Two new species of Cardiodectes Wilson (Copepoda: Siphonostomatoida)

Article *in* Systematic Parasitology · February 1981

DOI: 10.1007/BF00009904

1 author:

David R Bellwood
James Cook University
560 PUBLICATIONS **43,645** CITATIONS

TWO NEW SPECIES OF *CARDIODECTES* WILSON (COPEPODA: SIPHONOSTOMATOIDA)

David R. BELLWOOD

*c/o Crustacea Section, British Museum (Natural History), Cromwell Road, London SW7 5BD, U.K.

Summary

Two new species of pennellid copepods are described, *Cardiodectes boxshalli* from *Nicholsina usta* (Valenciennes, 1839) off Jamaica and *C. spiralis* from *Anthias tuka* (Herre, 1927) off the Massas Islands, New Guinea. A key to all known species of the genus is provided.

Introduction

The genus *Cardiodectes* was established by Wilson in 1917 to accommodate two species originally described as *Lernaeenicus medusaeus* (Wilson, 1908) and *Peroderma bellottii* (Richiardi, 1882). *Lernaeenicus medusaeus* is the type species of the genus *Cardiodectes* which at present contains 10 nominal species. The two new species described in this account are based upon unidentified material stored in the collections of the British Museum (Natural History). The specimens were either dissected from the host or were boiled in 15% KOH in order to remove surrounding host tissue and to reveal the appendages. All drawings were made using a camera lucida. Appendages were identified by comparison with the descriptions in Kabata (1979) and Gooding & Humes (1963).

Cardiodectes boxshalli sp.nov.

Description

Female: Body (Fig. 1B) divided into a large cephalothorax, narrow neck region and broad cylindrical trunk. Cephalothorax (Figs. 2D, 3A, 3B) expanded laterally forming a pair of large flattened lobes (l.l. Fig. 3A) that are most pronounced dorsally. Nodular or branching antennary processes on cephalothorax, partially covering ventral surfaces of lateral lobes. One pair of large antennary processes (a.p., Fig. 2D) originating lateral to mouth cone and extending posteriorly to level of neck. Three transverse cuticularized ridges (c.r., Fig. 3A) on dorsal surface between lateral lobes (possibly representing original tergal plates); anterior ridge bearing two posteriorly bifid processes, middle and posterior ridges plate-like. Mouthparts on ventral surface between anterior ends of lateral lobes, similar to other members of genus in structure. Neck region short, less than one third as wide as trunk and bearing two small ventro-lateral lobes that double over-all width of neck. Trunk (Figs. 1C, 1D) slightly dorso-ventrally flattened, broadest at rounded anterior angles and tapering posteriorly. Posterior surface irregular. Oviducts often visible through body wall. Egg tubes arising laterally near postero-lateral corner (Fig. 1B-D); uniseriate and loosely coiled into a spiral; length about 4mm and containing about 86 eggs in one complete paratype specimen.

* Work completed during a period of secondment from the University of Bath.

