

**First Record of *Isocyamus kogiae* Sedlak-Weinstein, 1992
(Crustacea, Amphipoda, Cyamidae) from the Eastern Pacific, with
Comments on Morphological Characters, a Key to the Genera of
the Cyamidae, and a Checklist of Cyamids and their Hosts**

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Abstract.—The cyamid amphipod species *Isocyamus kogiae* Sedlak-Weinstein, 1992, is reported for the first time from southern California, extending the known range of the species from Moreton Island, Queensland, Australia, to the north-eastern Pacific. Additional descriptive notes are provided based on a single adult male taken from a pygmy sperm whale, *Kogia breviceps* (de Blainville, 1838), stranded near San Diego, California. Morphological differences between this specimen and the description of the type series are discussed. A revised key to the six currently recognized genera of the family Cyamidae is provided, as well as a checklist of all described species of the family, their cetacean hosts, and the ranges of those hosts.

The amphipod crustacean family Cyamidae Rafinesque, 1815, is a relatively species-poor taxon, all members of which are ectoparasites on cetaceans (Laubitz 1982). Subsequent to Leung's (1967) review, where only 16 species in 5 genera were treated, there have been only one new genus (*Scutocyamus* Lincoln and Hurley, 1974) and relatively few other species described (e.g. Leung 1970b, Lincoln and Hurley 1974, 1980, 1981, Berzin and Vlasova 1982, Waller 1989, Sedlak-Weinstein 1992a, b). Currently, the family contains six genera and approximately 27 species (see Table 1).

Prior to 1992, there were no descriptions of cyamids associated with pygmy sperm whales, *Kogia breviceps* (de Blainville, 1838). Although Caldwell et al. (1971) reported a cyamid attached to one of seven pygmy sperm whales from the western Atlantic examined by them, they did not describe the cyamid, referring to it only as "Cyamidae, form D, genus and species undetermined" (Caldwell et al. 1971: 4). All specimens of cetacean parasites mentioned in that paper as being in the personal collection of Stephen Zam were subsequently lost in an office move (personal communication, Stephen Zam, 29 June 1993).

In 1992, a new species of cyamid was described by Sedlak-Weinstein (1992a) from a pygmy sperm whale that stranded on Moreton Island, Queensland, Australia, marking the first record of cyamids taken from the genus *Kogia* (with the exception of the western Atlantic record above). Sedlak-Weinstein's species proved to belong to the genus *Isocyamus*, but differed sufficiently from *I. delphinii*, the sole previous member of the genus, to necessitate the erection of a second species of the genus, *Isocyamus kogiae*. A third species of *Isocyamus*, *I.*

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Table 1. Known cyamid amphipods of the world and their cetacean hosts and distributions, compiled mostly from Leung (1965, 1967), Gruner (1975), Berzin and Vlasova (1982), and Sedlak-Weinstein (1991, 1992a, b). Additional earlier specific names now considered junior synonyms are listed in Gruner (1975). Selected host references are not meant to be exhaustive; numerous additional accounts exist in the cetacean and crustacean literature. Taxonomy of the host species has been updated based on Mead and Brownell (1993).

Family Cyamidae Rafinesque, 1815	Selected Host References
Genus <i>Cyamus</i> Latreille, 1796	
<i>Cyamus antarcticensis</i> Vlasova, 1982, in Berzin and Vlasova	
<i>Orcinus orca</i> (Linnaeus, 1758) (killer whale; worldwide)	Berzin and Vlasova, 1982
<i>Cyamus bahamondei</i> Buzeta, 1963	
<i>Physeter catodon</i> Linnaeus, 1758 (sperm whale; non-polar worldwide)	Leung, 1965; Gruner, 1975 Berzin & Vlasova, 1982
<i>Cyamus balaenopterae</i> Barnard, 1931	
<i>Balaenoptera musculus</i> (Linnaeus, 1758) (blue whale; worldwide)	Gruner, 1975
<i>Balaenoptera physalus</i> (Linnaeus, 1758) (fin whale; worldwide)	Leung, 1965; Gruner, 1975
<i>Balaenoptera acutorostrata</i> Lacépède, 1804 (minke whale; worldwide)	Gruner, 1975
<i>Cyamus boopis</i> Lutken, 1870	
<i>Megaptera novaeangliae</i> (Borowski, 1781) (humpback whale; worldwide)	Leung, 1965; Gruner, 1975
<i>Physeter catodon</i> Linnaeus, 1758 (sperm whale; non-polar worldwide)	Gruner, 1975 Berzin & Vlasova, 1982
unidentified New Zealand whale	Sedlak-Weinstein, 1991
unidentified south Australian whale	Sedlak-Weinstein, 1991
<i>Cyamus catodontis</i> Margolis, 1954	
<i>Physeter catodon</i> Linnaeus, 1758 (sperm whale; non-polar worldwide)	Leung, 1965; Gruner, 1975 Berzin & Vlasova, 1982; Fransen and Smeenk, 1991
<i>Cyamus ceti</i> (Linnaeus, 1758)	
<i>Balaena mysticetus</i> Linnaeus, 1758 (bowhead whale; Arctic)	Gruner, 1975 Leung, 1965, 1976
<i>Eschrichtius robustus</i> Lilljeborg, 1861 (gray whale; North Pacific; also North Atlantic in historic times)	Lueng, 1965 Gruner, 1975
<i>Cyamus erraticus</i> Roussel de Vauzeme, 1834	
<i>Eubalaena australis</i> (Desmoulins, 1822) (southern right whale; southern hemisphere)	Leung, 1965; Gruner, 1975
<i>Eubalaena glacialis</i> (Muller, 1776) (northern right whale; northern hemisphere)	Leung, 1965; Gruner, 1975
<i>Megaptera novaeangliae</i> (Borowski, 1781) (humpback whale; worldwide)	Gruner, 1975
<i>Cyamus gracilis</i> Roussel de Vauzeme, 1834	
<i>Eubalaena australis</i> (Desmoulins, 1822) (southern right whale; southern hemisphere)	Leung, 1965; Gruner, 1975
<i>Eubalaena glacialis</i> (Muller, 1776) (northern right whale; northern hemisphere)	Leung, 1965; Gruner, 1975

