 2003**. The role of grazing by the lysianassid amphipod *Orchomenella aahu* in dieback of the kelp *Ecklonia radiata* in north-eastern New Zealand. *Marine Biology* 143(6): 1201-1211.

**Hendrycks, Ed A. 2007**. A new species of *Valettiopsis* Holmes, 1908 (Crustacea: Gammaridea: Lysianassoidea) from abyssal waters off California. *Zootaxa* 1501: 45-56

**---------, and Kathleen Conlan. 2003**. New and unusual abyssal gammaridean Amphipoda from the north-east Pacific. *Journal of Natural History* 37, no. 19: 2303-68.

**Hessler, Robert R**., **Camilla L. Ingram, A. Aristides Yayanos, and B. R. Burnett. 1978**. Scavenging amphipods from the floor of the Philippine Trench. *Deep-Sea Research* 25: 1029-1047.

**Hirayama, Akira. 1985**. Taxonomic studies on the shallow water gammaridean Amphipoda of west Kyushu, Japan. V. Leucothoidae, Liljeborgiidae, Lysianassidae (*Prachynella*, *Aristias*, *Waldeckia*, *Ensayara*, *Lepidepecreum*, *Hippomedon*, and *Anonyx*. *Publications of the Seto Marine Biological Laboratory* 30(4/6): 167-212.

**———. 1986**. Taxonomic studies on the shallow water gammaridean Amphipoda of west Kyushu, Japan. VI. Lysianassidae (*Orchomene*), *Megaluropus* family group, Melitidae (*Cottesloe*, *Jerbarnia*, *Maera*, *Ceradocus, Eriopisella*, *Dulichiella*). *Publications of the Seto Marine Biological Laboratory* 3(1/2): 1-35.

**---------, and Taiji Kikuchi. 1980**. A new gammaridean Amphipoda, *Waldeckia elephas* sp. nov., attaching to the set net in Tomioka Bay, Amakusa, Japan. *Publications of the Amakusa Marine Biology Laboratory* 5(2): 143-151.

**Holmes, Samuel J. 1908**. The Amphipoda Collected by the U. S. Bureau of Fisheries Steamer 'Albatross' off the West Coast of North America, in 1903 and 1904, with Descriptions of a New Family and Several New Genera and Species. *Proceedings of the United States National Museum* XXXV(1654): 489-543.

**Horton, Tammy. 2004**. Revision of the amphipod genus *Valettiopsis* Holmes, 1908 (Crustacea: Lysianassoidea), with the addition of three new species. *Journal of Natural History* 38(14): 1735-1755.

**---------, and Michael H. Thurston. 2009**. *Hirondellea sindhusagar* (Crustacea, Amphipoda, Lysianassoidea), a new deep-water scavenger species from the Indian Ocean, with a key to the genus Hirondellea. *Zootaxa* 2096: 433-441.

**Hurley, Desmond E. 1963**. Amphipoda of the family Lysianassidae from the West Coast of North and Central America. *Allan Hancock Foundation Publications: Occasional Paper* 25: 1-160.

**Ide, Keiichiro, Kazutaka Takahashi. and Michio Omori.** 2007. Direct observation of swimming behaviour in a shallow-water scavenging amphipod *Scopelocheirus onagawae* in relation to chemoreceptive foraging. *Journal of Experimental Marine Biology and Ecology* 340: 70-79.

**---------, ---------, Koichi Sasaki, and Michio Omori**. 2006. Predation by scavenging amphipods to injured hatchery raised juvenile Japanese flounder *Paralichthys olivaceus* under laboratory conditions. *Fisheries Science* 72: 1209-1214.

**Ingólfsson, A., and I. Agnarsson. 1999**. *Anonyx sarsi*: a major unrecognized scavenger and predator in the intertidal zone. *Journal of the Marine Biological Association of the United Kingdom* 79(6): 1127-1128.

**Ingram, Camilla L**., **and Robert R. Hessler. 1983**. Distribution and behavior of scavenging amphipods from the central North Pacific. *Deep-Sea Research* 30(A): 683-706.