Systematic Parasitology 2, 149–156 (1981). 0165-5752/81/0022-0149 $1.60

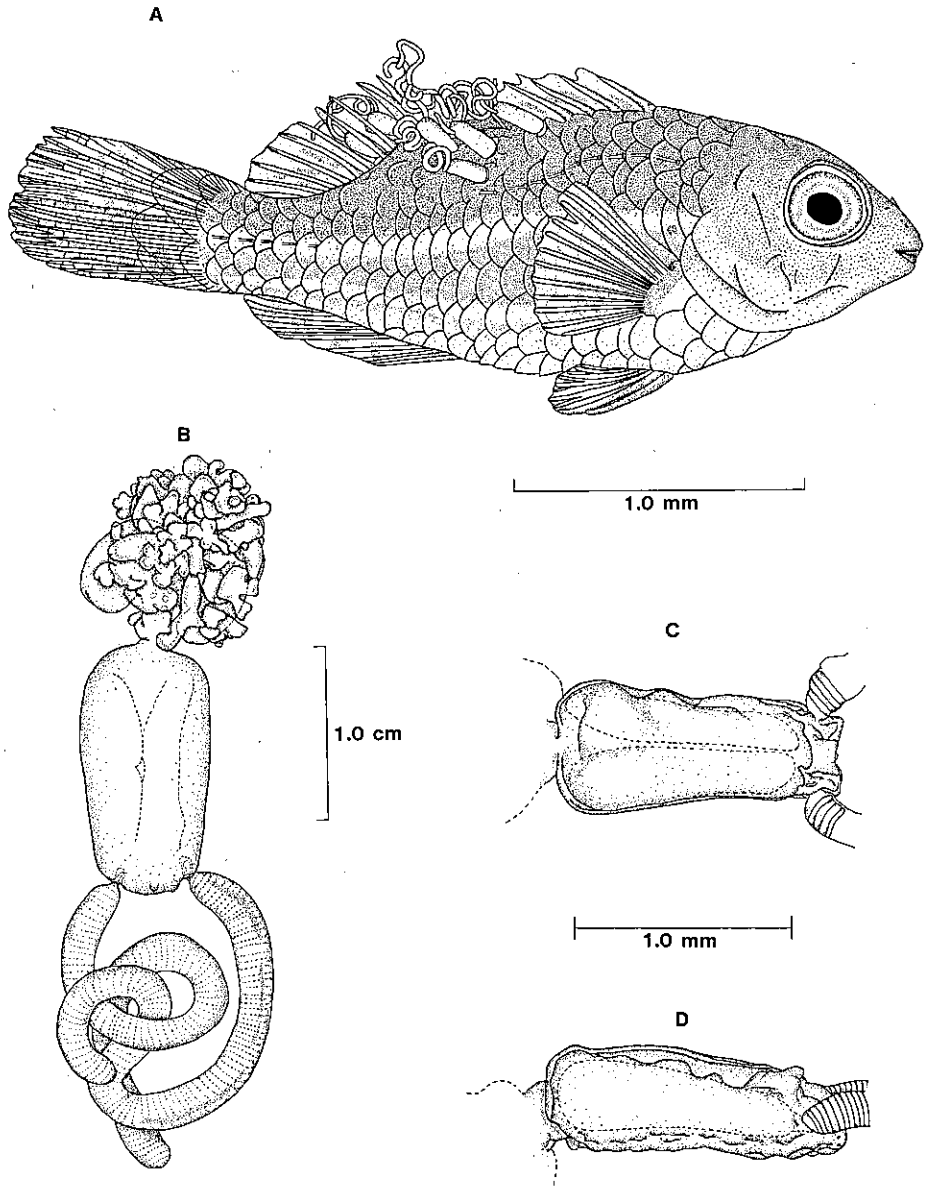

Fig. 1. *Cardiodectes boxshalli* sp.nov.: (A) *in situ* on host; (B) adult female, ventral; (C) trunk, dorsal; (D) trunk, lateral.

Three pairs of thoracic swimming legs on ventral surface of cephalothorax between posterior ends of lateral lobes. Legs 1 and 2 biramous with both rami 2 segmented, Leg 3 uniramous with a 2-segmented exopod (Figs. 2A, 2B, 2C,): armature formula as follows:

	Endopod	Exopod
Leg 1	0 – 0 ;7	1 – 0 ; 1, 6
Leg 2	0 – 0 ; 7	1 – 0 ; 1, 6
Leg 3	absent	0 – 0 ; 5