Table 1. Continued.

Family Cyamidae Rafinesque, 1815	Selected Host References
<i>Cyamus kessleri</i> A. Brandt, 1873	
<i>Eschrichtius robustus</i> (Lilljeborg, 1861) (gray whale; North Pacific; also North Atlantic in historic times)	Hurley and Mohr, 1957 Leung, 1965; Gruner, 1975
<i>Cyamus monodontis</i> Lutken, 1870	
<i>Monodon monoceros</i> Linnaeus, 1758 (narwhal; Arctic)	Leung, 1965; Gruner, 1975
<i>Delphinapterus leucas</i> (Pallas, 1776) (beluga; Arctic)	Gruner, 1975
<i>Cyamus nodosus</i> Lutken, 1861	
<i>Monodon monoceros</i> Linnaeus, 1758 (narwhal; Arctic)	Leung, 1965; Gruner, 1975
<i>Delphinapterus leucas</i> (Pallas, 1776) (beluga; Arctic)	Gruner, 1975
<i>Cyamus orcini</i> Leung, 1970b	
<i>Orcinus orca</i> (Linnaeus, 1758) (killer whale; worldwide)	Leung, 1970b; Gruner, 1975
<i>Cyamus orubraedon</i> Waller, 1989	
<i>Berardius bairdii</i> Stejneger, 1883 (Baird's beaked whale; North Pacific)	Waller 1989 Gruner, 1975; Leung, 1965, 1970a, b
<i>Cyamus ovalis</i> Roussel de Vauzeme, 1834	
<i>Eubalaena australis</i> (Desmoulins, 1822) (southern right whale; southern hemisphere)	Leung, 1965; Gruner, 1975
<i>Eubalaena glacialis</i> (Muller, 1776) (northern right whale; northern hemisphere)	Leung, 1965; Gruner, 1975
<i>Physeter catodon</i> Linnaeus, 1758 (sperm whale; non-polar worldwide)	Leung, 1965; Gruner, 1975 Berzin & Vlasova, 1982
<i>Cyamus rhytinae</i> (J. F. Brandt, 1846) {dubious species, supposedly found on Steller's sea cow; See Gruner, 1975: 88}	
<i>Cyamus scammoni</i> Dall, 1872	
<i>Eschrichtius robustus</i> Lilljeborg, 1861 (gray whale, North Pacific; also North Atlantic in historic times)	Gruner, 1975 Leung, 1965, 1976
Genus <i>Isocyamus</i> Gervais & Van Beneden, 1859	
<i>Isocyamus delphinii</i> Guerin-Meneville, 1837	
<i>Globicephala melas</i> (Traill, 1809) (long-finned pilot whale; temperature waters)	Sedlak-Weinstein, 1991 Gruner, 1975 Berzin and Vlasova, 1982 Sedlak-Weinstein, 1992a Leung, 1965 Raga et al., 1983 Hiro, 1938 Sedlak-Weinstein, 1992a
<i>Globicephala macrorhynchus</i> Gray, 1846 (short-finned pilot whale; temperate and tropical, worldwide)	Sedlak-Weinstein, 1991 Gruner, 1975 Sedlak-Weinstein, 1992a Bowman, 1955
<i>Pseudorca crassidens</i> (Owen, 1846) (false killer whale; temperate and tropical, worldwide)	

Table 1. Continued.

