Amphipoda of the Northeast Pacific (Equator to Aleutians, intertidal to abyss): XXVI.
Iphimedioidea – a review Donald B. Cadien, LACSD
22July2004 (revised 27Feb2015)

Preface

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

Introduction to the Iphimedioidea

The superfamily composition has changed over the years. It was not among the groups included in the subdivision of the gammaroids by Bousfield (1977). In his subsequent revision of the entire gammaridean grouping, he treated them as members of the superfamily Eusiroidea (Bousfield 1978). It was not until the proposal of Lowry and Myers in 2000, that this superfamilial group was united. Even now the number of included families is contentious. I intend to follow here the general grouping used by Coleman and Barnard (1991a) in their revision of the families related to the Iphimediidae. They included the Stilipedidae and Astyridae among this group; a decision that is not followed here. Pursuant to the investigations of Holman and Watling (1983), the discussions of Andres and Lott (1986) and Andres (1997) and the additional information on species characters provided in Berge (2003) and Berge and Vader (2005 a, b), the Astyridae are treated as a synonym of the Stilipedidae, and the Stilipedidae are viewed as members of the Pardaliscoidea. Although this does not agree with the nesting of Stilipedidae and Astyridae within the clade consisting of the other iphimedioid families in Berge, Vader and Coleman (1999), it is none-the-less the most accurate placement of the stilipedids in my estimation. Other difficulties with their cladistic analysis have been noted, and Coleman and Lowry (2006), have similarly disregarded their synonymization of Ochlesidae and Odiidae. Minds have, however, changed again, and the Odiidae is combined with the Ochlesidae in Worms (Horton and De Broyer 2014). As might be expected from the above comments, there is no good diagnosis of the characters of the superfamily. Despite this, it is often used in discussing these animals (see for instance Coleman 2007), sometimes without explicit mention of the superfamily or its concept.

The superfamily then consists currently of eleven families, six represented in the NEP: the Acanthonotozomellidae, Amathillopsidae, Epimeriidae, Iphimediidae, Odiidae, and Lafystiidae. The Acanthonotozomatidae is distributed in the Arctic, but none of the species occur further to the south in the NEP. Information on the family (the genus *Acanthonotozoma* is treated as an iphimediid in McLaughlin et al 2005) is available in Just (1978). The Dikwidae are exclusively found in the southern hemisphere. Members of the Ochlesidae are found in the tropics, or in the Southern Hemisphere. The Vicmusiidae is also austral in distribution, with no members in the Northern Hemisphere (Just 1990b). The Laphystiopsidae are found in the NWP, in the south Atlantic, and in the Antarctic. At least some are known to be associated with crinoids. None are yet reported from the NEP.

In their examination of the biogeography of this group of organisms Watling and Thurston (1989) found that nearly 50% of the described taxa were either Antarctic or Subantarctic, and viewed this as the evolutionary center for the group. The fauna of the North Pacific was, in contrast, only 4% of the world total. They did not include the members of the Amathillopsidae, or Lafystiidae in their treatment, however, where much of the diversity of the NEP fauna for the superfamily lies. The three provisional taxa listed below represent over half of the species listed by them as occurring in the North Pacific. Studies of the phylogeny of *Epimeria* (Lörz and Brandt 2004) support the evolutionary hypothesis put forward by Watling and Thurston (1989)

Ecological Commentary

The ecology of the members of the superfamily is far from unitary. While all lafystiids are fish ectoparasites, and at least one laphystiopsid is suspected of being an ectoparasite of crinoids, no other members of the superfamily have parasitic life styles.

Lafystius frameae and its location on the host *Prionotus carolinus* from the NW Atlantic (Dave Grant; Underwater Naturalist 22(1), 1993)

Many are known associates of other organisms as commensals or micropredators/grazers. The epimeriid *Paramphithoe hystrix* is known to be a micropredator of the sponge *Haliclona ventilabrum* (Oshel & Steele 1985). While virtually nothing is known of the ecology of *Amathillopsis* spp., the finding of *A. pacifica margo* on sponge stalks (Dr. Todd Haney, pers. comm. 2001) may be an indication of similar micropredatory proclivities. Dietary studies in the Arctic (Klages and Gutt 1990), and in the Antarctic, where much of the diversity within the superfamily resides, show most epimeriids to be opportunistic predators, macropredator/scavengers, or micropredatory browsers. All iphimediids were characterized as micropredatory browsers (Coleman 1989a,b; Dauby et al 2001a,b).

No information is available on ochlesids or odiids, although the algal association of the latter may suggest grazing on either plant tissue, or on associated colonial organisms. The sole representative of the Acanthonotozomellidae known from the NEP was found in association with a coral, but the nature of the association is not known.

Personal experience with the iphimediid *Coboldus hedgpethi* tends to contradict the characterization based on dietary studies in the Antarctic. A single specimen of *C. hedgpethi* was observed while diving in the kelp bed off San Onofre, perched in the open on a cobble. The animal was immobile enough to be hand collected by picking it up with a gloved hand. Its actions were slow and deliberate; suggesting an ambush predator of swimming organisms as reported for large epimeriids in the Antarctic. This animal did not appear to be associated with any other invertebrate, and appeared an unlikely

candidate for micropredatory browsing based on its behavior. Like many of the Antarctic epimeriids, the animal was boldly colored, with possibly aposematic patterning.

Epimeria oxycarinata, a large Antarctic epimeriid (photo Kelvin Barwick)

Members of the superfamily tend to occur in cool waters of the polar regions, although some of the families are more varied in distribution. The Iphimediidae are increasingly known from temperate or even tropical waters, with a number of new taxa being erected in recent years (Just 1990a, Lowry & Meyers 2003). Coleman and Lowry (2006) stated that the proportions of the family from polar and non-polar areas were now about equal. Similarly the Ochlesidae have increasingly been reported from warmer water regions (Thomas 1983, Souza-Filho & Serejo 2008, Ortiz et al 2007, Winfield & Ortiz 2014). The epimeriids are still predominantly polar, and the amathillopsids primarily deep-sea.

Key to NEP Iphimedioid genera – Coleman and Barnard 1991a provide keys to the families considered here (except for the Vicmusiidae and including the Stilipedidae and Astyridae now placed in Pardaliscoidea). In each of their keys mouthparts are used extensively. Should you need to key your organism to family first, these keys will suffice, though not easily used because of the mouthpart requirement. Rather than provide a new key to the families in the superfamily a key to the NEP genera is presented [note: the key applies only to NEP members of the genera, and will not work properly if applied to other areas)

1a. Coxa 1 ventrally truncate.....2
1b. Coxa 1 ventrally acuminate or tapering.....4
2a. Pereon and pleon dorsally ornamented with teeth/ridges.....*Amatiguakius*
2b. Pereon and pleon dorsally smooth.....3
3a. Anterior head lobe rounded.....*Paralafystius*
3b. Anterior head lobe subacute.....*Protolafystius*
4a. Coxa 1 acuminate.....5
4b. Coxa 1 tapering.....7
5a. P4 coxa posterior margin with crescentic excavation.....*Epimeria*
5b. P4 coxa posterior margin lacking crescentic excavation.....6
6a. Anteriorly directed blade-like spine on head.....*Peramphithoe*
6b. No blade-like spine on head.....*Amathillopsis*
7a. Body bearing articulated spines.....*Uschakoviella*
7b. Body lacking articulated spines.....8
8a. Pleonites 1 and 2 dorsally toothed or cuspidate.....9
8b. Pleonites 1 and 2 dorsally smooth.....10
9a. G2 propodochelate.....*Iphimedia*
9b. G2 robust, subchelate.....*Coboldus*
10a. Telson entire.....*Cryptodius*
10b. Telson incised.....*Odius*

NEP Iphimedioidea based on McLaughlin et al (2005) plus known provisional species. *=Taxa in SCAMIT Ed.9 (Cadien & Lovell 2014). Valid taxa **bolded**, synonyms not. The families Acanthonotozomatidae, Dikwidae, Laphystiopsidae, Ochlesidae, and Vicmusiidae have no representatives reported within the coverage area.