Total body length of holotype 2.5 mm, comprising

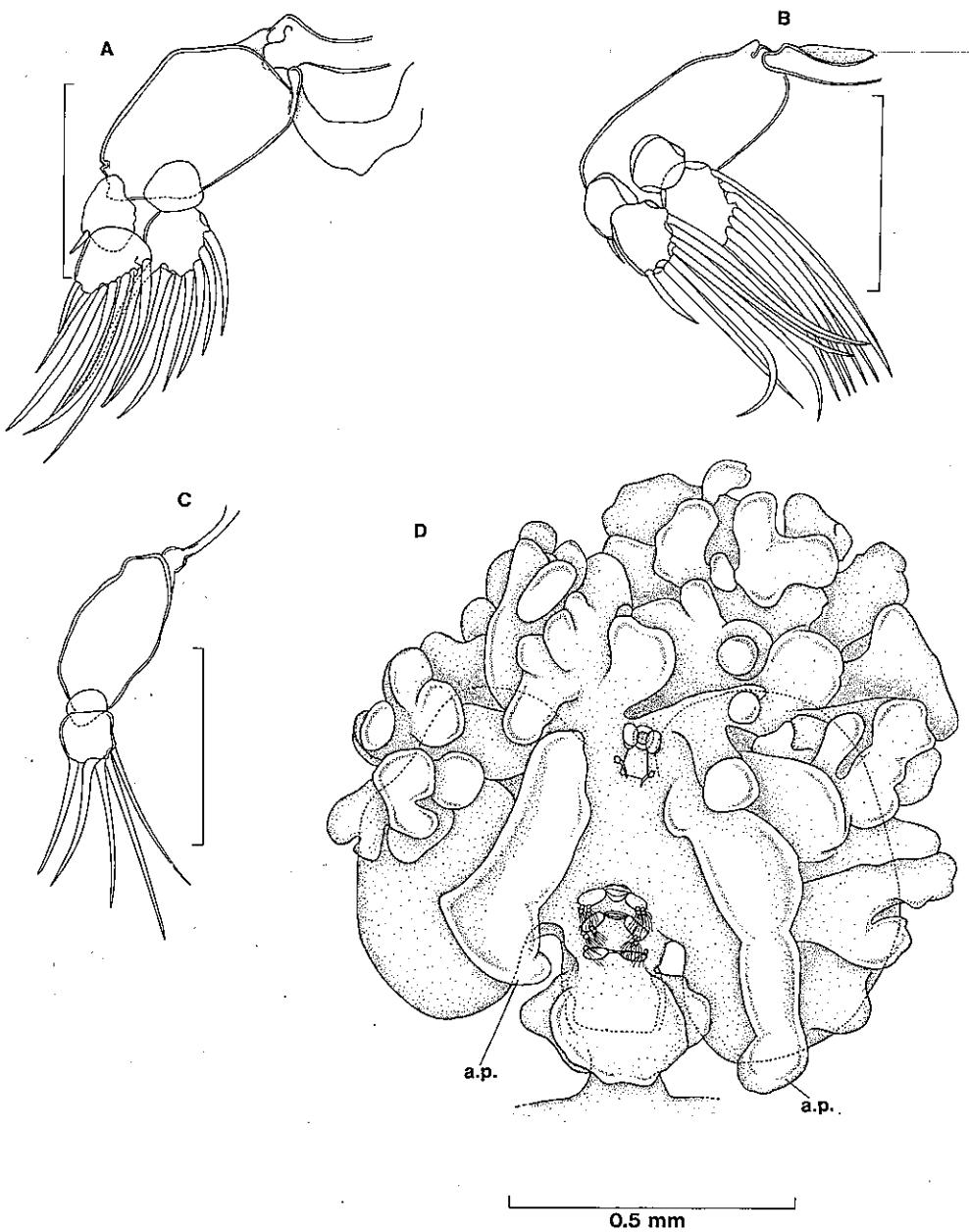

Fig. 2. *Cardiodectes boxshalli* sp.nov., female: (A) first swimming leg; (B) second swimming leg; (C) third swimming leg; (D) head, ventral surface, medial antennary processes removed. a.p. antennary processes. Scale 0.05 mm unless otherwise stated.

1.1 mm cephalothorax, and 1.4 mm trunk; cephalothorax width 1.0 mm, trunk width 0.7 mm.

Material examined: Holotype ♀, 17 ♀ ♀ paratypes, all ovigerous; BM(NH) Reg. Nos. 1957.12.4.1. (Holotype) and 1979.265-274 (paratypes).

Host: Emerald parrotfish, *Nicholsina usta* (Valenciennes, 1839).

Locality: off Jamaica.