Family Cyamidae Rafinesque, 1815	Selected Host References
<i>Steno bredanensis</i> (Lesson, 1828) (rough toothed dolphin; temperate and tropical worldwide)	Gruner, 1975 Lincoln and Hurley, 1974 Sedlak-Weinstein, 1992b
<i>Delphinus delphis</i> ^a Linnaeus, 1758 (common dolphin; temperate and tropical, worldwide)	Gruner, 1975 Berzin and Vlasova, 1982 Sedlak-Weinstein, 1992a
<i>Grampus griseus</i> (G. Cuvier, 1812) (Risso's dolphin; temperate and tropical, worldwide)	Gruner, 1975 Berzin and Vlasova, 1982 Sedlak-Weinstein, 1992a
<i>Phocoena phocoena</i> (Linnaeus, 1758) (harbor porpoise; northern hemisphere, temperate)	Gruner, 1975 Stock, 1977 Berzin and Vlasova, 1982 Sedlak-Weinstein, 1992a Fransen and Smeenk, 1991
<i>Tursiops truncatus</i> (Montagu, 1821) (bottlenose dolphin; tropical and temperate)	Balbuena and Raga, 1991 Sedlak-Weinstein, 1992a
<i>Lagenorhynchus albirostris</i> Gray, 1846 (white-beaked dolphin; temperate North Atlantic)	Stock, 1977 Sedlak-Weinstein, 1992a Fransen and Smeenk, 1991
<i>Mesoplodon europeaus</i> (Antillean beaked whale; North Atlantic)	Balbuena and Raga, 1991 Sedlak-Weinstein, 1992a
<i>Orcinus orca</i> (killer whale; worldwide)	Best, 1969 Sedlak-Weinstein, 1992a
<i>Isocyamus deltobranchium</i> Sedlak-Weinstein, 1992b	
<i>Globicephala macrorhynchus</i> Gray, 1946 (short-finned pilot whale; temperate and tropical waters)	Sedlak-Weinstein, 1992b
<i>Globicephala melas</i> (Triall, 1809) (long-finned pilot whale; temperate)	Sedlak-Weinstein, 1992b
<i>Isocyamus kogiae</i> Sedlak-Weinstein, 1992a	
<i>Kogia breviceps</i> (de Blainville, 1838) (pygmy sperm whale; tropical to warm temperate)	Sedlak-Weinstein, 1992a; This study
Genus <i>Neocyamus</i> Margolis, 1955	
<i>Neocyamis physeteris</i> (Pouchet, 1888)	
<i>Physeter catodon</i> Linnaeus, 1758 (sperm whale; non-polar worldwide)	Leung, 1965; Gruner, 1975 Berzin and Vlasova, 1982
<i>Phocoenoides dalli</i> (True, 1885) (Dall's porpoise; North Pacific, temperate)	Gruner, 1975 Berzin and Vlasova, 1982
Genus <i>Platycyamus</i> Lutken, 1870	
<i>Platycyamus thompsoni</i> (Gosse, 1855)	
<i>Mesoplodon grayi</i> Von Harst, 1876 (Gray's beaked whale; southern hemisphere)	Sedlak-Weinstein, 1991
<i>Hyperoodon planifrons</i> Flower, 1882 (southern bottlenose whale; southern hemisphere)	Berzin and Vlasova, 1982
<i>Hyperoodon ampullatus</i> (Forster, 1770) (northern bottlenose whale; northern hemisphere)	Gruner, 1975 Berzin and Vlasova, 1982 Fransen and Smeenk, 1991

Table 1. Continued.

