

Iphimedioidea of the NEP

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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 Ochlesiidae and Odiidae. As might be expected from the above comments, there is no good diagnosis of the characters of the superfamily.

The superfamily then consists currently of ten families, six represented in the NEP: the Acanthonotozomatidae, 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 *Acanthonozoma* is treated as an iphimediid in McLaughlin et al 2005) is available in Just (1978). The Dikwidae are exclusively found in South Africa. Members of the Ochlesiidae are found in the tropics, or in the Southern Hemisphere. The Lafystiopsidae are found in the NWP, in the south Atlantic, and in the Antarctic. At least some are known to be associated with crinoids. Members of the Lafystiidae are obligate parasites of fishes. None of these taxa are present on the LACSD encountered species list, although we have taken *Protolaphystius sp A* at T0-1000 on the head of a Blackgill Rockfish. 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)

Diagnosis of the Iphimedioidea

Ecological Commentary

The ecology of the members of the superfamily is far from unitary. While all lafystiids are fish ectoparasites, and at least one lafystiopsid 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 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 grazers. All iphimeriids were characterized as micropredatory browsers (Coleman 1989a,b; Dauby et al 2001a,b). No information is available on ochlesiids or odiids, although the algal association of the latter may suggest grazing on either plant tissue, or on associated colonial organisms. The acanthonotozomellid known from the NEP was found in association with a coral, but the nature of the association is not known.

Personal experience with the iphimeriid *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.

Key to NEP Iphimerioid genera

NEP Iphimerioida based on McLaughlin et al (2005) augmented by known provisional species. *=Taxa on the SCAMIT Ed. 5 list. Valid taxa **bolded**, synonyms not.

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 yaquinae McCain 1971 – Cascadia Abyssal Plain; 2800-2862m

Epimeria sp CS1 Cadien 2004§ - Cascadia slope off Oregon; 1372m

Epimeria sp CS2 Cadien 2004§ - Cascadia Abyssal Plain; 2815m

Paramphithoe hystrix (J. C. Ross 1835) – Arctic Alaska

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

Cryptodius kelleri (Brüggen 1907) – Japan Sea to Northern California; 0-90m

Cryptodius unguidactylus P. G. Moore 1992 – Alaska; 10m

Imbrexodius oclairi P. G. Moore 1992 – Amchitka Island, Alaska; 0m

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)

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). Descriptions and discussion of these taxa can be found in Just (1978) and Moore (1992).

Family Acanthonotozomellidae – 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).

The family was created by Coleman and Barnard (1991a) who later placed their new genus and species *Amatiguakius forsbergi* 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 are 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.

Family Amathillopsidae – 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.” (Lowry and Springthorpe 2001).



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)

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, all in the genus *Amathillopsis* (ten species). 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 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 crescentically excavated as in the Epimeriidae. A form photographed at the 21°N hydrothermal vent field during the East Pacific Rise expedition may be *A. pacifica margo*. The photograph (see below) 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, is eyed (see Barnard and Karaman 1991 Fig 76 for a full body illustration of *A. spinigera*). 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.

Family Dikwidae - The family is known only from South African waters from a single species in the genus *Dikwa*.

Family Epimeriidae – 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 calynophore 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, triturate; 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.” (Lowry and Springthorpe 2001).

According to Coleman and Barnard (1991) the family contains five genera, three of which have representatives in the NEP. A key to these five genera is included below. It is abstracted from the larger key to all iphimedioids by Barnard and Karaman (1991).

Key to Genera of Epimeriidae sensu Coleman and Barnard (1991)

- 1a. Body bearing (in the adult covered with) articulated spines; mandibular rakers small.....*Ushakoviella*
- b. Body lacking articulated spines, but may bear large cusps or spines which are not articulated; mandibular rakers large.....2
- 2a. Coxae 4 and 5 forming a crescentic ventral excavation.....3
- b. Coxae 4 and 5 not crescentically excavate below.....*Paramphithoe*
- 3a. Mandibular molar simple conical or lamellar.....*Epimeriella*
- b. Mandibular molar robust, blunt, broad, triturative.....4
- 4a. Maxillipedal palp of 4 articles.....*Epimeria*
- b. Maxillipedal palp of 3 articles.....*Metepimeria*

The monotypic genus *Ushakoviella* 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. Shoemaker (1964) illustrates it well, as did Barnard and Karaman (1991, Figure 75b). It is unlikely to occur in our temperate waters.

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, or in the NWP Arctic. None occur down to temperate latitudes. *Paramphithoe hystrix* is illustrated by Barnard and Karaman (1991 Figure 75a).

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Peramphithoe hystrix a species of the Arctic NEP (Photo Cédric d'Udekem d'Acoz)

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 all of the 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 a more pronounced dorsal keel/cusps than any of the remaining three forms.

Family Iphimediidae

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Iphimedia obesa a European species (Photo Cédric d'Udekem d'Acoz)

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-tritulative; 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.” (Lowry and Springthorpe 2001).

The sole member of the superfamily represented in the SCAMIT Taxonomic Listing is *Coboldus hedgpethi*, an iphimiid. 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 is 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).

Family Odiidae – 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).

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 both in Holmes (1904), and in Barnard and Karaman (1991, Figure 75a). *Odius cassigerus* is illustrated and described only in the original description.

Family Lafystiidae – 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.” (Coleman and J. L. Barnard 1991).

Only one of the three species listed for this family is known to occur in our area; 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.

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.

Family Oclesiidae - No family members known from the NEP, unless you follow the synonymization of Oclesiidae 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).

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