**Jamieson, Alan J., N. C. Lacey, Anna-Nina Lörz, Ashley A. Rowden, & S. B. Piertney. 2013**. The supergiant amphipod *Alicella gigantea* (Crustacea: Alicellidae) from hadal depths in the Kermadec Trench, SW Pacific Ocean. *Deep-Sea Research II*: 92: 107-113

**Jarrett, Norma E., and Edward L. Bousfield. 1982**. Studies on amphipod crustaceans of the Northeastern Pacific region. I. 4. Studies on the amphipod family Lysianassidae in the Northeastern Pacific region. *Hippomedon* and related genera: systematics and distributional ecology. *National Museums of Canada, Publications in Biological Oceanography* 10: 103-128.

**Jones, Emma G., Martin A. Collins, Philip M. Bagley, Steven Addison, and Imants G. Priede. 1998**. The fate of cetacean carcasses in the deep sea: observations on consumption rates and succession of scavenging species in the abyssal north-east Atlantic Ocean. *Proceedings of the Royal Society of London, Series B*. 265: 1119-1127.

**Just, Jean. 1979**. *Anonyx affinis* (Crust., Amphipoda: Lysianassidae), commensal in the bivalve *Musculus laevigatus*, with notes on *Metopa glacialis* (Amphipoda: Stenothoidae). *Astarte* 12: 69-74.

**Kaufmann, Ronald S. 1994**. Structure and function of chemoreceptors in scavenging lysianassoid amphipods. *Journal of Crustacean Biology* 14(1): 54-71.

**Keable, S. J. 1995**. Structure of the marine invertebrate scavenging guild of a tropical reef ecosystem: Field studies at Lizard Island, Queensland, Australia. *Journal of Natural History* 29(1): 27-45.

**Kilgallen, Niamh M. 2009.** New species of lysianassoid Amphipoda (Crustacea) associated with seamounts, marine canyons and cold seeps of New Zealand. *Zootaxa* 2298:1-30.

**---------, and James K. Lowry 2014**. The *Tryphosa* group (Crustacea: Amphipoda: Lysianassoidea: Lysianassidae: Tryphosinae). *Zootaxa* 3768(5):501-545.

**---------, Alan A. Myers, and David McGrath. 2007**. The genus *Sophrosyne* (Crustacea: Amphipoda: Lysianassoidea) in the North Atlantic, with a confirmation of the status of S. robertsoni. *Journal of the Marine Biological Association of the United Kingdom* 87: 1243-1246.

**Klages, Michael, Kay Vopel, Hartmut Bluhm, Thomas Brey, Thomas Soltwedel, and Wolf E. Arntz. 2001.** Deep-sea food falls: first observation of a natural event in the Arctic Ocean. *Polar Biology* 24:292-295.

**Lampitt, R. S., N. R. Merrett, and Michael H. Thurston. 1983**. Inter-relations of necrophagous amphipods, a fish predator, and tidal currents in the deep sea. *Marine Biology* 74: 73-78.

**Larsen, Kim**. 2007. Amphipoda (Crustacea: Peracarida) from the hydrothermal vent system of the Juan de Fuca Ridge, Escabana [sic] Trough and Gorda Ridge, Northeast Pacific. Part I. Lysiannassidae and Sebidae. *Zootaxa* 1445: 1-26.

**Ledoyer, Michel**. 1986. Crustaces Amphipodes Gammariens Families des Haustoriidae a Vitjazianidae. *Faune de Madagascar* 53(2): 599-1112.

**Lie, Ulf. 1974.** Distribution and structure of benthic assemblages in Puget Sound, Washington, USA. *Marine Biology* 26:203-223.

**Lincoln, Roger J. 1979**. *British Marine Amphipoda: Gammaridea*. British Museum (Natural History); London, England. 658pp.

**---------, and Michael H. Thurston. 1983**. *Valettietta*, a new genus of deep-sea amphipod (Gammaridea: Lysianassidae) with descriptions of two new species from the North Atlantic Ocean. *Bulletin of the British Museum of Natural History (Zoology)* 44(2): 85-101.

**Lowry, James K. 1984**. Systematics of the pachynid group of lysianassoid Amphipoda (Crustacea). *Records of the Australian Museum* 36(2): 51-105.

**---------. 1986.** The callynophore, a eucaridan/peracaridan sensory organ prevalent among the Amphipoda (Crustacea). *Zoologica Scripta* 75: 333-349.

**---------, and Claude De Broyer. 2008**. Alicellidae and Valettiopsidae, two new callynophorate families (Crustacea: Amphipoda). *Zootaxa* 1843:57-66.

