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Monogenea in marine fishes from Antofagasta, Chile, with description of *Caballerocotyla australis* n. sp. (Capsalidae)

Monogeneos en peces marinos de Antofagasta, Chile, con descripción de *Caballerocotyla australis* n. sp. (Capsalidae)

MARCELO OLIVA

Instituto de Investigaciones Oceanológicas, Universidad de Antofagasta, Casilla 1240, Antofagasta-Chile.

ABSTRACT

The presence of three monogeneans in marine fishes from Chile, is reported. One of them, *Caballerocotyla australis*, from the gills of *Sarda chiliensis chiliensis* (Cuvier 1876), is considered to be a new species. *Capsala neothunni* Yamaguti 1968, and *Capsala gotoi* Yamaguti 1968, are considered as member of the genus *Caballerocotyla* Price 1960. The species redescribed by Baeza & Castro (1975) as *Benedenia melleni* is *Neobenedenia melleni* Yamaguti 1963, type species of the venus *Neobenedenia* Yamaguti 1963.

Entobdella squamula (Heath 1902) from the skin of *Hippoglossina macrops* Steindachner 1876 is reported for the first time in northern Chile. Artificial keys to the known species of the genus *Neobenedenia* Yamaguti 1963, and *Caballerocotyla* Price 1960 are also given.

Key-words: Fish parasites, new species, Southeastern Pacific, Capsalidae.

RESUMEN

Se cita la presencia de tres monogeneos parásitos en peces marinos de Chile. Uno de ellos, *Caballerocotyla australis*, obtenido de las branquias de *Sarda chiliensis chiliensis* (Cuvier 1876) es considerado como una nueva especie. *Capsala neothunni* Yamaguti 1968 y *Capsala gotoi* Yamaguti 1968, son considerados como miembros del género *Caballerocotyla* Price 1960. La especie redescrita por Baeza & Castro (1975) como *Benedenia melleni* corresponde a *Neobenedenia melleni* Yamaguti 1963, especie tipo del género *Neobenedenia* Yamaguti 1963. *Entobdella squamula* (Heath 1902), de la piel de *Hippoglossina macrops* Steindachner 1876 es citada por primera vez en el norte de Chile.

Se incluyen claves artificiales para las especies conocidas de los géneros *Neobenedenia* Yamaguti 1963 y *Caballerocotyla* Price 1960.

Palabras clave: Parásitos en peces, nueva especie, Pacífico Suroriental, Capsalidae.

INTRODUCTION

Only thirteen species of monogenetic flukes have been reported as parasites from marine fishes of Chile (Brinkmann 1952, Baeza & Castro 1975, Jaramillo 1977, Suriano & Beverly-Burton 1979, Oliva & Muñoz 1985). This paper reports three additional species of monogeneans, including a new species of *Caballerocotyla* Price 1960, in marine fishes from the coastal waters in northern Chile, off Antofagasta.

MATERIALS AND METHODS

Parasites were obtained from fishes collected in the waters off the coast of Antofagasta (23°42'S, 70°24'W) and Coloso (23°43'S, 70°32'W). The monogeneans were collected from the fish gills and/or skin, washed in saline solution 0.87%, pressed and fixed with AFA and preserved in alcohol 70°. They were stained with Delafield's hematoxylin. The parasites were diafanized in xilol and mounted in Canada

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Balsam. Drawings were made with the aid of a camera lucida. All measurements are given in milimeters, except otherwise indicated. Scanning electron micrographs were taken with a microscope JEOL-JSM 25-S II, at the Pontificia Universidad Católica de Chile, Santiago. The following institutional abbreviations apply: MZUC = Museo Zoológico, Universidad de Concepción, Chile. IIO = Instituto de Investigaciones Oceanológicas, Universidad de Antofagasta, Chile.

RESULTS

Entobdella squamula (Heath 1902)

Host: *Hippoglossina macrops* Steindachner 1876 "Lenguado de ojo grande".
Site of infection: Skin.
Locality: Coloso.