Location on host: The 18 specimens were found on four host fish. They occurred, either singly or in groups, dorsal to the lateral line and typically close to the base of the dorsal fin (Fig. 1A). The cephal-

otorax was embedded in the host tissue with only the trunk and egg tubes visible externally.
Etymology: This species is named after Dr. G.A. Boxshall who first introduced me to parasitic copepods.

Cardiodectes spiralis sp. nov.

Description
Female: Body (Fig. 4A) resembling *C. boxshalli* sp.nov. Cephalothorax (Figs., 3C, 4C,) bearing two pairs of lateral lobes, the posterior pair (p.l., Fig. 4C) larger than the anterior pair (a.l., Fig. 4C); each posterior process with a well developed process ventrally (v.l., Figs. 4B, C). Dorsal surface bearing a rounded median lobe (m.l., Fig. 4B) posteriorly. Cephalothorax with many relatively small and tightly packed antennary processes in the area between the anterior lobes dorsally and the posterior lobes ventrally. Mouthparts similar to other members of genus, situated between anterior lobes. Neck short,bearing a pair of lateral lobes (n.l., Fig. 4C) that more than double the over-all width of neck. Trunk (Figs. 4A, 4B) about 1.2 times longer than wide, narrower than cephalothorax and comprising about half of total body length. Oviducts clearly visible through body-wall. Egg tubes arising laterally anterior to the rounded postero-lateral corners (Figs. 4A, 4B); uniseriate, containing about 140 eggs and tightly coiled into a spiral.

Three pairs of thoracic swimming legs on ventral surface of cephalothorax between posterior lobes. Legs 1 and 2 biramous with both rami 2-segmented; leg 3 uniramous with a 2-segmented exopod: armature formula as follows:

	Endopod	Exopod
Leg 1	0 – 0 ; 7	I – 0 ; I, 6
Leg 2	0 – 0 ; 7	I – 1 ; I, 6
Leg 3	absent	0 – 0 ; 5

Total length of holotype 3.3 mm comprising 1.6 mm cephalothorax and 1.7 mm trunk; cephalothorax width 1.7 mm, trunk width 1.4 mm.
Material examined: Holotype ♀, 6 ♀ ♀ paratypes, all ovigerous; BM(NH) Reg. Nos. 1979.400 (Holotype) and 1979.401–406 (paratypes).
Host: Anthias tuka (Herre, 1927) (= *Mirolabrichthys tuka*) Reg. Nos. 1974.5. 25. 1977–2068.
Locality: Madang Harbour, off southern edge of Massas Islands, New Guinea.
Location on host: The seven specimens were found on six host fish. Five specimens occured at the base of the dorsal fin of the host, the other two were attached either side of the caudal fin cleft of a single fish.
Etymology: The specific name *spiralis* alludes to the tight spiral coiling of the egg tubes in this species.

Discussion

Species of the genus *Cardiodectes* display a high degree of morphological variability, in common with other members of the family Pennellidae. This variability can represent differences in the position of the parasite on the host, as well as genetic and developmental differences. Although the variability in gross morphology is well documented, it is often necessary to separate species using gross morphological characters, as oral appendages and antennae are uniform in structure throughout the genus. The number of swimming legs, their position and their armature may also provide some useful taxonomic characters but they have been only poorly described or overlooked completely in most descriptions.

There are 12 nominal species of *Cardiodectes*, including the two new species described above. These species can be separated with the aid of the following key.

Key to species of *Cardiodectes* (females)

1. Abdomen present ..... 'medusaeus' group 7
   Abdomen absent ..... 'rubosus' group 2
2. Two pairs of lateral cephalothoracic lobes present 4
   One pair of lateral cephalothoracic lobes present 3
3. Trunk about twice as long as wide .....