Family Acanthonotozomellidae
Amatiguakius forsberghi Coleman and J. L. Barnard 1991 – Aleutians; 37m
Family Amathillopsidae
Acanthopleustes annectens Holmes 1908 (=Amathillopsis annectens)
Amathillopsis annectens (Holmes 1908)- Catalina Island; 617-1108m
Amathillopsis pacifica margo J. L. Barnard 1967 East Pacific Rise to Baja Abyssal Plain; 2300-3518m
Amathillopsis spinigera Heller 1875 – Arctic Alaska; shallow water
Family Epimeriidae
Acanthosoma hystrix J. C. Ross 1835 (=Paramphithoe hystrix)
Epimeria cora J. L. Barnard 1971 – off Oregon; 2086m
Epimeria pacifica Gurjanova 1955 – San Diego Trough: 1317-1324m
Epimeria yaquinae McCain 1971 – Cascadia Abyssal Plain; 2800-2862m
Epimeria sp CS1 Cadien 2004§ - Cascadia slope off Newport, Oregon; 1372m
Epimeria sp CS2 Cadien 2004§ - Cascadia Abyssal Plain; 2815m
Epimeria sp Z of Dickinson 1976 – Cascadia Abyssal Plain 2800m
Epimeria sp 1 of Dickinson 1976 – Cascadia Abyssal Plain 2820m
Paramphithoe hystrix (J. C. Ross 1835) – Arctic Alaska; depth?
Ushakoviella echinophora Gurjanova 1953 – Kuriles to Aleutian Ids.; 100-249m

Family Iphimediidae

***Coboldus hedgpethi** (J.L. Barnard 1969);1-82m
Iphimedia rickettsi (Shoemaker 1931);0-60m
Panoploea(?) hedgpethi J. L. Barnard 1969 (=Coboldus hedgpethi)
Panoploea rickettsi Shoemaker 1931 (= Iphimedia rickettsi)

Family Odiidae (currently submerged into Ochlesidae on WoRMs)

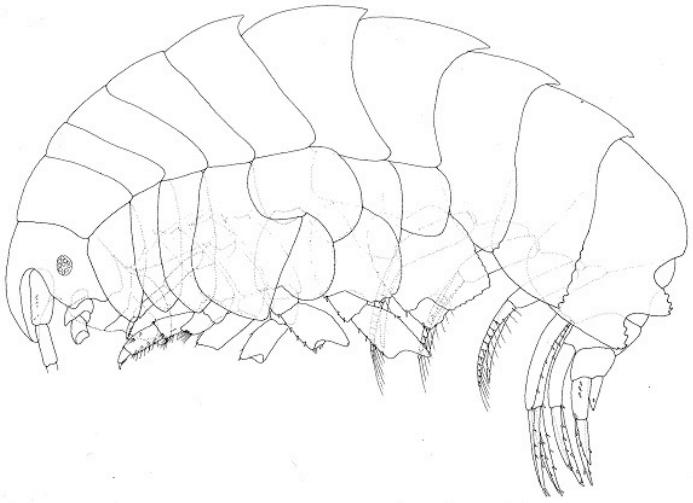
Cryptodius kelleri (Brüggen 1907) – Japan Sea to Northern California; 0-90m
Cryptodius unguidactylus P. G. Moore 1992 – Alaska; 10m
Imbrexodius oclairi (see Odius oclairi)
Odius carinatus (Bate, 1862) – Pribilof Islands, Arctic Alaska; 35-200m
Odius cassigerus Gurjanova 1972 –WNP to Arctic Alaska; 151-263m
Odius kelleri Brüggen 1907 (=Cryptodius kelleri)
Odius oclairi (P. G. Moore 1992) – Amchitka Island, Alaska: 0m
Otus carinatus Bate 1862 (=Odius carinatus)

Family Lafystiidae

Paralafystius mcallisteri Bousfield 1987 – SE Alaska; 27-64m (cod, greenling)
Protolafystius madillae Bousfield 1987 – British Columbia; 81m (English Sole)
Protolafystius sp A SCAMIT 1999 – SCB; 305m (Blackgill Rockfish)

Comments by Family

Family Acanthonotozomatidae - Strictly Arctic, with 8 species listed in McLaughlin et al (2005). All members are extralimital to current coverage. Descriptions and discussion of these taxa can be found in Just (1978) and Moore (1992).



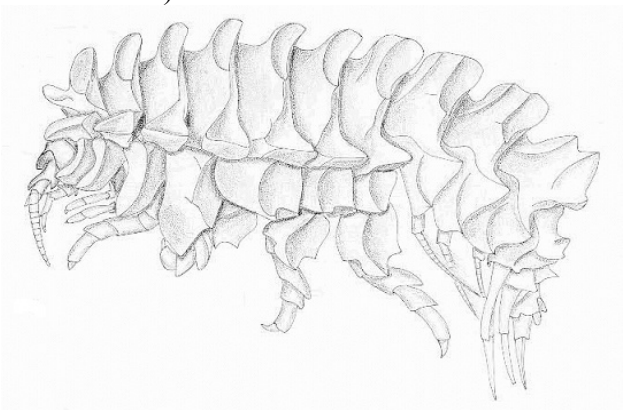
Acanthonotozoma rusanovae (from Moore 1992)

Acanthonotozoma - Although the genus is well represented in the North Pacific, none of the species are distributed in the Aleutians or below, and so fall outside our coverage area. All are Arctic, and most are distributed more to the Artic Northwest Pacific. They are often encountered in the Chukchi and Bering Seas, but not further south.

Diagnosis: "*Antenna 1 peduncle segment 2 shorter than 1. Maxilla 1 palp 2-segmented. Maxilla 2, inner plate without facial row of setae. Maxilliped, inner plate narrower but as long as outer plate, palp segment 2 generally unproduced, palp segment 4 small. Gnathopods diverse, simple, carpi and propodi elongate. Gnathopod 2 stouter than Gnathopod 1.*" (from Moore 1991)

Family Acanthonotozomellidae – The family was created by Coleman and Barnard (1991a) who later placed their new genus and species *Amatiguakius forsberghi* in it (Coleman and Barnard 1991b). The species is from relatively shallow depths (37m) in the Aleutians, associated with "pink coral". Neither the identity of the host, nor the nature of the association is known. There have been no other reports of the species since the unique female holotype to my knowledge. The species is relatively large, with the known specimen 28mm in length.

Diagnosis: "*Body compressed, with dorsal teeth (except Acanthonotozomopsis). Rostrum well developed (except Acanthonotozomopsis). Antennae elongate or short, flagella with 5+ articles, rarely with 2 (Amatiguakius): accessory flagellum absent. Mouthpart part field conical. Epistome and labrum narrow, long, incised. Incisor of mandible ordinary, toothed; raker row strong; molar reduced or absent; palp always present, 3-articulate. Lower lip without inner lobes, without distinct inner notches. Inner plate of maxilla 1 ordinary, medially setose or setation reduced; outer plate oblique, normally spinose; palp large, 2-articulate. Inner plate of maxilla 2 without facial or medial setae. Palp of maxilliped 4-articulate, article 2 often produced medially. Coxae 2-4 more or less acuminate, ventral margins fitting normal ventral parabolic curve of anterior coxae or in type genus coxa 2 shortened; coxae 1 and 4 not shortened, coxa 1 widened in 2 genera but not significantly wider than coxa 2 (versus Stilipedidae), subtruncate or rounded (except Acanthonotozomoides with concave margin and anteroventral tooth), coxa 4 with large posteroventral lobe (except Acanthonotozomopsis and small in Amatiguakius). Coxa 5 shorter than posteroventral lobe of 4. Gnathopods feeble, subequal; gnathopods 1-2 simple or weakly parachelate, merus and carpus not produced, carpi slender. Article 2 of pereopods 5-7 often with posterior cusps or teeth. Epimeron 3 often with 2 large cusps posteroventrally. Urosomites free. Uropods 1-3 biramous. Rami of uropod 3 longer than peduncle, flattened, lanceolate, 1-articulate. Telson entire or weakly incised, generally not longer than peduncle of uropod 3.*" (Coleman and J. L. Barnard 1991).



Amatiguakius forsberghi (from Coleman & J. L. Barnard 1991b)

Amatiguakius – The reported habitat for the single known specimen was "pink coral". Unfortunately there are a number of pink corals which occur in the area (Wing and Barnard 2004), and the substrate remains unsure.

Diagnosis: "*Body stout, with dorsal carinae on pereon and metasome; pereonite 1 with 2 dorsal carinae, dorsal carinae laterally ridged, carinae on pereonite 7 and metasomites wide, with 2 ridges; lateral carinae strongly produced and rounded, head short, with straight rostrum, lateral cephalic lobes rounded; antenna 2 shorter than 1; peduncle of antenna 1 stout, with acute processes; labrum with narrow notch; mandible with narrow incisor and setal row, but no molar; lacinia mobilis present on both mandibles; maxilla 1 with large inner plate, outer plate with numerous spiniform setae, palp exceeding outer plate; setae of maxilla 2 medioapically comb-like setulate; maxillipedal palp slender, article 2 not produced; coxae l to 3 pointed, similar in shape and ridged; gnathopods simple, similar; bases of pereopods 5 to 7 broad, lobate ventrally; pereopods 3-7 with small setae on medial and lateral surfaces; dactyli with spiniform setae on concave margin. Telson entire*." (from Coleman & Barnard 1991b)

Amathillopsis pacifica margo from 2300+m, 21°North Hydrothermal Vent field, East Pacific Rise. Animal was taken from a stalked sponge. (Photo by Todd Haney)

Family Amathillopsidae – Submerged into the Iphimediidae by Barnard and Karaman (1991), although, as pointed out by Just (1995), their manuscript was completed five years prior to publication. Subsequently their decisions regarding the Iphimediidae were revised in Coleman and Barnard (1991), who restricted the concept of the Iphimediidae, and restored the concepts of the Amathillopsidae and Epimeriidae independent of the Iphimediidae. The family has few members, most in the genus *Amathillopsis* (ten species). It is currently divided into three subfamilies containing three genera.