Family Cyamidae Rafinesque, 1815	Selected Host References
<i>Platycyamus flaviscutatus</i> Waller, 1989	
<i>Berardius bairdii</i> Stejneger, 1883 (Baird's beaked whale; North Pacific)	Waller, 1989 Leung, 1967, 1970a; Berzin and Vlasova, 1982
Genus <i>Scutocyamus</i> Lincoln and Hurley, 1974	
<i>Scutocyamus parvus</i> Lincoln and Hurley, 1974	
<i>Lagenorhynchus albirostris</i> (Gray, 1846) (white-beaked dolphin; temperate North Atlantic)	Lincoln & Hurley, 1974 Gruner, 1975 Fransen and Smeenk, 1991
<i>Scutocyamus antipodensis</i> Lincoln and Hurley, 1980	
<i>Cephalorhynchus hectori</i> (Van Beneden, 1881) (Hector's dolphin; New Zealand)	Lincoln & Hurley, 1980; Sedlak-Weinstein, 1991
Genus <i>Syncyamus</i> Bowman, 1955	
<i>Syncyamus chelipes</i> (Costa, 1866)	
<i>Delphinus delphis</i> ¹ Linnaeus, 1758 (common dolphin; temperate and tropical waters)	Gruner, 1975
<i>Syncyamus pseudorca</i> Bowman, 1955	
<i>Pseudorca crassidens</i> (Owen, 1846) (false killer whale; temperate and tropical waters)	Bowman, 1955 Gruner, 1975 Sedlak-Weinstein, 1991
<i>Syncyamus aequus</i> Lincoln and Hurley, 1981	
<i>Tursiops truncatus</i> (Montagu, 1821) (bottlenose dolphin; tropical and temperate)	Sedlak-Weinstein, 1991
<i>Stenella longirostris</i> ² (Gray, 1828) (Spinner dolphin; tropical)	Sedlak-Weinstein, 1991
<i>Stenella coeruleoalba</i> (Meyen, 1833) (striped dolphin; tropical and temperate)	Raga and Raduan, 1982 Raga, 1988
<i>Syncyamus</i> sp. Bowman, 1958 (close to <i>S. pseudorca</i> Bowman, 1955)	
<i>Stenella attenuata</i> ³ (Gray, 1846) (spotted dolphin; pan-tropical)	Bowman, 1958 Gruner, 1975
<i>Syncyamus</i> sp. Leung, 1970 (close to <i>S. pseudorca</i> Bowman, 1955)	
<i>Delphinus delphis</i> ¹ Linnaeus, 1758 (common dolphin; temperate and tropical)	Leung, 1965; Gruner, 1975
<i>Stenella coeruleoalba</i> (Meyen, 1833) (striped dolphin; tropical and temperate)	Leung, 1965; Gruner, 1975
<i>Stenella longirostris</i> ² (Gray, 1828) (spinner dolphin; tropical)	Leung, 1965; Gruner, 1975
<i>Tursiops truncatus</i> (Montagu, 1821) (bottlenose dolphin; tropical and temperate)	Leung, 1965; Gruner, 1975

Gruner (1975: 93) lists as "doubtful species" the following:

Cyamus latreillei A. Smith, 1831

Cyamus leachii A. Smith, 1831

¹ *Delphinus delphis* has been divided into *D. delphis* and *D. capensis* Gray, 1828; see Heyning and Perrin (1994).

² *Stenella longirostris* has been divided into *S. longirostris* and *S. clymene* (Gray, 1846); see Perrin et al. (1981).

³ *Stenella attenuata* has been divided into *S. attenuata* and *S. frontalis* (G. Cuvier, 1829); see Perrin et al. (1987).

deltobranchium, has now been described from Japanese and Australian pilot whales (see Sedlak-Weinstein 1992b).

On 21 May 1993, a pygmy sperm whale stranded alive in San Diego County, California. The whale was taken to Sea WorldTM in San Diego where it died the same day. The whale was frozen intact and then transported to the Natural History Museum of Los Angeles County (LACM). The cetacean was subsequently found to have a single attached cyamid amphipod, which we have attributed to *Isocyamus kogiae* Sedlak-Weinstein, 1992a. However, sufficient morphological differences exist between this specimen and the original description of the type of *I. kogiae*, and between other members of the genus *Isocyamus*, that we felt it appropriate to describe and discuss our specimen below. Additionally, we provide a more detailed diagnosis of the genus *Isocyamus*, a key to the six known cyamid genera, and an updated checklist of species of the Cyamidae and their hosts.

Materials and Methods

The stranded pygmy sperm whale was a 3.00 m male, the skeleton and selected tissues of which are catalogued in the Natural History Museum of Los Angeles County's collection of mammals as LACM 88938. The cyamid was found on the dorsolateral flank of the host, approximately two-thirds the body length posterior to the head. The dactyli of the pereopods were firmly embedded in the epidermis of the whale. The whale's body at the site of the cyamid was free of wounds. However, prior to the discovery of the cyamid, the whale was transported by truck to Sea World, subsequently died, and was frozen. Therefore, the relative position of the cyamid upon the whale's body may be a post-stranding artifact. Illustrations were made with a Wild M5APO stereo microscope and a Nikon LabophotTM, both equipped with a drawing tube. The cyamid specimen is catalogued as LACM 93-34.1 in the Crustacea collections of the Natural History Museum of Los Angeles County, a collection that contains the most extensive holdings of cyamids in the world (see Leung 1965).