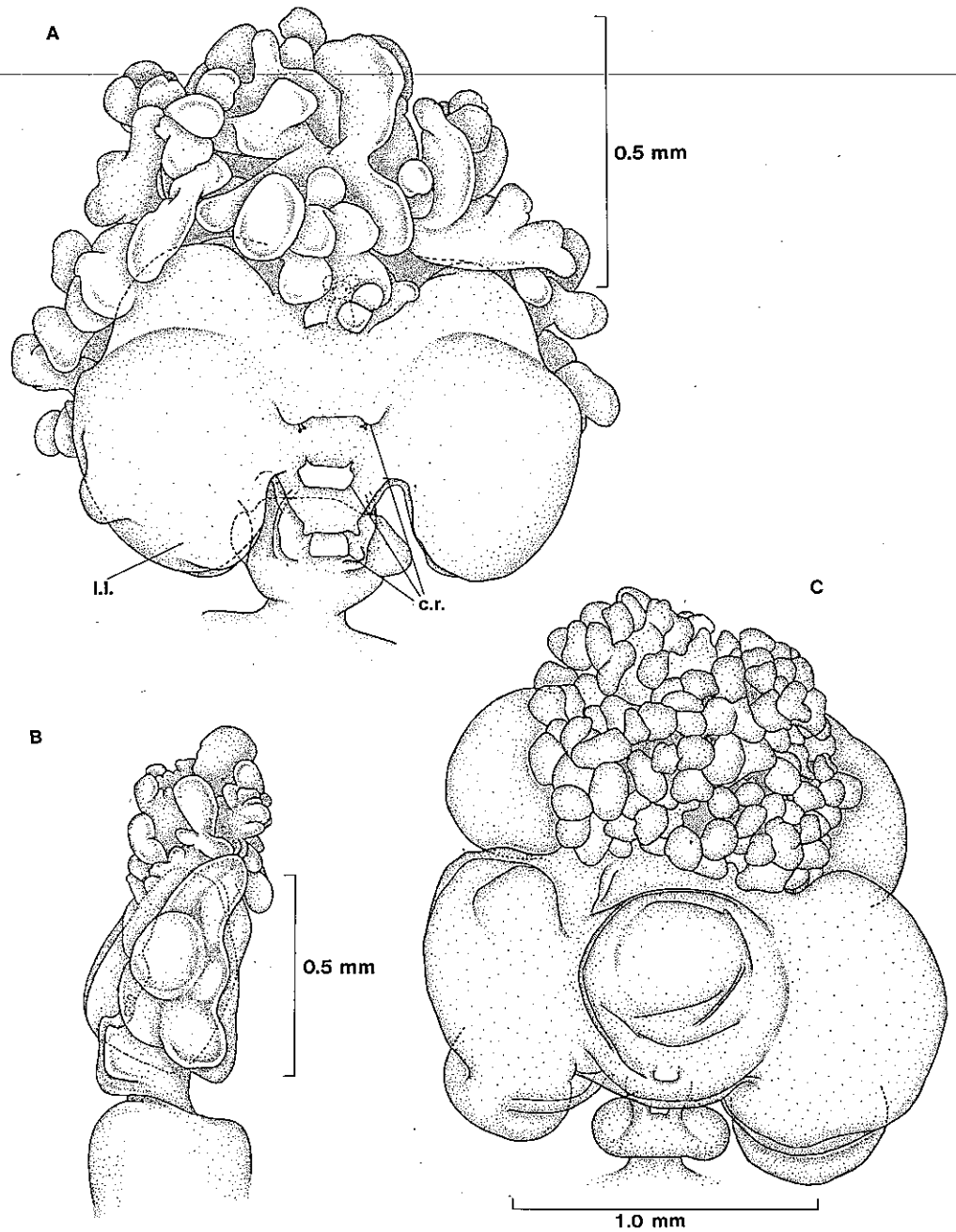

Fig. 3. *Cardiodectes boxshalli* sp.nov., female: (A) head, dorsal surface; (B) head, lateral. *Cardiodectes spiralis* sp.nov., female: (C) head, dorsal surface. l.l. lateral lobe; c.r. cuticularized ridges.

..... *C. boxshalli* sp.nov.
Trunk about 5 times as long as wide .....
..... *C. krishnai*

4. Trunk at least 3 times as long as wide and at least 1.7 times longer than cephalothorax and neck combined; oviduct openings on rounded posterior extremity 5
Trunk about as wide as long and about as long as cephalothorax and neck combined; oviduct openings lateral ..... *C. spiralis* sp.nov.