Description: "*Head free, not coalesced with peraeonite 1; exposed; deeper than long; rostrum present, short or moderate; eyes present, well developed or obsolescent, or absent; not coalesced; 1 pair; not bulging. Body laterally compressed; cuticle smooth, or processiferous and dorsally carinate.*

Antenna 1 longer than antenna 2; peduncle with sparse robust and slender setae; 3-articulate; peduncular article 1 shorter than article 2, or subequal to article 2; antenna

1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present; antenna 1 callynophore absent. Antenna 2 present; medium length; articles not folded in zigzag fashion; without hook-like process; flagellum shorter than peduncle; 5 or more articulate; not clavate; calceoli absent.

Mouthparts well developed. Mandible incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, 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; outer plates present; palp 4-articulate, article 3 without rugosities. Labium smooth.

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

*Coxae 1-7 well developed, none fused with peraeonites. **Coxae 1-4** longer than broad, overlapping. Coxae 1-3 not successively smaller, none vestigial or coxa 1 reduced. Coxae 2-4 none immensely broadened.*

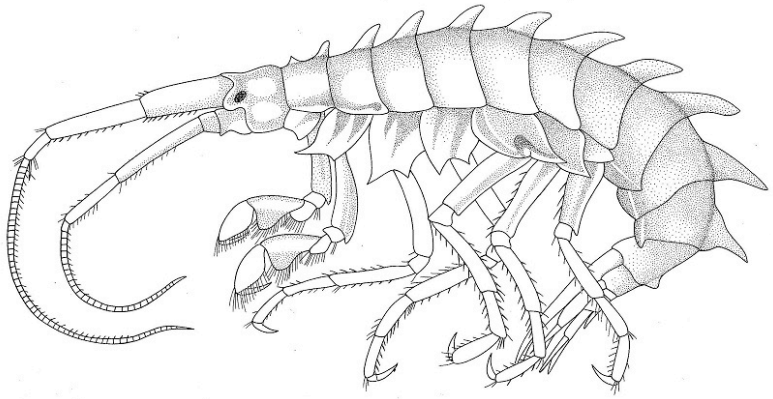
*Gnathopod 1 not sexually dimorphic; subequal to gnathopod 2; smaller than coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; subequal to propodus; **gnathopod 1 slightly produced along posterior margin of propodus**; dactylus large. Gnathopod 2 not sexually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

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

***Pleon**. Pleonites 1-3 without transverse dorsal serrations; 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; urosome urosomite 1 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. Uropod 3 not sexually dimorphic; peduncle short; **outer***

***ramus subequal to peduncle**, 1-articulate, without recurved spines. Telson laminar; emarginate, or entire; apical robust setae absent.*" (from Lowry and Springthorpe 2001).

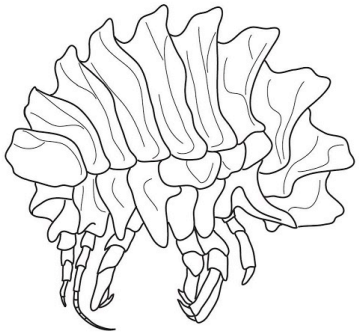


Amathillopsis spinigera the Arctic type species (from J. L. Barnard & Karaman 1991)

Amathillopsis - Three species are reported from the deep waters of the NEP. The type species, *A. spinigera* occurs in the Arctic Basin, but not further south in the NEP. Although *A. pacifica* Gurjanova is known only from the Kurile Islands in the NWP, J. L. Barnard (1967) described a subspecies *A. p. margo* from deep water off Baja California. Holmes (1908) described *A. annectens* from off Catalina Island, also in deep water (617-1108m). None of these forms are likely to be taken in even our deeper excursions during regional sampling. All are characterized most obviously by strongly developed dorsal spination on the posterior pereonites, and the pleosome. The anterior coxae are typically ventrally pointed, but are not crescenticly excavated as in the Epimeriidae.

A form photographed at the 21°N hydrothermal vent field during the East Pacific Rise expedition is probably *A. pacifica margo*. The photograph seems to show an eye placed far forward on the cephalon, but this may prove to be an attached foram on the carapace rather than an eye. The deep water species of the genus are typically eyeless, although the type, from shallower depths in the Arctic, has eyes. The three reported forms from the NEP can be easily distinguished based on the condition of the anterior coxae, which are all centrally indented ventrally in *A. spinigera*, are entire or with a single ventral point in *A. annectens*, and show a mixture of these states in *A. pacifica margo*. The three also differ in details of dorsal spination.

Diagnosis: "*Body covered with teeth or processes. Antenna 1: peduncular articles 1-2 long, subequal; or 1 shorter than 2. Mouthparts projecting quadrately. Labrum incised or entire, very broad, thin, elongate. Mandibular incisor ordinary, toothed; raker row present; molar broad and blunt, triturative. Labium: inner lobes present, weak, or coalesced. Maxilla 1 palp 2-articulate, article 2 ordinary. Maxilla 2: inner plate without facial row of setae. Maxillipeds: .inner plate shorter but scarcely narrower than outer plate, latter short; palp article 2 narrow and apicomedially unproduced; palp article 4 well developed. Coxae ordinary; 1- 4 progressively longer; coxa 4 mono- or polycuspidate. Gnathopods slightly enlarged, alike, articles 5-6 ordinary, stout, article 5 lobate, both gnathopods weakly subchelate. Telson entire or incised*." (from J. L. Barnard & Karaman 1991)



Dikwa andresi from the Scotia Sea, Antarctica(from Coleman 2007)

Family Dikwidae - The family is known only from Antarctic and South African waters from two species in the genus *Dikwa.*

Paramphithoe hystrix a member of the Epimeriidae (from benjamin 2121.blog.cz)

Family Epimeriidae – According to Coleman and Barnard (1991) the family contains five genera, three of which have representatives in the NEP.

Description: "*Head free, not coalesced with peraeonite 1; exposed; deeper than long; rostrum present, long; eyes present, well developed or obsolescent; not coalesced; 1 pair; bulging, or not bulging. Body laterally compressed; cuticle smooth, or processiferous and dorsally carinate.*

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

Mouthparts well developed. Mandible incisor dentate; lacinia mobilis present on both sides; accessory setal row without distal tuft; molar present, 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, large; palp 4-articulate or 3-articulate, article 3 without rugosities. Labium smooth.

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

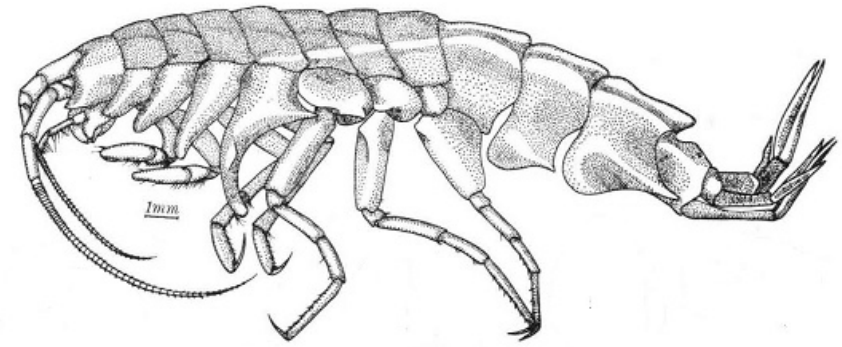
*Coxae 1-7 well developed, none fused with peraeonites. **Coxae 1-4** longer than broad, overlapping. Coxae 1-3 not successively smaller, none vestigial. Coxae 2-4 none immensely broadened.*

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

*Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. Peraeopod 3 well developed. Peraeopod 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, acuminate ventrally, with well developed posteroventral lobe; carpus not produced. Peraeopods 5-7 with few robust or slender setae; dactyli without slender or robust setae. Peraeopod 5 well developed; shorter than peraeopod 6; coxa smaller than coxa 4, without posterior lobe; **basis slightly expanded**, subrectangular, without posteroventral lobe; merus/carpus free; carpus linear; setae absent. Peraeopod 6 subequal in length to peraeopod 7; merus/carpus free; dactylus without setae. Peraeopod 7 with 6-7 well developed articles; longer than peraeopod 5; similar in structure to peraeopod 6; with 7 articles; basis expanded, without dense slender setae; dactylus without setae.*

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

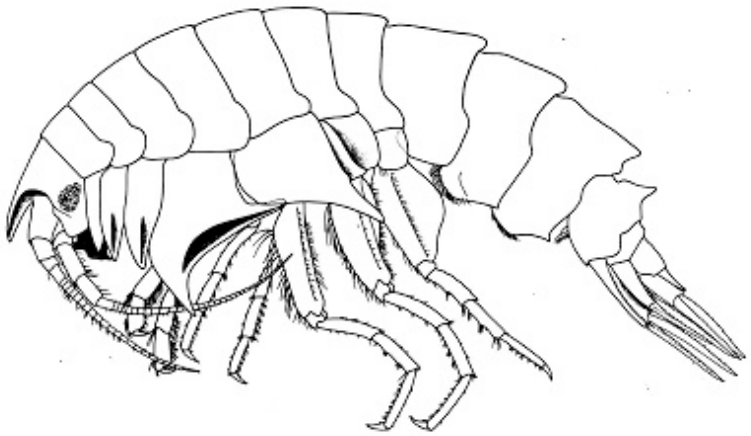
*Urosome not dorsoventrally flattened; urosomites 1 to 3 free; urosomite 1 longer than urosomite 2, or much longer than urosomite 2; **urosome urosomite 1 carinate**; urosomites 1-2 without transverse dorsal serrations. Uropods 1-2 apices of rami without robust setae. Uropods 1-3 similar in structure 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 longer than outer ramus. Uropod 3 not sexually dimorphic; peduncle short; outer ramus longer than peduncle, 1-articulate, without recurved spines. Telson laminar; moderately cleft, or weakly cleft, or emarginate, or entire; longer than broad, or as long as broad; apical robust setae absent.*" (from Lowry and Springthorpe 2001).