**---------, and---------. 2015**. *Socarnoides* Stebbing, 1888. In: Horton, T.; Lowry, J. & De Broyer, C. (2013 onwards) World Amphipoda Database. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=177041

**---------, and Niamh M. Kilgallen. 2014a**. New tryphosine amphipods from Australian waters (Crustacea, Amphipoda, Lysianassoidea, Lysianassidae, Tryphosinae). *Zootaxa* (3844 (1)): 1-64.

---------, ---------. **2014b**. A generic review of the lysianassoid family Uristidae and descriptions of new taxa from Australian waters (Crustacea, Amphipoda, Uristidae). *Zootaxa* 3867 (1):1-92.

**---------, ---------. 2014c**. A revision of the lysianassid genus *Waldeckia* with the description of four new species (Crustacea, Amphipoda, Lysianassidae, Waldeckiinae subfam. n.). *Zootaxa* (3784 (4)): 301-345.

**---------., and S. D. A. Smith. 2003**. *Invertebrate Scavenging Guilds along the Continental Shelf and Slope of Eastern Australia - General Description*, FRDC Project 96/280. Australian Museum, Sydney, Australia.

**---------, and Roger T. Springthorpe (2001 onwards).** Amphipoda: Families and Subfamilies. Version 1: 1 September 2001. http://crustacea.net/.

**---------, and Helen E. Stoddart. 1983.** The shallow-water gammaridean Amphipoda of the subantarctic islands of New Zealand and Australia: Lysianassoidea. *Journal of the Royal Society of New Zealand* 13(4): 279-394.

**---------, and ---------. 1984**. Taxonomy of the lysianassoid genera *Phoxostoma* K. H. Barnard, *Conicostoma* Lowry & Stoddart, and *Ocosingo* J. L. Barnard (Amphipoda, Gammaridea). *Crustaceana* 47(2): 192-208.

———, **and ---------. 1986**. Protandrous hermaphrodites among the lysianassoid Amphipoda. *Journal of Crustacean Biology* 6: 742-748.

———, **and ---------. 1987**. A new South American genus and species in the amaryllidid group of lysianassoid Amphipoda. *Journal of Natural History* 21(5): 1303-1309.

———, **and ———. 1989.** *Stephonyx*, a new, widespread genus of lysianassoid Amphipoda. *Zoologica Scripta* 18(4): 519-525.

**---------, and ---------. 1992**. A revision of the genus *Ichnopus* (Crustacea: Amphipoda: Lysianassoidea: Uristidae). *Records of the Australian Museum* 44: 185-245.

———, **and ---------. 1993**. The *Onisimus* problem (Amphipoda, Lysianassoidea, Uristidae). *Zoologica Scripta* 22(2): 167-181.

**---------, and ---------. 1994.** Crustacea Amphipoda: lysianassoids from the tropical western South Pacific Ocean. *Resultats des Campagnes Musorstom* 12: 127-223.

**---------, and ---------. 1995**. The Amphipoda (Crustacea) of Madang Lagoon: Lysianassidae, Opisidae, Uristidae, Wandinidae and Stegocephalidae. Pp 97-174 IN: Lowry, J. K., ed. Amphipoda (Crustacea) of the Madang Lagoon, Papua New Guinea. *Records of the Australian Museum*, Supplement 22.

———, **and ---------. 1997**. Amphipoda Crustacea IV. Families Aristiidae, Cyphocarididae, Endevouridae, Lysianassidae, Scopelocheiridae, Uristidae. *Memoirs of the Hourglass Cruises* 9(1): 1-147.

**---------, and ---------. 2002a.** First records of lysianassoid amphipods (Crustacea) from the Andaman Sea. Pp. 165-188 IN: Bruce, Niel L., Mats Berggren, and S. Bussawarit. Proceedings of the International Workshop on the Crustacea in the Andaman Sea. Phuket Marine Biological Center, 29 November-20 December 1998. *Phuket Marine biological Center Special Publication* 23(1).

**---------, and ---------. 2002b**. The lysianassoid amphipod genera *Lepidepecreoides* and *Lepidepecreum* in southern waters (Crustacea: Lysianassidae: Tryphosinae). *Records of the Australian Museum* 54: 335-364.

