Studies on the New Zealand Amphipodan Fauna

No. 1—The Family Cyamidae: The Whale-louse *Paracyamus boopis**

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Summary

The Whale Louse, *Paracyamus boopis*, is described and figured from specimens collected from a humpback whale at Te Awhaiti, South Island. A list of Cetacea occurring in New Zealand and their Cyamid parasites as found elsewhere is given.

Since species of the Family Cyamidae are host-specific, their dispersal is dependent on the territorial range of their host. For the purposes of this paper it has been taken that Cyamids from whales caught within New Zealand territorial waters or from whales cast on New Zealand beaches belong to the New Zealand fauna.

Commercial whaling in New Zealand is now almost entirely confined to *Megaptera nodosa*, the humpback whale. As far as records are available, and my material shows, the New Zealand Cyamid fauna is limited to one species, *Paracyamus boopis* (Lutk.), the common parasite of the humpback. Whales taken at Te Awhaiti Whaling Station, Picton, are all, to a lesser or greater degree, infected with the lice. The infestation is generally heaviest around the genital apertures, but is found all over the body, particularly where there is barnacle infestation, *Coronula diadema*. The lice will readily attach themselves to persons coming into contact with them. At least two of the whales caught off Te Awhaiti in recent years were considered too badly infested for handling and were not processed. In other cases, where there are bare exposed surfaces, the lice have congregated and appear to have been responsible for breaking through the pigmented layer of the skin. It seems unlikely that the vitality of heavily parasitised whales could remain unimpaired.

Records and Synonymy of New Zealand Specimens

The first record of whale lice in the New Zealand literature is a description by Chilton (1883) of *Cyamus ceti* (Linn. 1780), from *Virgia breviceps* (= *Kogia breviceps*).

A later reference to *Cyamus ceti* (Thomson and Chilton, 1886), and referring in part to the same specimens, states:

"Parasitic on whales (*Virgia breviceps*), C.C. It appears to be common on various whales (and sharks?). I have it from several localities in the New Zealand seas, G.M.T. On small humpbacked whale, Napier, A. Hamilton."

The remark, "and sharks?", is one for which I have seen no verification.

Cyamids from different localities are included in the late Professor Chilton's collection, and I have identified them as follows:

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Paracyamus boopis (Lutk.)

There are two tubes of this species, one labelled "*Cyamus erraticus,* Roussel de Vauzème. On whale. Parengarenga. T. F. Cheeseman", and the other, "*Cyamus ceti,* Linn Napier. A. Hamilton." These latter specimens are probably the ones referred to above as from *Virgia breviceps*

Cyamus ceti Linn.

One tube labelled "*Cyamus ceti,* Linn. Whaler 'Othello.' G.M.T " I have been unable to establish a more definite locality for these. Stephensen (1942) maintains the species *Cyamus ceti* as described by Linnaeus, although Barnard (1932) considered Linnaeus' species to be a composite one, and rejected it in favour of *Cyamus mysticeti* (Lutk) *Cyamus ceti* Linn has precedence.

Cyamus ovalis R. de Vauz

One tube labelled "*Cyamus ovalis* R. de Vauzème. New Zealand From Indian Museum. No. 1464." Mr. K. K. Tiwari, of the Zoological Survey of India, informs me that these were exchange specimens obtained from the Canterbury Museum, 2/8/1876, through Dr. J. von Haast Mr R. R Forster has examined records at Canterbury Museum, and I have been through Dr. Haast's papers in the Turnbull Library. Apart from corroboration that a shipment of Crustacea was received by Mr Wood-Jones, of the Indian Museum, about that date, no further information has been revealed.

Since the localities for the last two species are so indefinite, I can only note the presence of the specimens as possibly from New Zealand

My specimens, from *Megaptera nodosa,* are undoubtedly *Paracyamus boopis*

Genus Paracyamus G. O Sars

Sars, 1895, p 669 Stephensen, 1942, p 451

Sars' definition of the genus has been paraphrased by Barnard thus. "Gnathopods 1 and 2 unequal. Antennae 2, 4-jointed. Maxilla 2 with outer lobes. Maxilliped, palp well-developed in young, but rudimentary in adult. Dactylos and unguis of gnathopod 1 evenly tapering, the latter not distinct Branchiae single on both segments 3 and 4 "