Epimeria yaquinae (from McCain 1971)

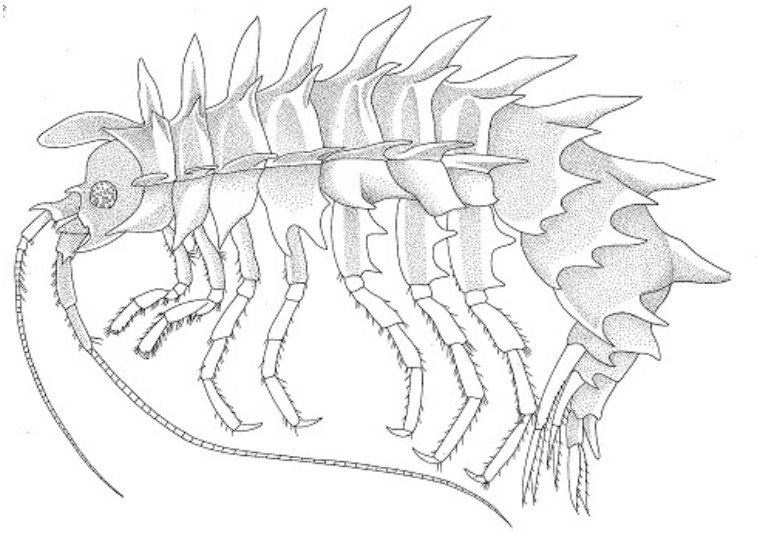
Epimeria – While the genus *Epimeria* is predominantly southern in distribution, with an apparent center of origin in the Antarctic (Watling and Thurston 1989), there are four species in the NEP. All of the forms in our area are from deep water, and all are much smaller than some of the Antarctic species, which reach sizes of 70+mm. All are rarely taken in small numbers. This may reflect association with deep hard bottom, which is notoriously difficult to sample. Southern species are usually associated with other benthic invertebrates, and this may be the case for our northern forms as well. Both of the described species are known from two specimens, each of the provisionals from a single individual. All four taxa are from Oregon, and are not known from south of the Gorda Ridge. *Epimeria* were not recorded in investigations off Baja California at the depths where they might be expected to occur (J. L. Barnard 1967), and none were found in submarine canyons in the NEP (J. L. Barnard 1966). Given the infrequency of their capture, this may be just a sampling artifact, and *Epimeria* spp may form a portion of the amphipod fauna of the SCB as yet undetected.

The crescentic form of the ventral margins of coxae 4 and 5 is a very noticeable character of nearly all *Epimeria* . This is viewed as facilitating pair formation and copulation by Moore (1981). The NEP species *E. yaquinae* is an exception, with nearly the entire ventral curve formed by the posterior margin of coxa 4, and coxa 5 so reduced in size as to contribute nothing to the concentric excavation. *E yaquinae* is also unusual in having the ventral projection on coxa 4 terminate subacutely, in a rounded finger-like process (McCain 1971). This helps separate it from the other described form *E. cora* (J. L. Barnard 1971), which has no reduction in coxa 5, which joins equally with coxa 4 in forming a concentric excavation, and an acute ventral cusp on coxa 4. The presence of eyes in *E. cora*, and their lack in *E. yaquinae*, also separate the two forms. Of the provisional forms, *Epimeria sp CS1* can be separated from all other NEP *Epimeria* species by the presence of a very large rostrum. That of *E. yaquinae* is virtually absent, that of *E. sp CS2* is smaller than that of *E. cora,* and that of *E. cora* is less than half the size off that of *sp CS1*. *Epimeria sp CS2* has more pronounced dorsal keel/cusps than any of the remaining three forms.



Epimeria cora (from J. L. Barnard 1971)

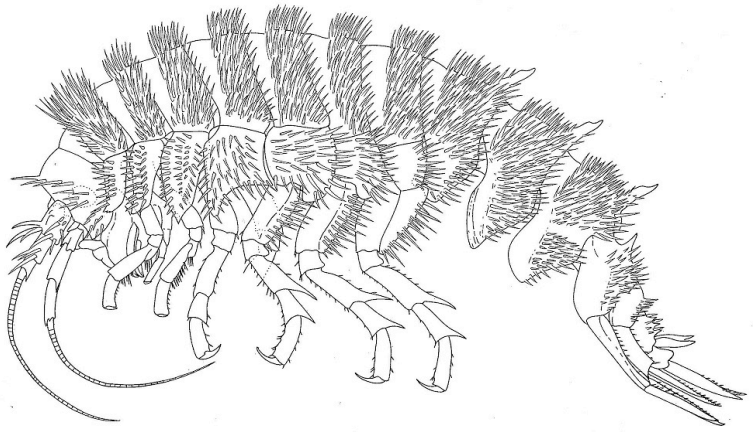
Diagnosis: "*Body covered with teeth or processes. Antenna 1: peduncular article 2 shorter than 1. Accessory flagellum present or absent. Mouthparts projecting quadrately. Labrum almost entire, epistome not very broad. Mandibular incisor ordinary, toothed, rakers present; molar, blunt, strong, triturative. Labium: inner lobes absent, outer lobes relatively broad. Maxilla 1: palp 2-articulate, article 2 ordinary. Maxilla 2: inner plate without facial row of setae. Maxillipeds: inner plate narrower but as long as outer plate, latter elongate; palp article 2 narrow and apicomedially unproduced; palp article 4 well developed, unguiform. Coxae 1-4 progressively longer; 4-5 forming ventral arc; coxa 4 long, polycuspidate. Gnathopods alike, article 5-6 elongate, both gnathopods simple or subchelate (typical). Telson incised or cleft*." (from J. L. Barnard and Karaman 1991)



Paramphithoe hystrix (from J. L. Barnard & Karaman 1991)

Paramphithoe - There are seven species, and 11 named forms (including subspecies) in the genus Paramphithoe, only one of which occurs in the Arctic NEP. All are Arctic forms, but most are distributed in the Atlantic Arctic (Udekem d'Acoz and Vader 2004), or in the NWP Arctic. None occur down to temperate latitudes.

Diagnosis: "*Body covered with teeth or processes. Antenna 1: peduncular articles 1-2 subequal. Mouthparts projecting quadrately. Labrum scarcely incised; epistome not very broad. Mandibular incisor ordinary, toothed; raker row present; molar broad and blunt, triturative. Labium: inner lobes absent. Maxilla 1: palp 2-articulate, article 2 ordinary. Maxilla 2: inner plate without facial row of setae. Maxillipeds: inner plate narrower and as long as outer plate, latter short; palp article 2 narrow and unproduced; palp' article 4 well developed. Coxae 1-4 progressively longer; coxa 4 scarcely to strongly polycuspidate. Gnathopods alike, articles 5-6 elongate, narrow; both gnathopods subchelate, palms transverse. Telson entire or weakly cleft*." (from J. L. Barnard and Karaman 1991)



Uschakoviella echinophora (from J. L. Barnard and Karaman 1991)

Uschakoviella -The monotypic genus *Uschakoviella* is represented in the northern NEP, occurring off the Aleutians. The animal is closely covered with thin articulated spines as an adult, although smaller individuals have the spines more scattered. It is unlikely to occur in the warmer waters to the south within the NEP.

Diagnosis: **"***Body covered with articulated spines. Antenna 1: peduncular articles 1-2 subequal. Mouthparts projecting conically. Labrum incised, not very broad.*

Mandibular incisor ordinary, toothed; raker row weak; molar broad and blunt, triturative. Labium: inner lobes absent. Maxilla 1: palp 2-articulate, article 2 ordinary. Maxilla 2: inner plate without facial row of setae. Maxillipeds: inner plate narrower but as long as outer plate, latter elongate; palp article 2 narrow and apicomedially unproduced; palp article 4 well developed. Coxae 1-4 progressively longer; 4-5 forming ventral arc; coxa 4 scarcely polycuspidate. Gnathopods alike, article 5 elongate, 6 shorter, both narrow; both gnathopods scarcely chelate. Telson incised or cleft."(from J. L. Barnard and Karaman 1991)

Iphimedia poorei, a highly ornamented Australian species (from Coleman & Lowry 2009)

Family Iphimediidae - The sole member of the superfamily represented in the SCAMIT Taxonomic Listing is *Coboldus hedgpethi*, an iphimediid. It was transferred to this genus by Karaman (1980) during a revision of *Iphimedia*. It is very similar in external appearance to the only other member of the family in the NEP, *Iphimedia rickettsi*. The two forms can be separated on the basis of the maxilla 1 palp (uniarticulate in *Coboldus*, biarticulate in *Iphimedia*) and the nature of the telson. In *C. hedgpethi* the telson has a shallow medial indentation flanked by lobes which extend beyond the posteriolateral corners of the telson. In *I. rickettsi* the medial indentation is deeper, and the flanking lobes are small and are well exceeded by the posteriolateral corners of the telson. The posterior margins of pleonites 1 and 2 can also help separate the two generally similar forms. In *I. rickettsi* these bear a sharp posterior cusp about 1/3 the distance from the dorsal to the ventral margin of the segment. Such sharp cusps are absent in *C. hedgpethi*, although there may be a low smooth lobe in the same position. Both species may occur in the SCB (and are listed as from "Southern California" in Thomas and Barnard 1991), but *I. rickettsi* was described from, and is known primarily from, Central California. It has been recorded once from as far south as Bahia San Quintin in Baja California (J. L. Barnard 1964). The value of the number of palp articles on maxilla 1 for generic separation has been called into question(Coleman and Barnard 1991a), and the generic structure of the family remains unsettled (Coleman and Lörz 2013) while new species continue to be added.