Results

Isocyamus Gervais and van Beneden, 1859

Emended diagnosis.—Body thin and elongate, not ovate. Pigment lacking, imparting whitish color. Head widest at base, tapering slightly anteriorly. Antenna 1 long, exceeding length of either first or second pereopod, composed of 4 articles. Antenna 2 with 3 articles (possibly 4 articles; distinction between distal most articles difficult to discern). Maxillipeds extremely reduced, flap-like. Maxillipedal palps lacking. First pereon fused with head. All subsequent pereonal somites fused dorsally at midline. Pereiopod (gnathopod) 1 slightly shorter and much thinner than pereiopod 2, composed of 6 articles. Dactylus of pereiopod 1 with comb row along cutting border; comb row either single (*I. delphinii*) or double, extending from tip proximally to at least midway point along ventral border. Dactylus with or without distinct unguis. Pereiopod (gnathopod) 2 robust, composed of 4 articles; dactylus smooth. Somite 2 with epaulet-like infoldings of cuticle along anterodorsal border. Somites 3 and 4 bearing single (unpaired), elongate and tubular primary gill and well-developed accessory gill equal in size to (*I. delphinii*) or smaller than primary gills. Sternal area just posterior to and lateral to each primary gill bearing laterally directed acute process. Oostegites rounded,

not triangular or wedge-shaped. Pereiopods 5, 6, and 7 similar, each terminating in smooth, sickle-shaped dactylus (as per family), each lacking ventral spines on any article, each with dorsal ridge-like process extending proximally on basis; this process most obvious on pereiopod 5. Adjacent sternal region with or without (*I. kogiae*) ventrally-directed spines.

Species: *Isocyamus delphinii* (Guerin-Meneville, 1836); *Isocyamus kogiae* Sedlak-Weinstein, 1992a; *Isocyamus deltobranchium* Sedlak-Weinstein, 1992b (see Table 1 for host species).

Comparison of *Isocyamus kogiae* specimens from California and Australia

Our specimen (Figs. 1, 2), a mature male, agrees with Sedlak-Weinstein's (1992a) original description of *I. kogiae* in most major morphological features, such as the relative size of the gnathopods, size and shape of the head, fusion of all pereonites dorsally, presence of epaulet-like processes on the second pereon, size and shape of primary and accessory gills, absence of sternal spines adjacent to pereiopods 5–7, and presence of an acute tooth on the propodus of gnathopod 2. Size of the specimens is also in agreement; our specimen (measured following Sedlak-Weinstein 1992a, and with corresponding measurements of the holotype from Australia given in brackets) measured: total length 4.7 mm [4.75]; width of body 1.4 mm [1.5]; length of primary gill 1.0 mm [1.0]; length of propodus of first gnathopod 0.7 mm [0.5]. Because our sole specimen is a mature male, we can not offer comparisons with Sedlak-Weinstein's allotype.

Our specimen differs from the Australian specimens in having a more strongly curved dactylus on pereiopods 5–7, a slightly different shape to the propodal distal expansion of the second gnathopod (which in the type specimens also bears a second, more proximal, blunt expansion not seen on our specimen), and a slightly different shape to the dactylus and propodus of gnathopod 1. In our specimen, the rounded ventral border of the propodus of gnathopod 1 bears a row of minute spines or teeth, corresponding to what is found on the dactylus; these spines were not mentioned or illustrated by Sedlak-Weinstein (1992a), but may have been overlooked. Another difference is that the accessory gills of our specimen are distally rounded (Figs. 1a, c), whereas they appear more tapered in Sedlak-Weinstein's illustration (1992a: fig. 2), but are well rounded in the paratypes (T. Haney, pers. com.).

Because we had only one specimen, we did not remove mouthparts for separate illustration or subject the specimen to SEM; mouthparts shown here (Fig. 2c) were illustrated in situ, so details are more difficult to see and illustrate. Still, some differences in the mouthparts between our specimen and the Australian series are evident. The most obvious is that in our specimen the second maxillae are fused basally, whereas in Sedlak-Weinstein's illustration (1992a: 4, fig. 11) these are shown as being separate basally. Additionally, her figure of the maxillipeds shows two distinct processes, each with three terminal setae (4–5 in text), whereas we detected only a small, crescent-shaped flap of cuticle, and did not see any setation.

Finally, our specimen differs from the Australian specimens of *I. kogiae*, and indeed from all other described cyamids, in having the last pair of legs displaced anteriorly so that they fall anterior to the penultimate pair; this is unique in the family. Although perhaps appearing as an artifact, the amount of dislocation of