**---------, and ---------. 2010a**. The deep-sea scavenging genus *Hirondellea* (Crustacea: Amphipoda: Lysianassoidea: Hirondelleidae fam. nov.) in Australian waters. *Zootaxa* 2329:37-55.

**---------, and ---------, 2010b**. Sophrosynidae, a new family in the Lysianassoidea (Crustacea: Amphipoda) with a revision of the genus *Sophrosyne*. *Zootaxa* 2370:1-35.

**---------, and ---------, 2011a**. The tryphosine genera *Photosella* gen. nov. and *Tryphosella* Bonnier, 1893 (Crustacea: Amphipoda: Lysianassoidea: Lysianassidae: Tryphosinae) in Australian waters. *Zootaxa* 2956:1-76.

**---------, and ---------, 2011b**. The new deep-sea families Cebocarididae fam. nov., Cyclocarididae fam. nov. and Thoriellidae fam. nov. (Crustacea: Amphipoda: Lysianassoidea). *Zootaxa* 2747:53-68.

**---------, and ---------, 2012a**. The Pachynidae fam. Nov. (Crustacea: Amphipoda: Lysianassoidea). *Zootaxa* 3246:1-69.

**---------, and ---------, 2012b**. Australian and South African conicostomatine amphipods (Amphipoda: Lysianassoidea: Lysianassidae: Conicostomatinae subfam. Nov.). *Zootaxa* 3248:43-65

**McLaughlin, P. A., D. K. Camp, M. V. Angel, E. L. Bousfield, P. Brunel, R. C. Brusca, D. B. Cadien, A. C. Cohen, K. Conlan, L. G. Eldredge, D. L. Felder, J. W. Goy, T. A. Haney, B. Hann, R. W. Heard, E. A. Hendrycks, H. H. Hobbs III, J. R. Holsinger, B. Kensley, D. R. Laubitz, S. E. LeCroy, R. Lemaitre, R. F. Maddocks, J. W. Martin, P. Mikkelsen, E. Nelson, W. A. Newman, R. M. Overstreet, W. J. Poly, W. W. Price, J. W. Reid, A. Robertson, D. C. Rogers, A. Ross, M. Schotte, F. R. Schram, C.-T. Shih , L. Watling, and G. D. F. Wilson. 2005.** *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada - Crustaceans*. Bethesda, Maryland, U. S. A.: American Fisheries Society. 565pp.

**Meador, J. P 1989.** Chemoreception in a lysianassid amphipod: the chemicals that initiate food-searching behavior. *Marine Behavior and Physiology* 14: 65-80.

**---------, and T. M. C. Present. 1985.** *Orchomene limodes*, new species, a scavenging amphipod from Scripps Canyon, California: species description and analysis of morphological variation. *Journal of Crustacean Biology* 5(3): 523-538.

**Mitchell, Fiorenza, Charles H. Peterson, Lauren S. Mullineaux, Charles R. Fisher, Susan W. Mills, Gurka Sancho, Galen A. Johnson, and Hunter S. Lenihan. 2002.** Predation structures communities at deep-sea hydrothermal vents. *Ecological Monographs* 72(3): 365-382.

**Moore, P. Geoffrey. 1983**. On the male of *Sophrosyne robertsoni* Stebbing & Robertson (Crustacea, Amphipoda). *Zoological Journal of the Linnean Society* 77(1): 103-109.

**Narahara, Yukiko, Ko Tomikawa, and Kenji Torigoe. 2012.** Four species of the genus *Stephonyx* (Crustacea: Amphipoda: Uristidae) from Japan, with description of a new species. *Journal of Natural History* **46**(23-24): 1477-1507.

**Nyssen, Fabienne, Thomas Brey, Gilles Lepoint, Jean-Marine Bouquegneau, Claude De Broyer, and Patrick Dauby. 2002.** A stable isotope approach to the eastern Weddell Sea trophic web: focus on benthic amphipods. *Polar Biology* 25: 280-287.

**Oleröd, Roy. 1975**. The mouthparts in some north Atlantic species of the genus *Orchomene* Boeck (Crustacea, Amphipoda). *Zoologica Scripta* 4: 205-216.

**Peattie, Martina E., and R. Hoare. 1981**. The sublittoral ecology of the Menai Strait. II. The sponge *Halichondria panicea* (Pallas) and its associated fauna. *Estuarine, Coastal and Shelf Science* 13(6): 621-635.