LEGENDS OF FIGURES:

Ci	= Cirrus	Te	= Testes
Eu	= Egg in uterus	Va	= Vaginal aperture
Ev	= Excretory vessels	Vd	= *Vas deferens*
Gp	= Genital pore	Vi	= Vitelline ducts
Od	= Oviduct	Vr	= Vitelline receptacle
Ov	= Ovary	Cg	= Cephallic Glands
Sr	= Seminal receptacle		

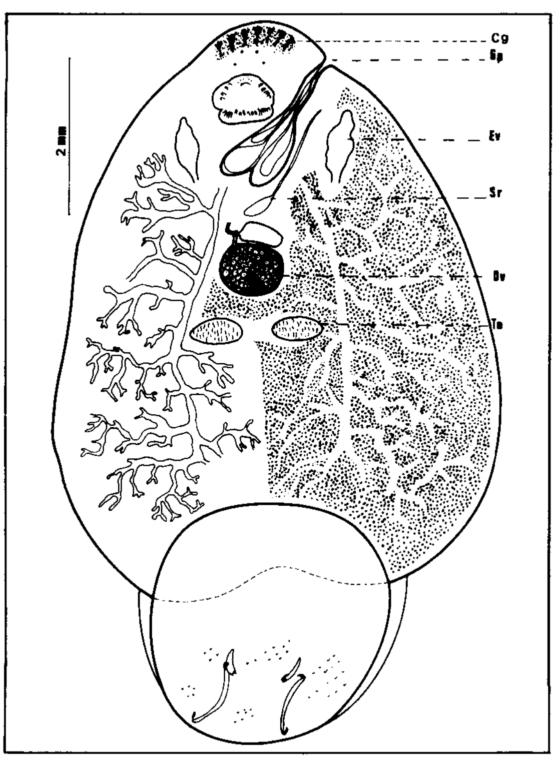

FIG. 1: Entobdella squamula (Heath 1902), ventral view.
Entobdella squamula (Heath 1902), vista ventral.

Material examined: MZUC 3478: One stained whole mount. IIO: One stained whole mount.

The worms (Fig. 1) have total lengths of 6.2 and 9.8 and maximum widths in posttesticular field of 3.3 and 6.0. Posthaptor diameters are 2.2 and 3.2. Testes are elliptical (0.53-0.81 x 0.31-0.36) and ovaries are spherical (0.6-0.9 x 0.37-0.67). There is a vitelline receptacle on and to the left of the ovary. Posthaptoral hooks (Fig. 2) are similar in size and morphology to those described by Brinkmann (1952). Lengths were 0.38 and 0.46 for the first pair, 0.58 and 0.85 for the second pair, and 0.075 and 0.112 for the third.

Remarks: Morphological characters of the worms are the same as those described by Brinkmann (1952). The only differences are related to the length of some structures. In our specimens the testes, ovary, posthaptoral diameter, and the size of the first and third, but not of the second pair of hapto-