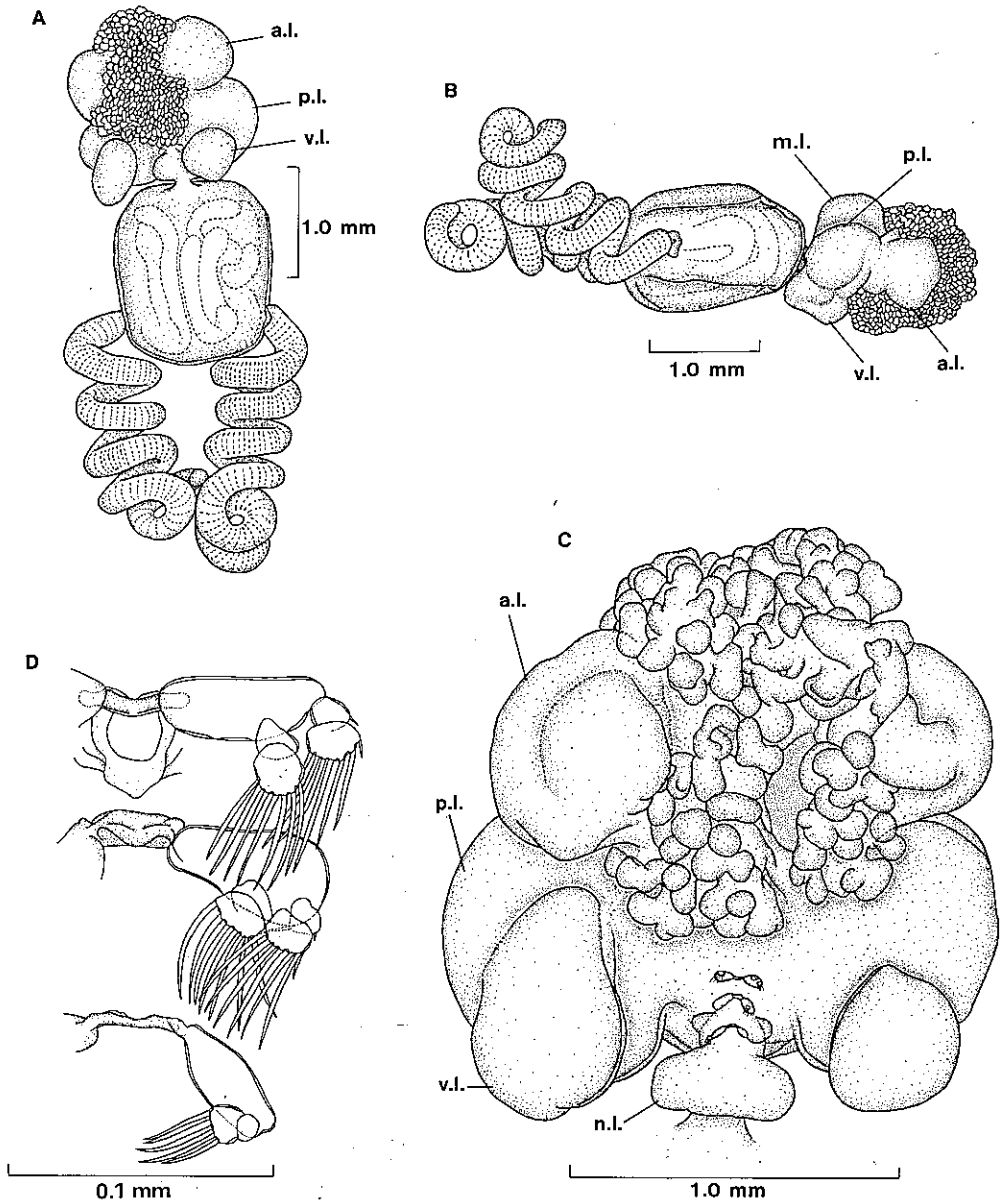

Fig. 4. *Cardiodectes spiralis* sp.nov., female: (A) adult ventral; (B) adult lateral; (C) head, ventral; (D) three pairs of swimming legs *in situ*. a.l. anterior lobe; p.l. posterior lobe; v.l. ventral lobe; m.l. median lobe; n.l. neck lobe.