Paracyamus boopis (Lutk.) (Plates 23, 24, Text-figures 1–7)

Cyamus boopis, Lutken, 1873, p 262, pl iii, fig. 6.
Cyamus pacificus, Lutken, 1873, p. 264, pl iii. fig 7
Paracyamus boopis, Barnard, 1932, p. 312

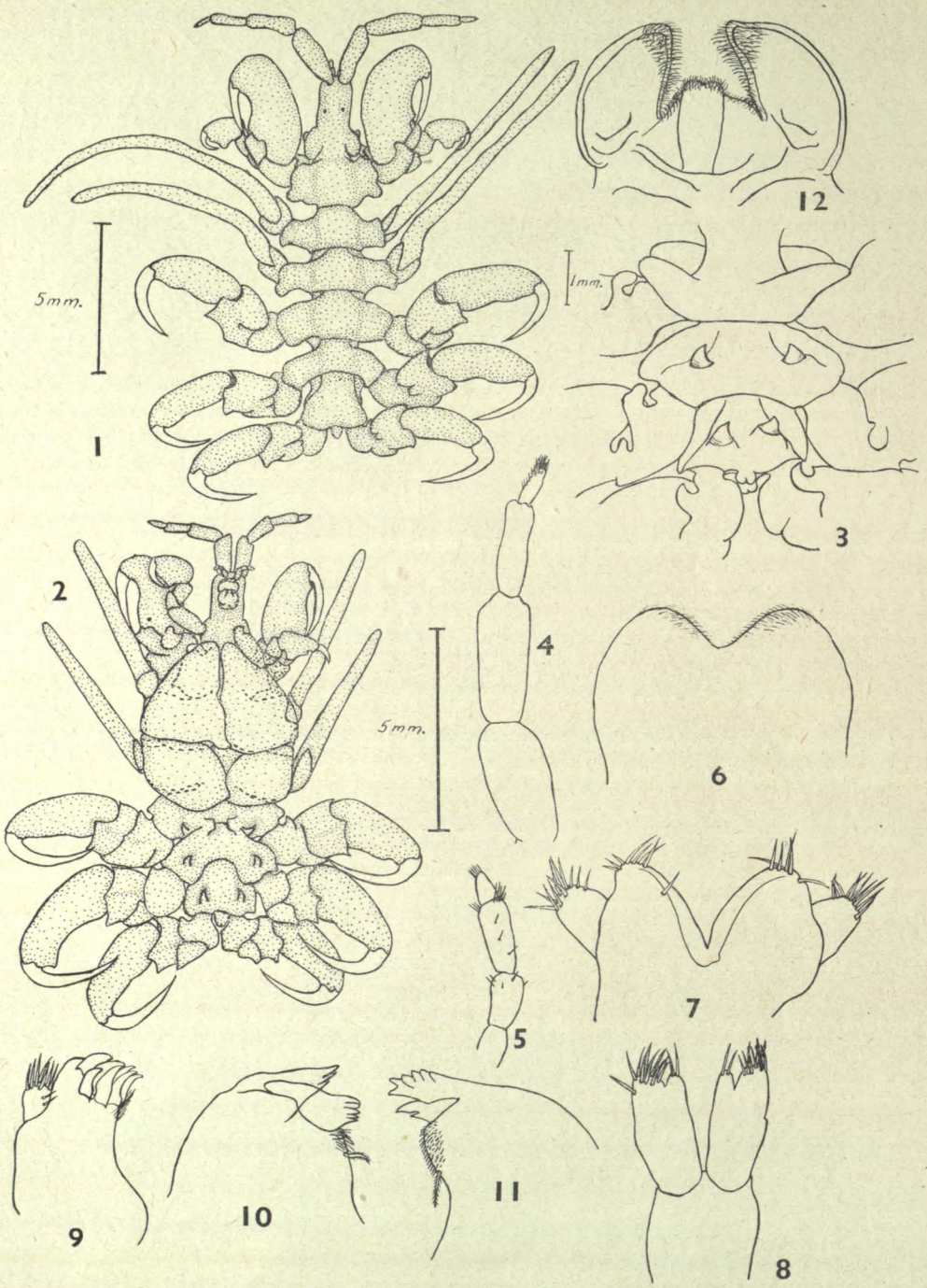
Male, length 11½ mm.; width 4 mm , first antenna, 5¼ mm.