Description: "***Head*** *free, not coalesced with peraeonite 1; exposed; as long as deep, or deeper than long; rostrum present, long; eyes present, well developed or obsolescent; not coalesced; 1 pair; bulging, or not bulging. Body laterally compressed, or subglobular; cuticle smooth, or processiferous and dorsally carinate.*

Antenna 1 shorter than antenna 2, or subequal to antenna 2; peduncle with sparse robust and slender setae; 3-articulate; peduncular article 1 subequal to article 2, or longer than article 2; antenna 1 article 2 longer than article 3; peduncular articles 1-2 not geniculate; accessory flagellum present, or absent; antenna 1 callynophore present, or absent. Antenna 2 present; medium length; articles not folded in zigzag fashion;

without hook-like process; ***flagellum longer than peduncle****; 5 or more articulate; not clavate; calceoli absent.*

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

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

Coxae 1-7 well developed, none fused with peraeonites. ***Coxae 1-4*** *longer than broad, overlapping. Coxae 1-3 not successively smaller, none vestigial. Coxae 2-4 none immensely broadened.*

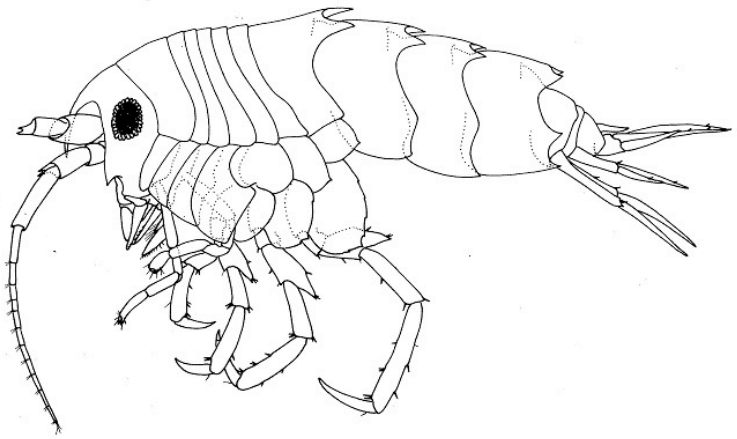
Gnathopod 1 not sexually dimorphic; smaller (or weaker) than gnathopod 2, or subequal to gnathopod 2; smaller than coxa 2, or subequal to coxa 2; gnathopod 1 merus and carpus not rotated; gnathopod 1 carpus/propodus not cantilevered; shorter than propodus, or subequal to propodus, or longer than propodus;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

Peraeopods heteropodous (3-4 directed posteriorly, 5-7 directed anteriorly), none prehensile. Peraeopod 3 well developed. Peraeopod 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, acuminate ventrally, with well developed posteroventral lobe; carpus not produced. Peraeopods 5-7 with few robust or slender setae; dactyli without slender or robust setae. Peraeopod 5 well developed; shorter than peraeopod 6, or subequal in length to peraeopod 6; coxa smaller than coxa 4, with ventrally produced posterior lobe or without posterior lobe; basis expanded or slightly expanded, subrectangular, without posteroventral lobe; merus/carpus free; carpus linear; setae absent. Peraeopod 6 shorter than peraeopod 7, or subequal in length to peraeopod 7; merus/carpus free; dactylus without setae. Peraeopod 7 with 6-7 well developed articles; subequal to peraeopod 5, or longer than peraeopod 5; similar in structure to peraeopod 6; with 7 articles; basis expanded, without dense slender setae; dactylus without setae.

Pleon*. Pleonites 1-3 without transverse dorsal serrations; 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 with robust setae, or 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 longer than outer ramus. Uropod 3 not sexually dimorphic; peduncle short; outer ramus longer than peduncle, 1-articulate, without recurved spines. Telson laminar; moderately cleft, or weakly cleft, or emarginate, or entire; longer than broad, or as long as broad; apical robust setae absent." (from Lowry and Springthorpe 2001).

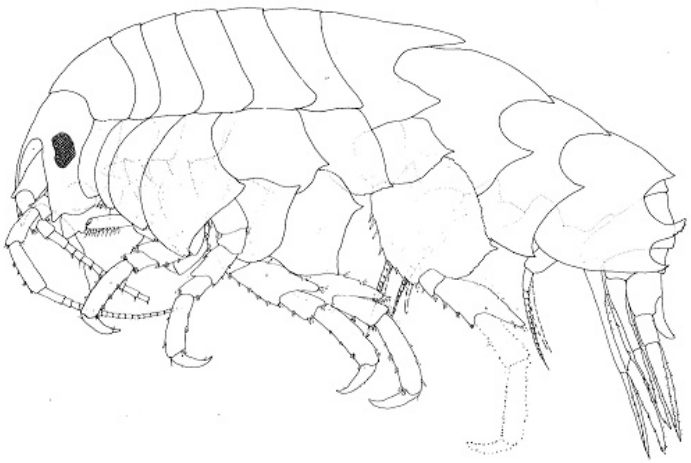


Coboldus laetifucatus, a Caribbean cognate of *C. hedgpethi* (from Just 1990a)

Coboldus – The genus contains six species, and while the type is Mediterranean, most of the taxa are from the American temperate/tropic area. The local *C. hedgpethi* has two possible cognates in the Caribbean; *C. laetifucatus* and *C. chazaroi*, although the key provided to species of the genus by Ortiz et al (2012) suggests that *C. laetifucatus* is the more similar to *C. hedgpethi*. The remaining two members are from the Western Pacific.

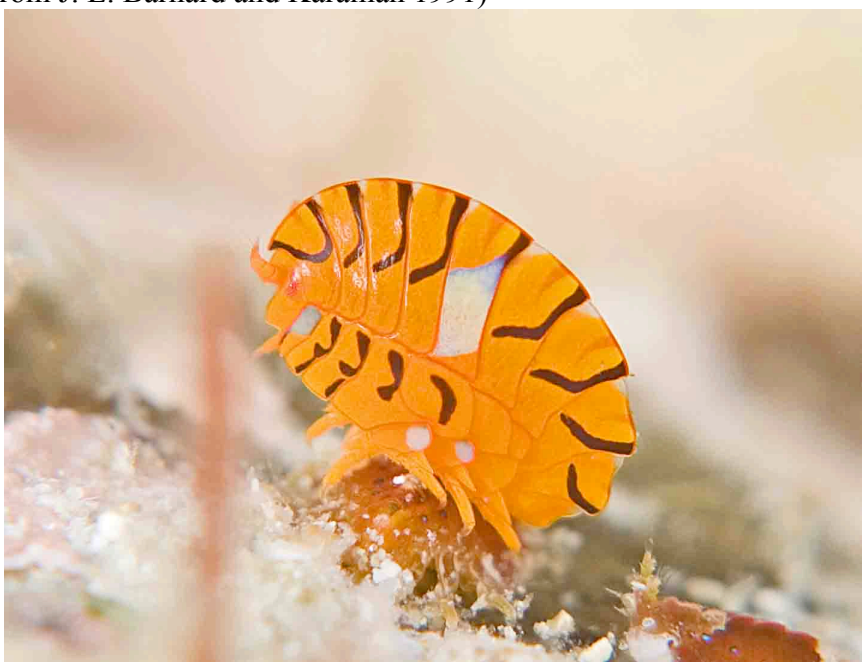
Diagnosis: " *Body with weak posterior teeth or processes, poorly armed. Antenna 1: peduncular article 2 shorter than 1. Mouthparts projecting conically. Labrum incised, not very broad. Mandibular incisor ordinary, blunt and smooth; raker row absent; molar absent. Labium: inner lobes present, [outer strongly notched]. Maxilla 1: palp articulate, very short. Maxilla 2: inner plate without facial row of setae. Maxillipeds: inner plate narrower but as long as outer plate, latter elongate; palp article 2 apicomedially produced; palp article 4 absent. Coxae ordinary; 1-4 progressively longer; coxa 4 long, weakly polycuspidate. Gnathopods 1-2 alike, but of different setosities, articles 5-6 elongate, narrow; both gnathopods chelate. Telson incised*." (from J. L. Barnard and Karaman 1991)

Iphimedia – A large genus of 55 species (Lowry 2014), which is distributed world-wide. Only a single species in the genus is reported from the NEP, although *Coboldus hedgpethi* was placed in *Iphimedia* prior to 1974. The local species is smooth dorsally although the last pereonal segment and the pleosome bear lateral and posterior cusps. Most other species in the genus follow this pattern, but a few are more ornamented (see *I. poorei* above for an extreme example of this trend).