5. 3 pairs of swimming legs present 6
   4 pairs of swimming legs present ..... *C. rubosus*
6. Egg tubes straight ..... *C. hardenbergi*
   Egg tubes loosely coiled ..... *C. rotundicaudatus*
7. Abdomen at most 1.5 times longer than wide 8
   Abdomen twice as long as wide ..... *C. cristatus*
8. Antennary processes relatively elongate and more or less divergent 9
   Antennary processes relatively small and forming a rounded compact mass 11

9. Neck long, comprising more than 20% of total body length 10
   Neck short, comprising less than 10% of total body length ..... *C. anchorellae*
10. Abdomen well developed and longer than wide; lateral cephalothoracic lobes subdivided ..... *C. frondosus*
    Abdomen rudimentary; lateral cephalothoracic lobes simple ..... *C. bellottii* (as described by Wilson, 1917)
11. Two pairs of simple lateral cephalothoracic lobes present 12
    Many lateral lobes present on cephalothorax ..... *C. longicervicus*
12. Neck comprising less than 25% of total body length ..... *C. medusaeus*
    Neck comprising about 30% of total body length ..... *C. bellottii* (as described by Capart, 1953)

It is not possible to distinguish between *C. hardenbergi* and *C. rotundicaudatus* on the basis of the published descriptions except by the nature of the egg tubes. This character may prove to be unreliable and taxonomic distinction between these two species may be unjustified. *C. rubosus* was figured by Leigh-Sharpe (1934) as possessing a pair of small posterior processes and four pairs of swimming legs. The position of the posterior processes suggests that they represent the swellings at the openings of the oviducts and as such have little taxonomic significance. The presence of four pairs of swimming legs (if this observation proves to be accurate) would serve to separate *C. rubosus* from the other members of the 'rubosus' group as defined by Izawa (1970). *C. rubosus* appears to differ from *C. hardenbergi* and *C. rotundicaudatus* only in the presence of four pairs of swimming legs, as all three species are very similar in gross morphology. The presence of four pairs of swimming legs has also been noted in four of the six species in the 'medusaeus' group. (The number of legs in the remaining two species, *C. cristatus* and *C. longicervicus*, is not known.) The number of legs is important in members of the Pennellidae as a difference may indicate a different number of ontogenetic stages, which should perhaps be recognized at the generic level.

C. bellottii appears twice in the above key because two readily distinguishable forms have been assigned to this species. *C. bellottii* as described by Jungersen (1911) and Wilson (1908, 1917) possesses a relatively short neck and elongate, divergent frontal processes whereas *C. bellottii* according to Capart (1953) has small compact frontal processes and a relatively long neck. Jungersen's (1911) material agreed in every essential point with the short original description of *C. bellottii* (Richiardi, 1882 — as *Peroderma bellottii*). Brian (1906) repeated Richiardi's description but the figure numbers given (Brian 1906 : Pl. VII fig. 2, Pl. XIX fig. 2-5) do not refer to figures of *Cardiodectes*. Capart's (1953) material clearly differs from *C. bellottii* and is in need of re-examination and re-identification.

The new species, *C. boxshalli* and *C. spiralis*, are clearly referable to the 'rubosus' group on the basis of their short neck, distinct neck/trunk boundary and absence of an abdomen. They both differ from other members of this group in the presence of large neck lobes and in body proportions; the ratio of cephalothorax to trunk length in *C. boxshalli* is 1:1.3 and in *C. spiralis* 1:1.0 whereas it is 1:1.8 or greater in all four other species (*C. rubosus*, *C. hardenbergi*, *C. rotundicaudatus* and *C. krishnai*). The smaller *C. boxshalli* also differs from all other species of the group in the 2:1 length to width ratio of the trunk and by the relatively large size of the antennary processes. *C. spiralis* differs from all other species, including *C. boxshalli*, in the position of the oviduct openings, in the tight spiral coiling of the egg tubes and in the 1:1 length to width ratio of the trunk.