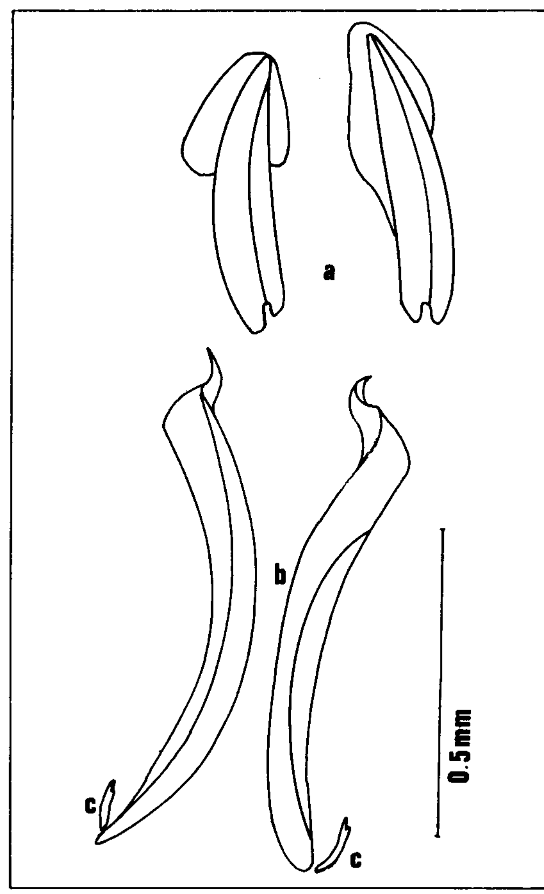

FIG.2: E. squamula. Posthaptoral hooks. a = first pair; b = second pair; c = third pair.
E. squamula. Ganchos del posthaptor. a = primer par; b = segundo par; c = tercer par.

ral hooks, are larger than those reported by Brinkmann (1952).

Entobdella squamula was described from material collected in Mexico (Mazatlan), obtained from the skin of *Paralichthys californicus* Steindachner 1876. This parasite has been found on *Sebastes* spp. in the northern Pacific (California to Alaska) and on unidentified fish from the Gulf of Mexico (Yamaguti 1963).

This parasite was also found by Brinkmann (1952) on a different flatfish (*Paralichthys adspersus*) in the southern Hemisphere (Piedra Azul = Chile: 41°31'S, 72°47'W), and stated that both flatfish are restricted geographically, as reported by Norman (1934). Moreover, Chirichigno (1974) pointed out that the geographical distribution of *H. macrops* is from Mazatlan (México) to Chile. Thus, the discovery of this parasite in two disjunct geographical areas is expected, because at least one of the known hosts of this parasite has a distribution that can explain the presence of the worm in both the northern and southern Hemisphere.

Neobenedenia melleni Yamaguti, 1963
Host: *Seriola* sp. "Dorado".
Site of infection: Skin.
Locality: Antofagasta.
Material examined: MZUC 3479: One stained whole mount. IIO: Four stained whole mounts.

Remarks: Baeza & Castro (1975) redescribed this species, collected from the body surface of *Seriola mazatlana* (Steindachner 1881) and *Thunnus thynnus orientalis* (Linneo 1758), but they considered the species as *Benedenia melleni* (MacCallum 1927). Price (1939) claimed that at least four species of *Benedenia*, namely *B. melleni*, *B. adenea* Meserve 1938, *B. isabellae* Meserve 1938 and *B. muelleri* Meserve 1938, may be regarded as generically different because of the absence of vaginae and the similarity of their hooks. Yamaguti (1963) erected the genus *Neobenedenia* for these four species and added *Benedenia girellae* Hargis 1955. Subsequently, the following species have been included in this genus: *N. pacifica* Bravo-Hollis 1971, *N. longiprostata* Bravo-Hollis 1971, *N. vermiculariacola* Gupta & Khanna 1975, and *N. manilae* Velásquez 1982. *Neobenedenia* sp. described by González & Sarmiento (1978) (1) is considered *nomen nudum* because of the lack of a published description.

KEY TO THE KNOWN SPECIES OF *NEOBENEDENIA* YAMAGUTI 1963

1.	Goto's gland absent	2
	Goto's gland present	3
2.	Crenulated and fenestrated testes . . . . *N. melleni* Yamaguti 1963	
	Testes smooth and afenestrated . . . . *N. vermiculariacola* Gupta & Khanna 1975	
3.	Crenulated and fenestrated testes	4
	Testes smooth and afenestrated	7
4.	Prostatic gland fan-like, prostatic canalicles do not exceed the testicular field	5
	Prostatic glands cluster-like, they reach posterior end of the body . . . . *N. longiprostata* Bravo-Hollis 1971	
5.	Vitelline receptacle with a central constriction . . . . *N. isabellea* Meserve 1938	
	Vitelline receptacle without constriction	6
6.	First pair of haptoral hooks with an anterior projection . . . . . *N. pacifica* Bravo-Hollis 1971	
	First pair of haptoral hooks without anterior projection . . . . *N. girellae* Hargis 1955	
7.	Prohaptoral sucker surpassing the anterior end of the body . . . . . *N. muelleri* Meserve 1938	
	Prohaptoral sucker not surpassing the anterior end of body	8
8.	Eggs with polar filaments and appendages . . . . *N. manilae* Velasquez 1982	
	Eggs without polar filaments and appendages . . . . *N. adenea* Meserve 1938	