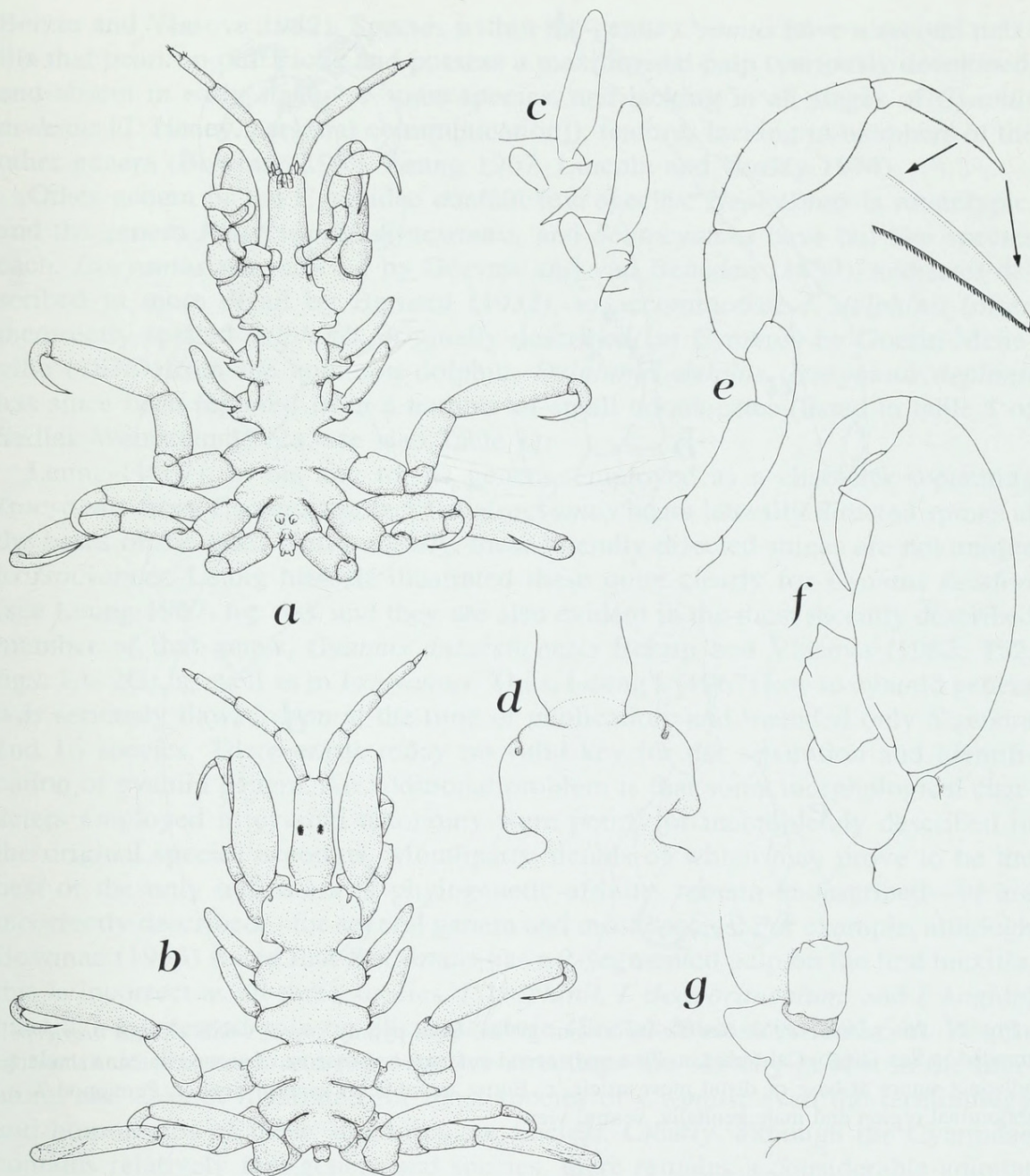


Fig. 1. *Isocyamus kogiae* Sedlak-Weinstein, 1992a, from pygmy sperm whale (*Kogia breviceps*) stranded in San Diego, California. a, Entire animal, ventral view. b, same, dorsal view. c, Primary and accessory gills and ventrally projecting processes of somites 3 and 4. Note ventrolateral process of somite 3 directed more laterally than that of somite 4. d, Dorsal view of somite 2. Note epaulet-like infoldings of cuticle at anterodorsal margins. e, First gnathopod with tip of dactylus enlarged at lower right showing comb row. f, Second gnathopod. g, Ventral view of proximal two articles of gnathopod 2 and part of propodus.

the legs that would be necessary to return the posterior most leg to its "usual" position is substantial, and would involve bilaterally pulling the back legs a considerable distance upward in order for the long claw-like dactylus to clear the other legs. This very unusual feature is immediately diagnostic, but could be overlooked in a disarticulated or damaged specimen, or even one that has been manipulated to the point that the pereopods are in the "normal" arrangement.