**Perrone, F. M., A. Dell'Anno, R. Danovaro, N. Della Croce, and Michael H. Thurston. 2002**. Population biology of *Hirondellea* sp nov (Amphipoda : Gammaridea : Lysianassoidea) from the Atacama Trench (South-east Pacific Ocean). *Journal of the Marine Biological Association of the United Kingdom* 82(3): 419-425.

**Pirlot, J. M. 1933**. Les amphipodes de l'expedition du Siboga, deuxieme partie, Les amphipodes gammarides, II: Les amphipodes de la mer profonde, I (Lyssianassidae, Stegocephalidae, Stenothoidae, Pleustidae, Lepechinellidae). *Siboga Expedition, Monographie* 33c:115-167

**Sainte-Marie, Bernard. 1984**. Morphological adaptations for carrion feeding in four species of littoral or circalittoral lysianassid amphipods. *Canadian Journal of Zoology* 62: 1668-1674.

**---------. 1991**. A review of the reproductive bionomics of aquatic gammaridean amphipods: variation of life history traits with latitude, depth, salinity and superfamily. *Hydrobiologia* 223: 189-227.

**---------, and G. Lamarche. 1985**. The diets of six species of the carrion-feeding lysianassid amphipod genus *Anonyx* and their relation with morphology and swimming behavior. Sarsia 70: 119-126.

**Schellenberg, A. 1926a.** Die gammariden der deutschen Südpolar-Expedition 1901-1903, *Deutsch Südpolar-Expedition* 18: 235-414.

**---------. 1926b.** Die Gammariden der Deutschen Tiefsee-Expedition. *Wissenschaften Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899* 23(5): 195-243.

**---------. 1936**. Zwei neue Amphipoden des Stillen Ozeans und zwei Berichtigungen. *Zoologischer Anzeiger* 116: 153-156.

**Senna, André R. 2009.** The giant deep-sea amphipods (Lysianassoidea: Eurytheneidae) from Brazilian waters. *Nauplius* 17(2):81-96.

**---------, and Cristiana Serejo. 2007**. A new deep-sea species of *Stephonyx* (Lysianassoidea: Uristidae) from off the central coast of Brazil. Nauplius 15(1): 7-14.

**Serejo, Cristiana S., and Yoko Wakabara. 2003**. The genus *Valettiopsis* (Crustacea, Gammaridea, Lysianassoidea) from the southwestern Atlantic, collected by the RV Marion Dufresne. *Zoosystema* 25(2): 187-196.

**Shoemaker, Clarence R. 1916.** Descriptions of three new species of amphipods from southern California. *Proceedings of the Biological Society of Washington* 29: 157-160.

**---------. 1920.** Part E: Amphipods. *Report of the Canadian Arctic Expedition 1913-18* Volume VII: Crustacea: 3-30.

**---------. 1942**. Amphipod Crustaceans Collected on the Presidential Cruise of 1938. *Smithsonian Miscellaneous Collections* 101(11): 1-52.

**---------. 1945**. The Amphipoda of the Bermuda Oceanographic Expedition, 1929-1931. *Zoologica* 30(4)17:185-266.

**---------. 1955.** Amphipoda collected at the Arctic Laboratory, Office of Naval Research, Point Barrow, Alaska, by G. E. MacGinitie. *Smithsonian Miscellaneous Collections* 128(1): 1-78.

———. **1956**. Notes on the Amphipods *Eurythenes gryllus* (Lichtenstein) and *Katius obesus* Chevreux. *Proceedings of the Biological Society of Washington* 69: 177-178.

———. **1964**. Seven new amphipods from the West Coast of North America with notes on some unusual species. *Proceedings of the United States National Museum* 115(3489): 391-430.

**Shulenberger, Eric, and J. Laurens Barnard. 1976**. Amphipods from an abyssal trap set in the North Pacific Gyre. *Crustaceana* 31(3): 241-258.

**---------, and Robert R. Hessler. 1974**. Scavenging abyssal benthic amphipods trapped under oligotrophic Central North Pacific Gyre waters. *Marine Biology* 28:185-187.

**Smith, Craig R., and Amy R. Baco. 2003**. Ecology of whale falls at the deep-sea floor. *Oceanography and Marine Biology; an Annual Review* 41: 311-354.