The specimens of *Anthias tuka* infected by *C. spiralis* ranged in length from 43 to 48 mm (mouth-caudal peduncle) from a sample of 86 fish (range 39 to 50 mm) which probably represents the immatures and females from a larger collection of 151 fish. No copepod parasites were found on the other 65 fish (range 50 to 65 mm) which possessed elongate fins and a dorsal lip and are believed to represent the male stage in a protogynous hermaphroditic life history.

Acknowledgements

I would like to thank Alwyne Wheeler for the fish identifications, and Dr Z Kabata for his valuable comments during the preparation of the manuscript. This study would not have been possible but for the kindness and guidance of Dr G A Boxshall, to whom I am deeply indebted.

References

Brian, A.G.G. (1906) *Copepodi parassiti dei Pesci d'Italia. Genova, 190 pp.*

Brian, A.G.G. & Gray, P. (1928) Morphologie externe et interne d'un nouveau copépode parasite *Cardiodectes anchorellae* n. sp., trouvé à Madras. *Bollettino dei Musei di Zoologia e Anatomia Comparata della R. Università di Genova*, [s.2] **8**(26), 1–10.

Capart, A. (1953) Quelques copépodes parasites de poissons marins de la région de Dakar. *Bulletin de l'Institut française d'Afrique noire*, **15**, 647–671.

Gooding, R.U. & Humes, A.G. (1963) External anatomy of the female *Haemobaphes cyclopterina*, a copepod parasite of marine fishes. *Parasitology*, **49**, 663–667.

Izawa, K. (1970) A parasitic copepod, *Cardiodectes rotundicaudatus* n. sp., (Caligoida: Lernaeidae) obtained from a deep-sea goby in Japan. *Annotationes Zoologicae Japonenses*, **43**, 219–224.

Jungersen H.F.E. (1911) On a new gymnoblastic hydroid (*Ichthyocodium sarcotretis*) epizoic on a new parasitic copepod (*Sarcotretes scopeli*) infesting *Scopelus glacialis* Rhdt. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Foreningi København*, **64**, 1–33, 2 pl.

Kabata, Z. (1979) *Parasitic Copepoda of British Fishes*. London: The Ray Society, 468 pp.

Leigh-Sharpe, W.H. (1934) The Copepoda of the Siboga Expedition. Siboga-Expedite, XIV Copepoda, part II Commensal and Parasitic Copepoda. *Siboga Expeditie monogr.*, 29b, 1-43.

Markewitsch, A.P. (1936) *Cardiodectes hardenbergi*, ein neuer parasitscher Copepode aus der Java See. *Treubia*, **15**, 407–411.

Richiardi, S. (1882) Intorno ad una nuva specie del genere *Peroderma*. *Zoologischer Anzeiger*, (120) **5**, 475–476.

Schuurmans Stekhoven, J.H. (1937) Crustacea parasitica part II. *Mémoires du Musée royale d'histoire naturelle de Belgique*, ser. 2, (9) 11–26.

Sebastian, M.J. (1968) *Cardiodectes krishnai*, a new species of lernaeid copepod from the fish, *Vinciguerria lucetia* (Garman). *Crustaceana*, Suppl. 1, 136–140.

Shiino, S.M. (1958) Copepods parasitic on Japanese fishes. 17. Lernaeidae. *Report of the Faculty of Fisheries, Prefectural University of Mie*, **3**, 75–100.

Wilson, C.B. (1908) North American parasitic copepods: A list of those found upon the fishes of the Pacific Coast, with descriptions of new genera and species. *Proceedings of the United States National Museum*, **35**, 431–481.

Wilson, C.B. (1917) North American parasitic copepods belonging to the Lernaeidae, with a revision of the entire family. *Proceedings of the United States National Museum*, **53**, 1–150.

Accepted for publication 30th January, 1980.