Female, length 9½ mm.; width 4 mm ; first antenna, 3½ mm.

Antennae. First: Four-segmented Segments successively narrower; first and second subequal in length, third segment ¾ length of second, last segment less than half length of third, fringed with setae terminally and along superior distal margin *Second:* Four-segmented. Second segment slightly shorter than the narrower third segment, both with scattered long setae. Last segment less than half length of third, with strong bristles terminally and superiorly.

Maxillae First: Of two lobes, the inner with 7 strong curved spines, at base of innermost spine is an area of fine bristles. Outer lobe small, not reaching as far as extremity of spines on inner lobe, projecting as a small setose palp. *Second:* One lobe only present, terminally bifurcate to two small lobes; inner lobe the smaller and bearing two strong setae, outer with a number of setae.

Maxilliped. Adult: Inner lobes subtriangular, tending to ovate, with terminal tuft of strong setae. Outer lobes present, emerging from oblique outer margin



Paracyamus boopis (Lutk.)

(1) Adult male, dorsal view. (2) Adult female, ventral view. (3) Ventral surface of segments 5, 6, 7, male. (4) First antenna. (5) Second antenna. (6) Upper lip. (7) Maxilliped. (8) Second maxilla. (9) First maxilla. (10) Left mandible. (11) Right mandible. (12) Lower lip. (Appendages figured 3–12 not all to same scale. Scale in millimetres.)