**---------, and T. M. C. Present. 1983**. *In vivo* marking of shallow-water and deep-sea amphipods by ingestion of bait mixed with fast green. *Marine Biology* 73: 183-192.

**Smith Jr., Kenneth L., and R. J. Baldwin. 1982**. Scavenging deep-sea amphipods: effects of food odor on oxygen consumption and a proposed metabolic strategy. *Marine Biology* 68: 287-298.

**---------, and ---------. 1984.** Vertical distribution of the necrophagous amphipod, *Eurythenes gryllus*, in the North Pacific: spatial and temporal variation. *Deep-Sea Research* 31(A): 1179-1196.

**Stasek, Charles R. 1958**. A new species of *Allogaussia* (Amphipoda, Lysianassidae) found living within the gastrovascular cavity of the sea-anemone *Anthopleura elegantissima*. *Journal of the Washington Academy of Sciences* 48(4): 119-126.

**Stebbing, Thomas R. R., and David Robertson. 1891**. On four new British Amphipoda. *Transactions of the Zoological Society of London* 13(1): 31-42.

**Steele, Donald H. 1967.** A new species of the genus *Anonyx* (Amphipoda) from the Barents Sea. *Crustaceana* **13**: 257-264.

**———. 1969.** Additional comments on the genus *Anonyx* (Crustacea: Amphipoda) of the Atlantic and Arctic coasts of North America**.** *Journal of the Fisheries Research Board of Canada* 26(3): 683-686.

**———. 1979a**. A new species of *Psammonyx* (Crustacea, Amphipoda, Lysianassidae) from the northwestern Atlantic. *Canadian Journal of Zoology* 57(6): 1215-1221.

**———. 1979b**. Clinal variation in the morphology of *Anonyx nugax* (Phipps)(Crustacea, Amphipoda). *Bulletin of the Biological Society of Washington*, no. 3: 41-46.

———. **1979c**. Zoogeography of the genus *Anonyx* (Crustacea, Amphipoda). *Bulletin of the Biological Society of Washington* 3: 47-53.

———. **1982**. The genus *Anonyx* (Crustacea, Amphipoda) in the North Pacific and Arctic oceans: *Anonyx nugax* group. *Canadian Journal of Zoology* 60(7): 1754-1775.

———. **1983**. The genus *Anonyx* (Crustacea, Amphipoda) in the North Pacific Ocean: *Anonyx validus* group. *Canadian Journal of Zoology* 61(12): 2921-2931.

———. **1986**. The genus *Anonyx* (Crustacea, Amphipoda) in the north Pacific and Arctic oceans: *Anonyx laticoxae* group. *Journal of the Fisheries Research Board of Canada* 64: 2603-2623.

———**. 1989**. The genus *Anonyx* (Crustacea, Amphipoda) in the North Pacific and Arctic oceans: *Anonyx compactus* group. *Canadian Journal of Zoology* 67: 1945-1954.

**---------. 1991**. The Genus *Anonyx* (Crustacea, Amphipoda) in the North Pacific and Arctic Oceans - The *Anonyx bispinosus* Group. *Canadian Journal of Zoology - Revue Canadienne De Zoologie* 69(6): 1600-1611.

**--------- and Pierre Brunel. 1968**. Amphipoda of the Atlantic and Arctic coasts of North America: *Anonyx* (Lysianassidae). *Journal of the Fisheries Research Board of Canada* 25(5): 943-1060.

**---------., and Virginia J. Steele. 1993**. Biting mechanism of the amphipod *Anonyx* (Crustacea: Amphipoda: Lysianassoidea). *Journal of Natural History* 27(4): 851-860.

**Stepien, Carol A., and Richard C. Brusca. 1985**. Nocturnal attacks on nearshore fishes in southern California by crustacean zooplankton. *Marine Ecology Progress Series* 25: 91-105.

**Stock, Jan H., and Thomas M. Iliffe. 1990**. Amphipod crustaceans from anchihaline cave waters of the Galapagos Islands. *Zoological Journal of the Linnean Society* 98(2): 141-160.

**Stoddart, Helen E**., **and James K. Lowry. 2004.** The deep-sea lysianassoid genus *Eurythenes* (Crustacea, Amphipoda, Eurytheneidae n. fam.). *Zoosystema* 26(3): 425-468.