Iphimedia rickettsi (from Moore 1992)

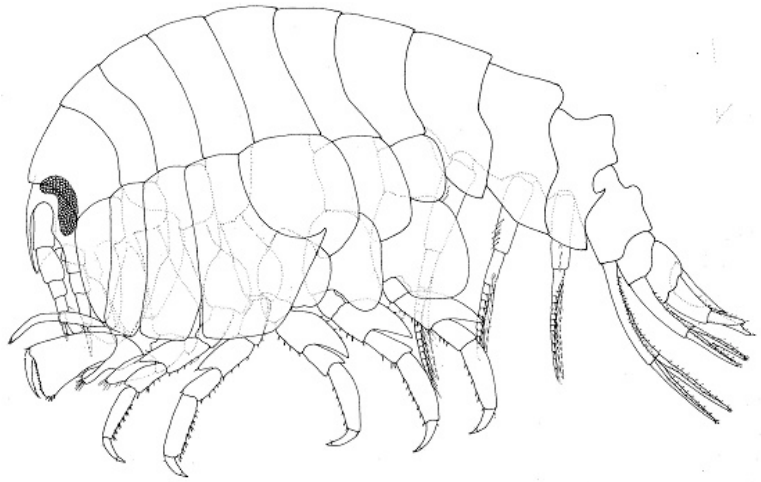
Diagnosis: "*Body covered with teeth or processes posteriorly or smooth. Antenna ·1: peduncular article 2 shorter than 1. Mouthparts projecting conically. Labrum scarcely incised or entire, epistome not very broad. Mandibular incisor ordinary, toothed or not; raker row absent; molar conical or obsolescent, simple. Labium: inner lobes absent, outer notched or not. Maxilla 1: palp 2...articulate, article 2· ordinary. Maxilla 2: inner· plate without facial row of setae. Maxillipeds: inner plate as long as but narrower -than outer plate, latter elongate; palp article 2 apicomedially produced; palp article 4 obsolescent or' absent. Coxae 1-4 progressively longer; coxa 4 sometimes weakly polycuspidate. Gnathopods diverse, of similar size, articles 5-6 elongate, narrow; gnathopod 1 filiformly chelate, gnathopod 2 narrowly subchelate. Telson entire to incised.*" (from J. L. Barnard and Karaman 1991)



Postodius striatus, a brightly colored odiid from Japan

[Family Odiidae] – Based on the cladistic analysis of Berge et al (1999), the families Odiidae and Ochlesidae were found paraphyletic, and were merged under the oldest name, Ochlesiidae. Following that synonymy Horton & De Broyer (2015) list nine genera in the family, of which two occur in the NEP, *Cryptodius* and *Odius*. Five members of this family are recorded from the NEP, although *Odius carinatus* is reported only from the Pribilof Islands in the Arctic portion of the NEP, and *Odius cassigerus* was also reported from Arctic Alaska (Coyle and Mueller 1981). Of the five species, only *Cryptodius kelleri* is found in California waters, extending south to Fort Bragg, in northern California. All five species are lenticular, with well defined and distinctive eyes. Most are found in shallow water associated with algae, although the *Odius* species occur deeper . Given their Arctic-Boreal distribution, it is unlikely that any odiids will be taken in the SCB, and none have been to date. Descriptions and illustrations of all species except *Odius carinatus* and *O. cassigerus* are in Moore (1992). *Odius carinatus* is illustrated in Holmes (1904. *Odius cassigerus* is illustrated and described only in the original description (Gurjanova 1972).

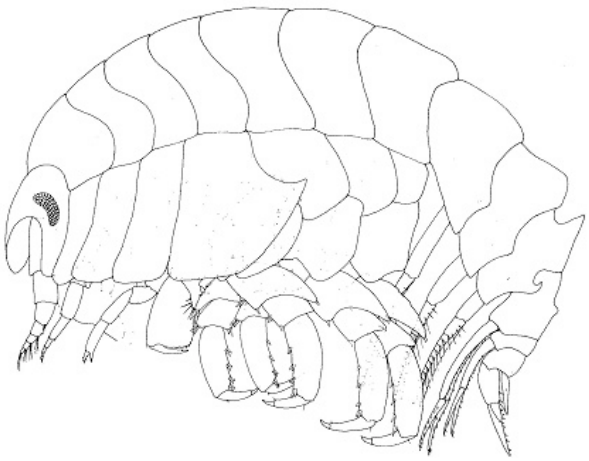
Diagnosis: "*Body compressed, all pereonites dorsally flush, in most species projecting dorsalwards as thin flat keel, teeth present only on pleon. Rostrum well developed. Antennae poorly developed, short, flagella with 6-8 short articles; accessory flagellum absent. Mouthpart part field conically developed. Epistome and labrum narrow, elongate, minutely incised. Incisor of mandible narrow, scarcely toothed; raker row strong; molar small and triturative; palp present, 3-articulate (D-E setae reduced, versus Dikwidae). Lower lip without inner lobes, outer lobes thin, with inner notches or excavations. Inner plate of maxilla 1 small, apically with 1-3 setules; outer plate oblique (:conical"), normally spinose; palp 1-articulate. Inner plate of maxilla 2 without facial or medial setae. Palp of maxilliped 4-articulate, article 2 not produced medially. Coxae 1-3 weakly tapering but coxae 2-4 remaining quadrate below, ventral margins fitting normal ventral parabolic curve of anterior coxae; coxae 1 and 4 not shortened, coxa 3 lacking posterodorsal buttress, coxa 4 with large posteroventral lobe, coxa 5 shorter than 4. Gnathopod 1 feeble and with elongate articles 5-6, weakly flagellar, gnathopod 2 much larger and broader than gnathopod 1; gnathopod 1 propodochelate or with spine and carpus produced. Article 2 of pereopods 5-7 with or without posterior cusps or teeth. Epimeron 3 with 2 large cusps posteroventrally. Urosomites free. Uropods 1-3 biramous. Rami of uropod 3 longer than peduncle, flattened, lanceolate, usually 1-articulate. Telson weakly incised, not longer than peduncle of uropod 3*." (Coleman and J. L. Barnard 1991).



Cryptodius kelleri (from Moore 1992)

Cryptodius – A two member genus endemic in the NEP. Both of the species are found further to the north in boreal and/or Arctic waters, and do not range south to the temperate waters of California. They are keyed in Moore (1992)

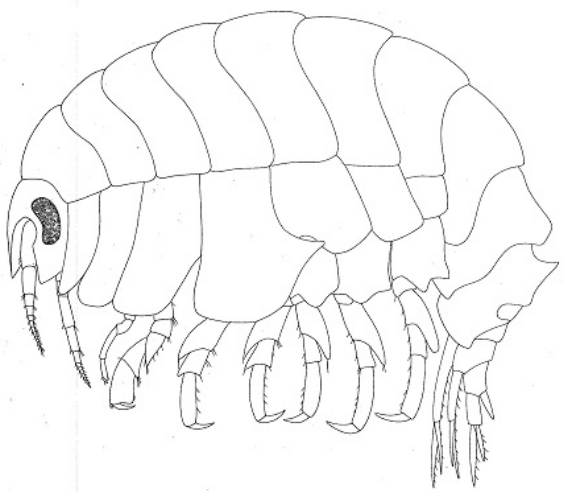
Diagnosis: "*Body smooth. Peraeon lacking a conspicuous narrow, mid-dorsal keel. Head telescoped into a peraeon segment 1. Rostrum overreaching antenna 1 peduncle segment 1. Eyes present, large. Antennae short. Antenna 1, peduncle segment 1 subequal to 2 and 3 together. Antenna 2, peduncle segments 4 and 5 subequal. Epistome raised in a median keel. Upper lip elongate, asymmetrically incised. Mandible elongate; spine row strong, molar on level with palp origin, well developed; mandibular palp, segment 1 small, segments 2 and 3 elongate, subequal. Maxilla 1. inner plate reduced, few setose; outer plate conical, medial margin with curved dentate spines distally, setose proximally; palp I-segmented. Maxilla 2, inner plate with medial margin setulose, outer plate with lateral margin setulose. Maxilliped, paIp segment 2 produced medially, segment 4 not reduced (may be slender and obscured by setae). inner plate subequal to or longer than outer plate. Coxae 1-4 not shortened. Coxa 1 triangular. Coxae 2 and 3 distally truncate. Coxa 4 with posterodistal lobe truncated obliquely to produce an acute posterior tooth. Gnathopods and peraeopods dactylus with unguis. Gnathopod 1 flagellar, propodochelate; carpus and propodus elongate, subequal; dactylus bearing several long plumose setae and 2 unguinal spines distally. Gnathopod 2, broader than 1, propodus triangular, with long palm, dactylus with accessory tooth on posterior margin. Peraeopods 5-7, bases not bearing teeth or cusps. Epimeral plates 2 and 3 posterodistal angles acute. Uropod 1, rami subequal. Uropod 2, inner ramus longer than outer. Uropod 3, inner ramus longer than outer and subequal to peduncle. Telson, ventrally boat-keeled, acutely rounded, entire apex*." (from Moore 1992)



Imbrexodius oclairi (from Moore 1992) [now viewed as *Odius oclairi*]

[Imbrexodius] – The genus is currently not accepted as valid, being submerged into *Odius* (Coleman and Lowry 2014). Moore originally based the separation from *Odius* on several mouthpart characters, including the size of article 4 of the maxillipedal palp.