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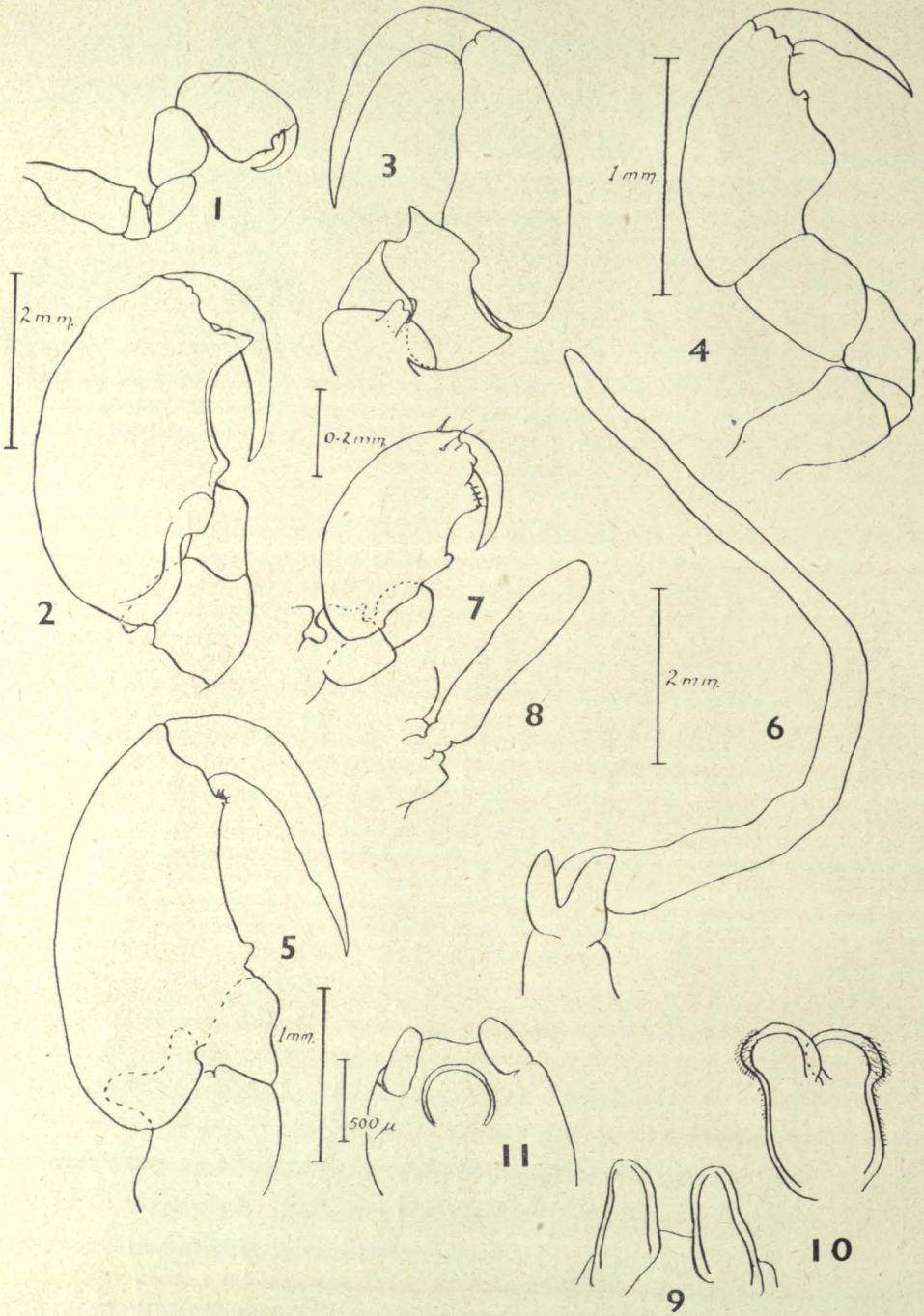
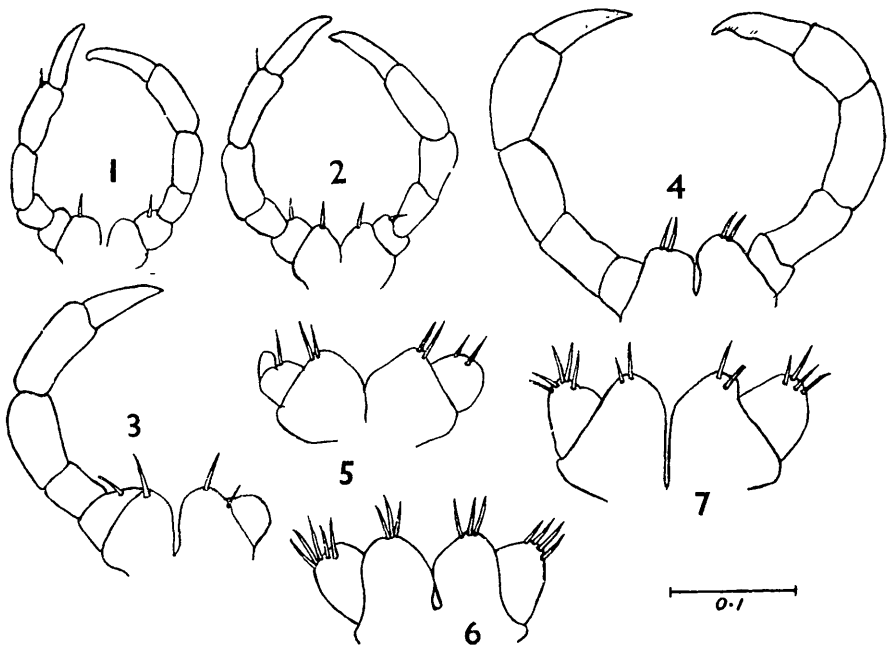


Paracyamus boopis (Lutk.)

(1) Gnathopod 1, male. (2) Gnathopod 2, male. (3) Peraeopod 3, male. (4) Gnathopod 1, female. (5) Gnathopod 2, female. (6) Gill of adult male. (7) Gnathopod 2, juvenile male. (8) Gill of juvenile male. (9, 10, 11) Urosome appendages.



Series of maxillipeds from *Paracyamus boopis* juveniles of various sizes.
(1) Juvenile, 1 mm long. (2) Juvenile, 1½ mm. long (3) Juvenile, 2 mm. long.
(4) Juvenile, 2⅔ mm long (5) Juvenile, 3 mm long (6) Juvenile, 3⅔ mm. long
(7) Juvenile, 4⅓ mm. long.

of inner lobes, small and somewhat globular, with similar distal setae. *Juvenile:* Total length 2⅔ mm. Palp present, four-segmented, attached to outer margin of outer lobe. First segment more than twice as large as outer lobe, second and third segments successively longer, dactylos subequal with third segment, stout, curved, tapering, with row of minute setules distally along inner margin.

Upper Lip. Dorsal margin with wide, shallow cleft dividing lip into two lobes, each finely bristled terminally and along inner margins.