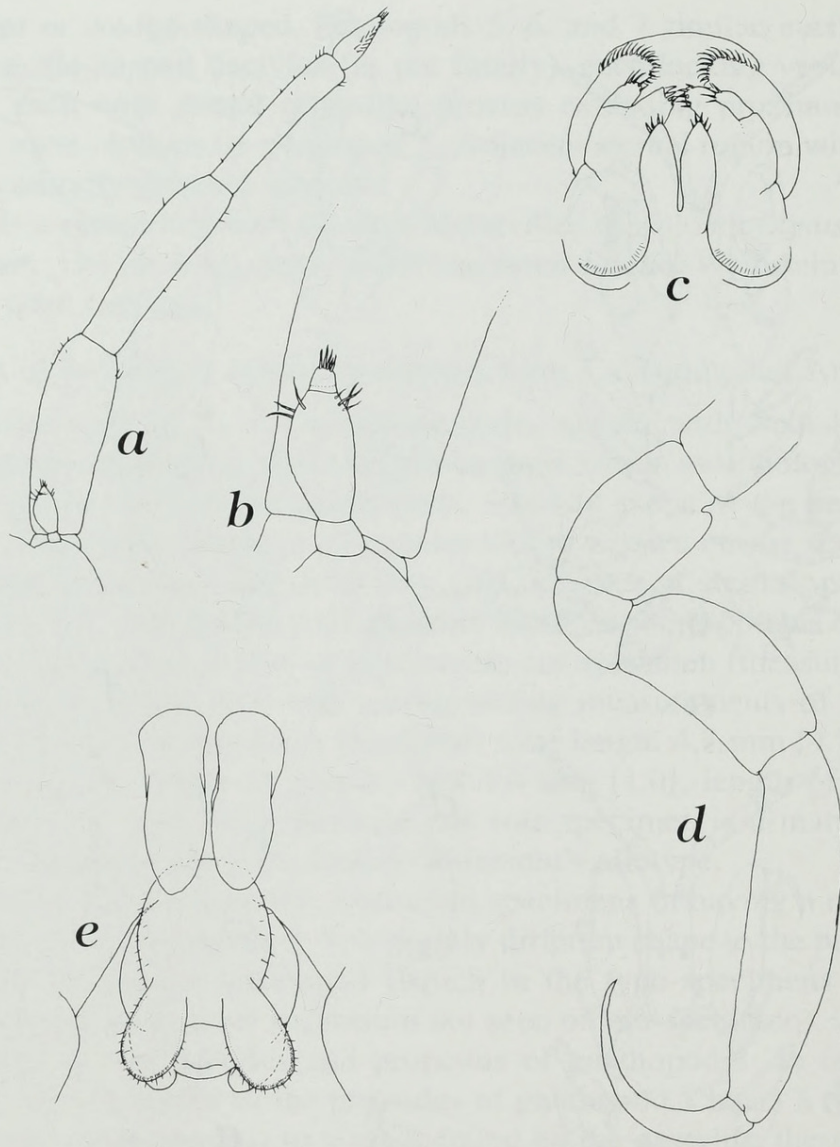


Fig. 2. *Isocyamus kogiae* Sedlak-Weinstein, 1992a, from pygmy sperm whale (*Kogia breviceps*) stranded in San Diego, California. a, First and second antenna. b, Close up of second antenna showing indistinct suture at base of distal most article. c, Entire mouthfield, ventral view. d, Pereiopod 7. e, Abdominal region and male genitalia, ventral view.

This condition does not occur in the collection of 9 females and 5 males of *I. kogiae* from Australia.

Based on known variability of some cyamid features (e.g. Raga 1988), and because of the similarities of the southern California specimen to Sedlak-Weinstein's (1992a) description of *Isocyamus kogiae* from the same host (*Kogia breviceps*) off Australia, we do not believe the above differences warrant erection of another species of the genus.

Currently Recognized Genera of the Cyamidae

As currently recognized, the family Cyamidae contains only the genera *Cyamus* Latreille, 1796; *Isocyamus* Gervais and van Beneden, 1859; *Platycyamus* Lutken, 1870; *Syncyamus* Bowman, 1955; *Neocyamus* Margolis, 1955; and *Scutocyamus* Lincoln and Hurley, 1974. Most species in the family are members of the genus *Cyamus*, currently containing 16 nominal species (Table 1; see also Gruner 1975,

Berzin and Vlasova 1982). Species within the genus *Cyamus* have a second maxilla that bears an outer lobe and possess a maxillipedal palp (variously developed, and absent in early stages of some species, and lacking in all stages of *Cyamus nodosus* [T. Haney, personal communication]), features lacking in members of the other genera (Bowman 1955, Leung 1967, Lincoln and Hurley 1974).

Other genera of the Cyamidae contain few species; *Neocyamus* is monotypic, and the genera *Platycyamus*, *Syncyamus*, and *Scutocyamus* have but two species each. *Isocyamus* was erected by Gervais and van Beneden (1859), and later described in more detail by Barnard (1932), to accommodate *I. delphinii* (often incorrectly spelled *delphini*), originally described (as *Cyamus*) by Guérin-Meneville (1836) from the common dolphin, *Delphinus delphis*. *Isocyamus dephini* has since been reported from a number of small odontocetes (listed in table 1 of Sedlak-Weinstein 1992a; see also Table 1).