Diagnosis: *" Body smooth. Peraeon raised into a narrow, mid-dorsal keel. Head retractable under cowl-like peraeonite 1 (to extent of obscuring eye). Rostrum well developed, reaching distal margin of antenna 1 peduncle segment 1. Eyes reniform. Antennae short. Antenna 1 tapering, peduncle segment 1 subequal to 2 and 3 together. Antenna 2, segments 4 and 5 subequa1. Epistome raised in a median kee1. Upper lip elongate, asymmetrically incised. Mandible elongate; spine row lacking; molar on level with palp origin, weak; mandibular palp, segment 1 small, segments 2 and 3 elongate subequa1. Lower lip, with outer lobe acute. Maxilla 1, inner plate reduced, few setose* [sic] *outer plate conical, medial face setulose with strong spines subdistally; palp 1-segmented. Maxilla 2, inner plate medial margin setulose, outer plate with lateral margin setulose. Maxilliped, palp segment 2 slightly expanded medially, segment 4 prominent; inner plate shorter than outer plate. Coxae 1-4 not shortened, coxa 1 tapering, bluntly rounded ventrally, anterior margin concave, obscuring lateral lobe of head. Coxa 2 hardly tapering, distally truncate, anterior margin concave. Coxa 4 posterior margin, with prominent, acute cusp. Gnathopod 1 flagellar, propodochelate; propodus longer than carpus. Peraeopods 5-7 stout. Peraeopod 7 basis with posterior margin drawn out into a blunt cusp. Pleon segment 2 with mid-dorsal gibbous hump distally. Pleon segment 3 with wedge-shaped, mid-dorsal hump (planar face anteriorwards). Epimeral plates acute, with posterior margins broadly excavate distally. Pleopod rami particularly strongly developed. Urosomite 1 with small mid-dorsal hump, urosomites 2 and 3 with dorsal margins smooth. Uropods 1-3 slender. Uropod 1, rami subequal. Uropod 2, inner ramus longer than outer. Uropod 3 rami lanceolate, inner ramus more than twice as long as outer ramus, peduncle longer than outer ramus. Telson, apex moderately incised."* (from Moore 1992)



Odius carinatus (from J. L. Barnard and Karaman 1991)

Odius – Moore (1992) separated two new genera from *Odius*, one of which has since been recombined on WoRMS (Coleman and Lowry 2014). Even with *Imbrexodius* considered as a synonym, *Odius* only contains four species, three of which occur in the NEP or immediately adjacent to it. The remaining species is North Atlantic. No key to the genus currently exists, so one is offered below:

Key to members of the genus Odius, primarily from the NEP

1. Pleonal epimeron 2 posteriorly sinuous, but lacking tooth.....2
   Pleonal epimeron 2 with subacute or blunt tooth on posterior margin.....3
2. Pereonites 6 and 7, and pleonites 1 and 2 bearing a tooth on the posterior margin.....*Odius cassigerus*
   Pereonites 6 and 7, and pleonite 1 lacking a posterior tooth; pereonite 2 with a rounded posterior lobe rather than a tooth.....*Odius carinatus*
3. Dorsal carina well defined; pleonal epimeron 2 with acute posterior tooth..... .....*Odius polarsterni* [Greenland]
   Doral carina poorly developed; pleonal epimeron 2 with blunt posterior tooth.. .....*Odius oclairi*

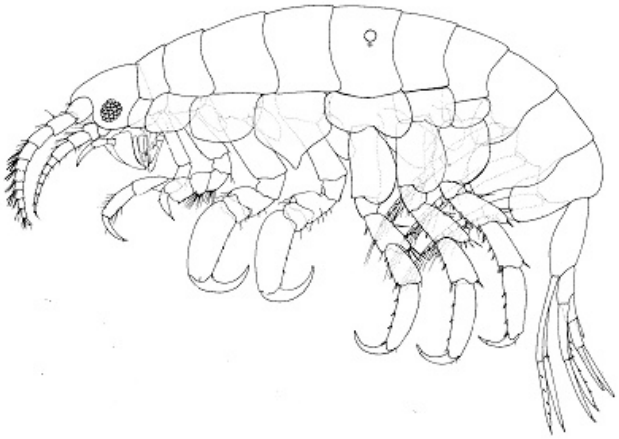
Diagnosis: "*Body with few posterior with teeth or processes. Antenna. 1: peduncular article 2 shorter than 1. Mouthparts projecting conically. Labrum incised, very thin, elongate. Mandibular incisor elongate, narrow, almost needle-like; toothed; raker row present; molar broad· and blunt, triturative-; Labium: inner lobes absent. Maxilla 1: styliform, palp I-articulate, minute. Maxilla 2: inner plate without facial row of setae. Maxillipeds: inner plate narrower and slightly shorter than outer plate (if each plate measured from its base), latter elongate; palp article 2 narrow and apicomedially unproduced (in Sars, 1895: pL133 but P.G. Moore, in litt. remarks that it is produced in his· material of the type species), palp article 4 obsolescent. Coxae ordinary; 1-4 progressively longer; coxa 1 (or2) pointed, (2) 3-4 truncate, coxa 4 long, monocuspidate.*

Gnathopods diverse, of different sizes, gnathopod 1 chelate, articles 5-6 elongate, narrow; gnathopod 2 enlarged, subchelate, palm transverse, articles 4-5 lobate. Telson incised or entire, elongate." (from J. L. Barnard and Karaman 1991)

Family Lafystiidae – Members of the Lafystiidae are obligate parasites of fishes. Only one of the three species listed for this family is known to occur in the SCB; the provisional species *Protolafystius sp A*. The species has been encountered only once, on the head, and particularly on the membranes surrounding the orbits, of a trawl-caught blackgill rockfish. As an ectoparasite, this species is not included in the SCAMIT Taxonomic Listing, although having been presented in a SCAMIT voucher sheet. It is also not to be found, except in comments, in the LACSD databases.

Given its host species, the English sole (*Parophrys vetulus*), *Protolafystius madillae* may eventually prove to be distributed in the SCB along with the host. It is currently known only from British Columbian waters. During the close examination of trawl fishes undertaken by Dr. Juli Kalman as the basis for her dissertation, no specimens of this species were encountered on English sole in the SCB. The species is reported from the gills of the fish, and this area was examined carefully by Dr. Kalman in her search for ectoparasites. Its presence here remains only a possibility. The characteristics given in the attached Voucher sheet will serve to separate the species, should both be found to be represented locally.

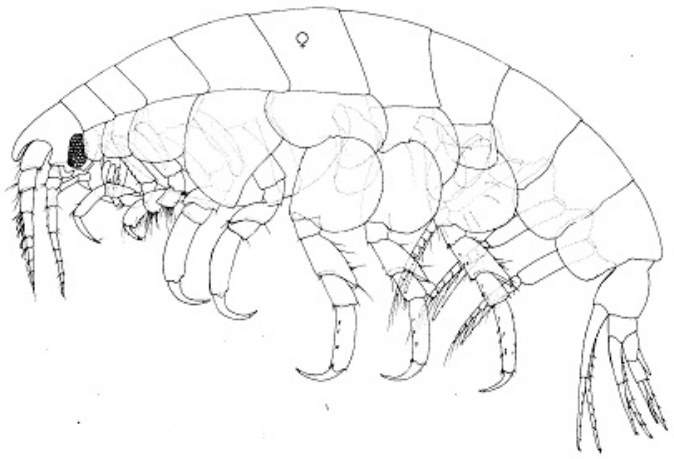
Diagnosis: "*Body broadened, without dorsal teeth. Rostrum large, flattened. Antennae scarcely elongate, flagella with 5+ articles; accessory flagellum absent. Mouthpart part field conically developed (box-like). Epistome and labrum of ordinary width and length, entire. Incisor of mandible ordinary, toothed; raker row absent; molar absent; palp present, 3-articulate. Lower lip without inner lobes, without distinct inner notches. Inner plate of maxilla 1 small, apically setose; outer plate oblique, normally spinose; palp tiny, 1-articulate. Inner plate of maxilla 2 without facial setae. Palp of maxilliped reduced to 2 articles. Only coxae 4-6 acuminate, coxa 4 longer than coxae 1-3, latter ordinary and quadrate, their ventral margins flush; coxa 4 with weak posteroventral lobe, with strong anteroventral lobe, coxae 5-6 with strong, sharp posteroventral lobe, scarcely shorter than or subequal to 4. Gnathopod 1 feeble and with scarcely elongate articles 5-6, gnathopod 2 slightly larger than gnathopod 1; gnathopod 1 simple, gnathopod 2 weakly propodochelate, merus and carpus not produced. Article 2 of pereopods 5-7 without posterior cusps or teeth. Epimeron 3 lacking 2 large cusps. Urosomites free. Uropods 1-3 biramous. Rami of uropod 3 elongate but peduncle also slightly elongate, rami flattened, lanceolate, 1-articulate. Telson entire, not longer than peduncle of uropod 3.*" (from Coleman and J. L. Barnard 1991).