Lower Lip Inner and outer lobes present. Inner slightly cleft medially, raised on mound, both mound and lobe with strong bristles. Outer lobes much larger, subovate, inner and distal margins strongly setose

Body. Male: General outline of body ovate in dorsal view. Head parallel-sided. Segment 1 fused with and widening sharply from head, then rounding laterally and distally. Segment 2 subrectangular, nearly twice as long as head, and half as wide again, anterior and posterior margins excavated sinuously to projecting anterolateral and posterolateral corners. Lateral margins between projections also sinuous. Segments 3 and 4 more or less spindle-shaped, widening a little laterally, posterior angles bluntly produced. Segments 5 and 6, anterior and posterior margins parallel, broadly arched and broadly concave posteriorly; last segment subtriangular, slightly broader than long. Body segments 6 and 7 each with a single pair of sharp tubercles ventrally. *Female:* Ventral surface of segment 5 with pair of inwardly directed blunt processes; a single pair of pointed tubercles on each of segments 5, 6, and 7.

Mandibles. Molar process absent. Right mandible with cutting edge of upper process with six teeth, and lower two-toothed spine. Surface and margin immedi-

ately below lower spine finely setulose, below that again a single setulose spine. Left mandible with upper process of cutting edge bearing three teeth, lower spine with five. Below spine, inner margin finely bristled, inner margin medially with setulose spine.

Gnathopod 1. Male: Basos sharply constricted proximally, twice as long as distal width; ischium subequal in width with basos, half as long as wide. Merus subovate, narrower than ischium, length twice width, distal two-thirds of anterior margin contiguous with proximal margin of carpus. Carpus subtriangular, width $\frac{3}{4}$ length, anterior margin twice length of posterior. Propod subtriangular, anterior margin rounded, more than twice length of straight posterior margin which rounds sharply to transverse palm Palm with strong tooth medially, excavated between tooth and dactylos, which is curved and as long as palm. Tooth and outer margin of palm minutely serrate. *Female:* Propod narrower at distal end than in male; palm oblique, poorly defined, minutely denticulate, small setae at dactylos base and on single median tooth.

Gnathopod 2. Male: Merus subrectangular, as long as wide; anterior margin produced medially to strong blunt projection reaching to proximal margin. Carpus smaller, subrectangular, very narrow. Propod twice as long as wide, posterior margin (palm) half as long as anterior, with two teeth, the proximal one a small blunt projection; the anterior, near base of dactylos, produced, acute and strong; the palm between teeth excavate; dactylos curved and reaching as far as proximal tooth. *Female:* Distal tooth of palm poorly defined, with five or so setae; both teeth denticulate; palm between teeth very little excavated, almost straight, non-denticulate.

Peraeopods 1 and 2. Segments 3 and 4 which bear the gills have no peraeopods, and the peraeopods on segment 5 are regarded as Peraeopods 3.

Peraeopod 3. Ischium, anterior margin with strong flange produced backwardly; a small subrectangular or conical projection arising medially near distal margin and projecting slightly posterior to base of flange. Merus subrectangular, anterior margin similarly produced. Carpus width twice its length, posterodistal angle sharply produced, distal margin with posterior half excavated to acute anterodistal angle; proximal angle forming broadly rounded projection. Propod narrowing distally, anterior margin convex, twice length of straight posterior margin (palm). Dactylos long, stout, strongly curved.

Peraeopods 4 and 5. Slightly larger, otherwise similar.

Urosome. This bears ventrally, in the male, a pair of simple conical projections (Pl 24, fig 9) which Sars refers to as "external sexual appendages." Posterior to these is a single appendage (fig. 10), cleft terminally for a third of its length to form two globular lobes. the outer lateral margins of lobes richly covered with bristles, the bristles thinning out along peduncle margin. Corresponding to the telson is a small subcircular plate, with a simple conical projection either side (fig. 11), these possibly corresponding to uropods.

Gills. Male: Unsegmented, single, present on segments 3 and 4, and as long as body less segment 1. Each with pair of accessory appendages. *Female:* A little shorter, comparatively, than in male. *Juvenile:* Shorter and stouter, more balloon-like.