---------, and ---------. 2012. Revision of the lysianassoid genera *Acidostoma* and *Shackletonia* (Crustacea: Amphipoda: Acidostomatidae fam. nov.). Zootaxa 3307: 1-34.

**Takekawa, Atsushi, Koichi Sasaki, and Michio Omori. 2004**. Diel activity and vertical distribution of lysianassoid amphipods dominant in Onagawa Bay, north-eastern Japan. *Fisheries Science* 70(6): 971-977.

**Thorsteinson, Elsa D. 1941.** New or noteworthy amphipods from the north Pacific Coast. *University of Washington Publications in Oceanography* 4: 50-96.

**Thurston, Michael H. 1976a.** The vertical distribution and diurnal migration of the Crustacea Amphipoda collected during the Sond Cruise, 1965. I. The Gammaridea. *Journal of the Marine Biological Association of the United Kingdom* 56: 359-382.

**---------. 1976b. .** The vertical distribution and diurnal migration of the Crustacea Amphipoda collected during the Sond Cruise, 1965. II. The Hyperiidea and general discussion. *Journal of the Marine Biological Association of the United Kingdom* 56**:** 383-470.

**---------.1979**. Scavenging abyssal amphipods from the North East Atlantic Ocean. *Marine Biology* 51: 55-68.

———**. 1989**. A new species of *Valettia* (Crustacea: Amphipoda) and the relationship of the Valettidae to the Lysianassoidea. *Journal of Natural History* 23(5): 1093-1107.

———**. 1990**. Abyssal necrophagous amphipods (Crustacea: Amphipoda) in the northeast and tropical Atlantic Ocean. *Progress in Oceanography* 24: 257-274.

**---------, and Brian J. Bett. 1995.** Hatchling size and aspects of biology in the deep-sea amphipod genus *Eurythenes* (Crustacea: Amphipoda). *Internationale Revue der Gesamten Hydrobiologie* 80(2): 201-216.

**---------, Michael Petrillo, and N. Della Croce. 2002**. Population structure of the necrophagous amphipod *Eurythenes gryllus* (Amphipoda: Gammaridea) from the Atacama Trench (south-east Pacific Ocean). *Journal of the Marine Biological Association of the United Kingdom* 82(2):205-211.

**Vader, Wim.. 1970**. The amphipod*, Aristias neglectus* Hansen, found in association with Brachiopoda. *Sarsia* 43: 13-14.

**---------. 1978**. Associations between amphipods and echinoderms. *Astarte* 11: 123-134.

**---------. 1979**. *Allogaussia recondita* Stasek (Amphipoda, Lysianassidae), an associate of the aggregating sea anemone, *Anthopleura elegantissima* (Brandt) in California. (A preliminary report and plan of work.)[draft].

**———. 1983**. Associations between amphipods (Crustacea: Amphipoda) and sea anemones (Anthozoa, Actiniaria). *Records of the Australian Museum* 18: 141-53.

**———. 1984**. Notes on Norwegian marine Amphipoda 7. Amphipod associates of *Geodia* sponges in western Norway. *Fauna Norvegica, Series A* 5: 14-16.

**---------. 2004.** New amphipod species and subspecies described in the years 1974-2004, ordered alphabetically by genus name. *Amphipod Newsletter* 28: 1-100 (available at http://www.imv.uit.no/amphipod/AN28.pdf.)

**---------, and Sunniva Lönning. 1973**. Physiological adaptations in associated amphipods. A comparative study of tolerance to sea anemones in four species of Lysianassidae. *Sarsia* 53: 29-40.

**Vinogradov, G**. **M. 1993.** Amphipoda (Crustacea) from the 'black smokers' from hydrothermal vent areas of the eastern Pacific. *Zoologicheskii Zhurnal* 72(2): 40-53.

**---------. 1994.** Amphipodes (Crustacea) from seep fields and nearby common benthic communities of the northern and eastern Pacific. *Trudy Instituta Okeanologii* 131: 100-125.

**Wesławski, Marcin, and Joanna Legezynska. 2002**. Life cycles of some Arctic amphipods. *Polish Polar Research* 23(3-4): 253-264.

**Yamada, Y**., **and T. Ikeda. 2000.** Development, maturation, brood size and generation length of the mesopelagic amphipod *Cyphocaris challengeri* (Gammaridea: Lysianassidae) off southwest Hokkaido, Japan *Marine Biology* 137:933-942.