Paralafystius mcallisteri (from Bousfield 1987)

Paralafysius – A monotypic genus apparently endemic to the NEP. The host fish is not known, although the holotype was collected along with black rockfish, red and yellow Irish lord, kelp greenling, and blue-eyed searcher.

Diagnosis: "*Generally similar to Lafystius in body form, slender urosome, deep pleosome plates, truncated rostrum and broad head, posteriorly setose propod of gnathopod 1, and peraeopods 5-7 with unlike bases and normal segment 5, but differing mainly in the following : (i) rostrum relatively short, less than half length of head, (ii) eye rounded, small, (iii) antenna 1, peduncular segment 1 shorter than 2, (iv) upper lip broadly rounded below, (v) mandible, left lacinia with 5 teeth, (vi) maxilla 1, outer plate short, inner group of apical spines vestigial, palp apically 1-segmented, (vii) maxilla 2, plates with few apical setae, (viii) maxilliped, inner plate short, palp 1-segmented, (ix) coxa 1 much smaller than coxa 2; coxae 2-4 broader than deep, (x) gnathopod 2, propod deep, palm convex, hind margin and posterodistal angle armed with short spines; dactyl not microcheliform at tip, unguis attenuated, (xi) peraeopods 3 and 4 (especially segment 6) conspicuously more powerfully prehensile than peraeopods 5-7; segment 4 very short, deeper than long, (xii) peraeopods 5 and 6 hind lobe of coxae rounded (not attenuated) below; bases lacking inner facial plumose setae; segment 6, anterior margin spinose, (xiii) pleopods relatively short, rami 6-8 segmented; "clothespin" spines present, tips bifid, (xiv) uropods 1 and 2 rami each with a prominent apical spine, (xv) telson subtruncate behind, (xvi) coxal gills 2-4 and 6 relatively short, sac-like, (xvii) brood plates large, marginal setae elongate.*" (from Bousfield 1987)



Protolafystius madillae (from Bousfield 1987)

Protolafystius – Another monotypic apparently endemic genus found only in the cooler waters of the NEP off British Columbia. A second species, the provisional *Protolafystius* sp A is known from temperate waters within the SCB. Each is based on a single collection. In California specimens of the black-gill rockfish, from which the initial lot was collected, have been checked for over a decade without finding additional specimens. The initial lot came from a very large, and so probably very old fish, much larger than any taken since. Either the infestation rate is quite low, or it takes time for the parasite to locate a suitably sized host.

The holotype of the northern *P. madillae* is unique. Additional specimens of an undescribed species in the genus are reported by Bousfield (1987) from bocaccio taken in southern and central California (Jensen et al 1982). He examined the material collected by Jensen et al, and indicated their placement in this genus. In all likelihood this is the same organism as *Protolafystius* sp A, given the similarity in reported hosts. Bousfield (loc. cit.) also reported records of a third species, possibly of *Protolafystius*, noted by Brad Myers from collection on an unknown host in California waters. These specimens are yet to be located and examined, and are not treated as different from *P.* sp A here. Jensen et al reported an infestation rate of 3.4% for their *Lafystius* sp (5 of 145 fish examined) with an average of over ten amphipods per host. The initial lot of *Protolafystius* sp A contained numerous individuals of both sexes and from juvenile to mature. The animals were light pink when alive, with the intensity of pigment increasing with growth.

Although most arthropod fish parasites are reported from gills, the specimens of *P*. sp A were taken from the surface of the head. They were most concentrated around the ocular membrane, but also occupied pits on both the dorsal and lateral head areas. The material reported by Jensen et al came from the dorsal fin, pelvic fin, and general body surface.

Diagnosis: " *Body relatively long and slender, little broadened. Head not elevated anteriorly; not broader than long, anterior lobe sub-acute, antero-lateral margin incised; rostrum apically rounded. Eye small, elliptical.*

Antennae subequal in length; flagella short, 5-6 segmented.

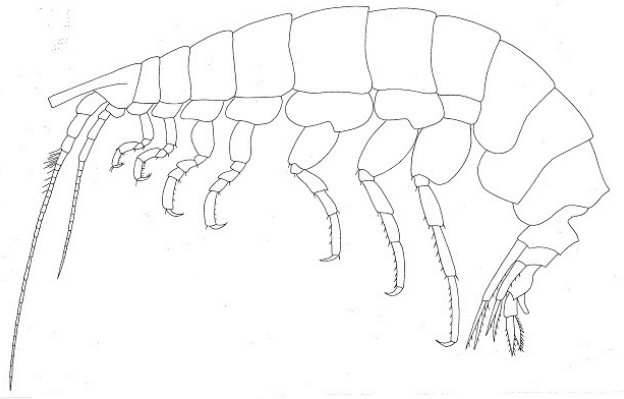
Upper lip weakly incised below, slightly asymmetrical. Mandible, left lacinia with 4 teeth, right lacinia a simple spike: palp segment 3 arched, posterior margin with slender spines. Maxilla 1, inner plate narrowing, with 2 apical setae; outer plate narrowing, apex continuous with inner margin, with 7 strong distal and 4 small proximal spines. Maxilla 2, inner plate narrowing distally. Maxilliped, palp 2-segmented, inner plate elongate.

Gnathopod 1, propod lacking posterodistal setae. Gnathopod 2, palm short, posterodistally right-angled, inner face and hind margin setose; dactyl unguis short, spine-like, forming microchela with posterodistal process. Coxae 1 and 2 small, subequally deep, 3 longer, subrectangular, 4 very large, broadly acuminate below. Coxae 5 and 6, hind lobes broadly deepened below (not sharply produced). Peraeopods 3 and 4, and 5-7 moderately and similarly prehensile. In peraeopods 3 and 4, margins of segments 4 and 5 bare, 4 strongly overhanging 5 anterodistally. Peraeopods 5-7 closely similar in form and size; bases broad, rounded behind, weakly setose medially, segment 5 distinctly shorter than 4, 4 strongly overhanging 5 posterodistally, segment 6 spinose anteriorly.

Pleosome side plates normal, about as wide as deep. Pleopods strong, rami multi-segmented. Urosome segment 1 normal, not elongated; uropod 1 peduncle about equal to rami. Uropod 3, inner ramus, margins weakly spinose. Telson shallowly and broadly incised apically.

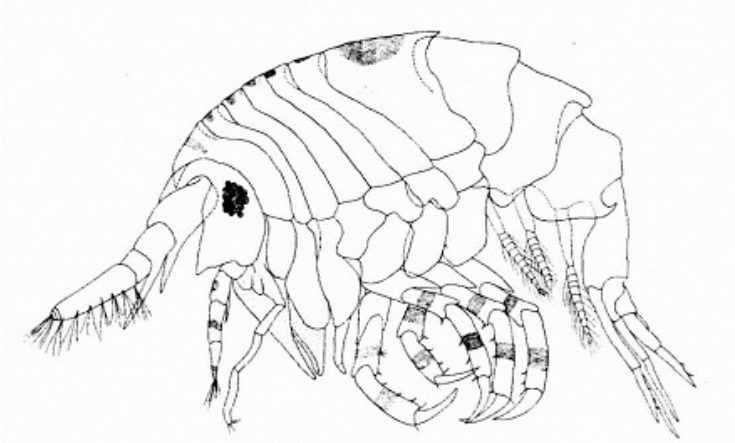
Coxal gills relatively large; elongate sac-like on peraeopods 2-4, plate-like on peraeopods 5 and 6, small on peraeopod 7.

Brood plates 2-4 broad, 5 sublinear; setae elongate." (from Bousfield 1987)



Laphystiopsis planifrons (from J. L. Barnard & Karaman 1991)

Family Laphystiopsidae - No members of the family are reported from the NEP, although two are known from the NWP, *Laphystiopsis iridiometrae* Shoemaker 1919 was described from crinoids off Hong Kong, and *L. ornithorhynchus* Bulycheva 1952 was described from the Sea of Japan. The family contains three genera



Curidia debrogania, an ochlesiid from Belizean reefs (from Thomas 1983)

Family Ochlesidae - No family members known from the NEP, unless you follow the synonymization of Ochlesidae and Odiidae proposed by Berge, Vader and Coleman (1999). Nearly all species in the family are from the southern hemisphere, although species have been described from Belize, and Hawaii; north of the equator but south of the Tropic of Cancer (Coleman and Lowry 2006). Since WoRMS has recently adopted the above synonymy (Horton and De Broyer 2014), this family currently holds the genera previously assigned to the Odiidae. The NEP forms were discussed previously. Ariyama (2011) treats the NWP members of the family.

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