These specimens were taken by Mr W. H. Dawbin at Te Awhaiti, in July, 1949, and are in my personal collection, slides 71 to 75. The female described above contained between 70 and 80 juveniles in her brood-pouch, ranging in

length from 1 to 3 millimetres. The colour of the animals in life is brownish-white, in spirit yellowish. The eyes are brown, small, round and apart.

DISCUSSION

Of the previous descriptions of the species published, only two (Lutken, 1873; Sars, 1895) are full descriptions, and Lutken's is in Danish. Barnard (1932) described *P. erraticus* in some detail, and stated that *P. boopis* differed only in the ventral tubercles. Since this is the first paper of a series towards a revision of the New Zealand Amphipodan fauna, a detailed description of the New Zealand specimens is given. The species itself is very constant in form.

There are five species in the genus, *P. boopis, P. erraticus, P nodosus, P. physeteris,* and *P. gracilis;* and what Stephenson (1942) calls "a rather uncertain variety," *P. boopis* var. *physeteris P. physeteris* has the gills tufted, whereas in the other four species they are not tufted but elongate-cylindrical. *P. nodosus* may be distinguished in turn by the rugged dorsal surface. In *P. erraticus, P. gracilis,* and *P. boopis* the dorsal surface is smooth, and in *P. gracilis* the ventral surface lacks the characteristic pointed tubercles of *P. erraticus* and *P. boopis.* The female of *P. erraticus* has one pair of tubercles on each of segments 5 and 7, and two pairs on segment 6; and the male has one pair on each of segments 5, 6, and 7. On the other hand, *P. boopis* has one pair of tubercles on segments 5, 6 and 7 in the female, and one pair on only segments 6 and 7 in the male.

Otherwise *P. erraticus* and *P. boopis* are similar Although both species have been recorded elsewhere from *Megaptera nodosa,* I have not as yet seen *P. erraticus* collected from New Zealand.

Short references to the occurrence of *P boopis* on whales are made in whaling papers by Lillie (1915) and Matthews (1937, pp. 47, 48).

The maxilliped palp in the young of the genus *Paracyamus* is easily distinguished under a high power microscope, and the constancy of the size-degeneration ratio makes it an eminently satisfactory characteristic for distinguishing the genus from *Cyamus.*

The growth stages of the palp (Text-figs.) in *P. boopis* closely parallel those figured by Chevreux (1913, fig. 62) for *P. erraticus.* Up to a size of about 3·5 mm. the palp is well developed; above this the maxilliped shows the degeneration characteristic of the genus This agrees with Chevreux's findings for *P. erraticus*:

". . ce palpe était encore complètement développé chez les exemplaires de 3 millimètres de longueur. In commence à s'atrophier et ne possède plus que deux articles chez un spécimen long de 4 millimêtres, pour en arriver à être très court et uniarticulé chez les adultes."

The following list of Cetaceans occurring in New Zealand waters (Oliver, 1922) and their Cyamid parasites as found elsewhere (cf. Barnard, 1932, and Stephensen, 1942) suggests that further examination of these animals will add a number of species of Cyamidae to the New Zealand fauna.

Balaena australis (Southern Right Whale)	*Cyamus ovalis*
	Paracyamus erraticus
	Paracyamus gracilis
Balaenoptera musculus (Blue Whale)	*Cyamus balaenopterae*
Balaenoptera physalus (Fin Whale)	*Cyamus balaenopterae*

Megaptera nodosa (Humpback)	*Paracyamus erraticus*
Physeter macrocephalus (Sperm Whale)	*Paracyamus boopis*
	Paracyamus physeteris
	P. boopis var. *physeteris*
Delphinus delphis (Dolphin)	*Isocyamus delphini*
Grampus griseus (Risso's Dolphin)	*Isocyamus delphini*
Globicephala maelena (Blackfish)	*Isocyamus delphini*
Pseudorca crassidens (Tasmanian Blackfish)	*Isocyamus delphini*

The genera *Paracyamus* and *Isocyamus* are alike in having the maxilliped palp in the adult rudimentary or absent. They may be distinguished in that the second antennae of *Paracyamus* sp are 4-segmented, and in *Isocyamus* they are 3-segmented. In *Cyamus* the maxilliped palp in adult specimens is 5-segmented. *Cyamus ovalis* has two pairs of branchia to each segment and *C. balaenopterae* has one pair.

Acknowledgments

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