Leung (1967), in his key to the genera, employed as a character separating *Isocyamus* from *Cyamus* the fact that *Isocyamus* bears laterally directed spines at the bases of the gills. Unfortunately, these laterally directed spines are not unique to *Isocyamus*; Leung himself illustrated these quite clearly for *Cyamus kessleri* (see Leung 1967: fig. 4a), and they are also evident in the most recently described member of that genus, *Cyamus antarcticensis* Berzin and Vlasova (1982: 152, figs. 1A, 2G), as well as in *Isocyamus*. Thus, Leung's (1967) key to cyamid genera was seriously flawed even at the time of publication, and included only 5 genera and 16 species. There exists today no valid key for the separation and identification of cyamid genera. An additional problem is that some morphological characters employed in cyamid taxonomy were poorly or incompletely described in the original species accounts. Mouthparts, details of which may prove to be the best or the only indicators of phylogenetic affinity, remain undescribed—or are incorrectly described—for several genera and most species. For example, although Bowman (1955) stated that *Isocyamus* has a 2-segmented palp on the first maxilla, this is incorrect as all three species, *I. delphinii*, *I. deltobranchium*, and *I. kogiae*, have a 1-segmented palp on this appendage (Sedlak-Weinstein 1992a, b). Details of the male abdomen and reproductive structures are sketchy at best in the literature, and are not illustrated for most species of *Cyamus*; even the terminology and homologies of these structures are unclear. Clearly, although the Cyamidae contains relatively few genera and species, there remains a considerable amount of taxonomic confusion, and a systematic revision of the group, including redescrptions of all species, is badly needed. To facilitate more accurate identification of cyamids, at least to the level of genus, we have constructed a revised key that is admittedly artificial, employing what appear to us (from the literature and from examination of select taxa in the LACM Crustacea Collection) to be fairly conservative characters.

Revised Key to the Genera of the Cyamidae

1. Gills fasciculate (highly branched, appearing as bundles). Males lacking accessory gills *Neocyamus*
- Gills not fasciculate. Males with or without accessory gills 2
2. Gnathopods 1 and 2 approximately equal in size. Pereon 1 extending laterally beyond lateral margins of head, clearly separated from head by distinct indentation *Platycyamus*

- Gnathopod 1 distinctly smaller (shorter and thinner) than gnathopod 2. Pereon 1 not extending laterally beyond lateral margins of head, or if so then fused to head, not separated from it by distinct indentation 3
- 3. Pereon 3 and 4 greatly reduced in male, fused dorsally in both sexes. Gnathopod 2 composed of 3 articles. Pereon 6–7 fused. Males without accessory gills *Scutocyamus*
- Pereon 3 and 4 not reduced or reduced in male, fused or unfused dorsally in both sexes. Gnathopod 2 composed of 5 articles. Pereon 6–7 fused or unfused. Males with accessory gills 4
- 4. Antenna 2 with 4 articles. Maxilliped occasionally with palp in adult. Pereon 2 without infoldings of cuticle along anterodorsal region ... *Cyamus*
- Antenna 2 composed of 2 or 3 articles. Maxilliped greatly reduced, never with palp in adult. Pereon 2 with epaulet-like cuticular infoldings on anterodorsal region 5
- 5. Combined head and pereon 1 arising from recessed area along front of pereon 2. Antenna 1 shorter than either gnathopod and shorter than fused head + pereon 1. Pereiopods 5–7 short, heavy. Adults not greater than 3 mm total length *Syncyamus*
- Combined head and pereon 1 not arising from recessed area in pereon 2. Antenna 1 elongate, clearly exceeding length of head + pereon 1. Pereiopods 5–7 elongate, delicate. Adults greater than 4 mm total length (usually 6–9 mm) *Isocyamus*

Discussion

In the first report of any cyamid from a pygmy sperm whale, Caldwell et al. (1971) reported that the undescribed cyamid (now lost) was taken from “infected tissue in [an] unhealed open lesion penetrating the skin into the underlying adipose tissue on the side of the body.” The *Kogia breviceps* from which that cyamid was taken was a 3.2 m male (Caldwell and Caldwell 1989: 255) from northeastern Florida in the vicinity of St. Augustine (Caldwell et al. 1971: 4). Similarly, Sedlak-Weinstein’s (1992a) pygmy sperm whale cyamids were collected “from among 20 ‘golf ball-sized’ wounds” on the stranded host. These described wounds are characteristic of those inflicted by cookie-cutter sharks. In contrast, the southern California cyamid specimen from *Kogia breviceps* was found firmly attached to healthy tissue just posterior to midlength.

Interestingly, only species of the genus *Cyamus* have been taken from baleen whales (suborder Mysticeti), whereas species of all six genera, including *Cyamus*, have been found on various members of the toothed whales (suborder Odontoceti) (see Leung 1967 and Table 1). Unfortunately, all systematic investigations of cyamids to date have been of a phenetic rather than cladistic nature, precluding for the moment comparisons of cyamid and cetacean phylogenies.

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