Caballerocotyla australis n. sp.

Host: *Sarda chiliensis chiliensis* (Cuvier 1831) "Mono".
Site of infection: Gills.
Locality: Antofagasta.
Material examined: MZUC 3475: Holotype MZUC 3476-3477: Paratypes.
IIO: Eight stained whole mounts.

Description: (Based on 11 whole mounts; Table 1 shows the number of measurements, mean, range, and standard deviation).

1. GONZALEZ & SARMIENTO (1978) Nuevos registros de parásitos en *Mugil cephalus* (L) "Liza" 1er Congreso Nacional de Pesquería. Huacho-Perú. Libro Resumen pp. 78-79.

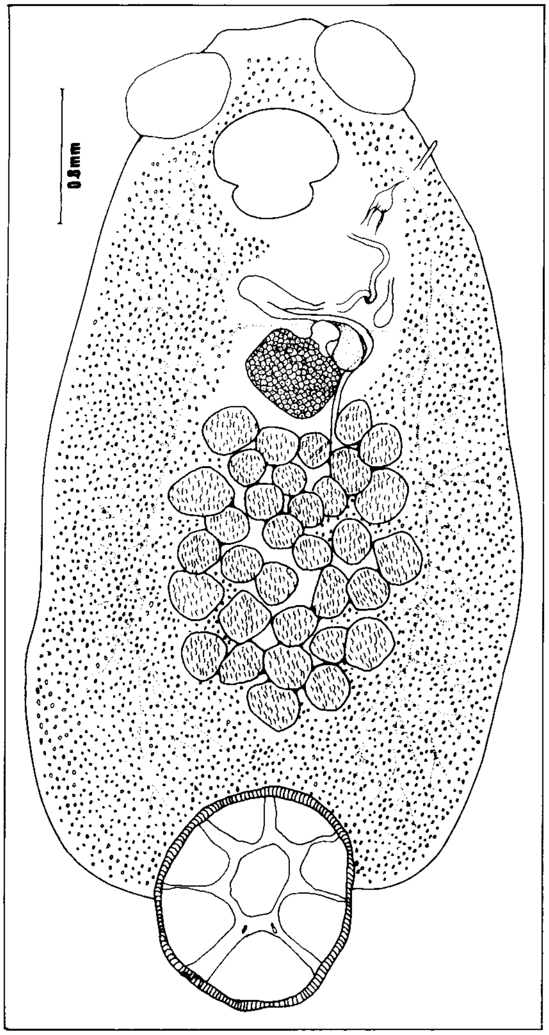

FIG. 3: Caballerocotyla australis n. sp. Holotype, ventral view.
Caballerocotyla australis n. sp. Holotipo, vista ventral.

FIG. 4: C. australis. Scanning electron micrograph, ventral view (x 30), showing position of genital pore.
C. australis. Fotomicrografía obtenida mediante microscopio electrónico de barrido, vista ventral (x 30), mostrando la posición del poro genital.

Body (Fig. 3) enlarged with maximum width at testicular level. Prohaptor sucker (Fig. 4) oval and in diagonal position in relation to the anterior end. Posthaptor circular, surrounded by a thin membrane with a width of 44 micrometers. Posthaptor with seven rays that conform seven peripheral loculi and one central, the last of the open type (Fig. 4). The haptoral hooks are irregular in shape. Larval hooks present.

Dorsomarginal spines (Fig. 5a-5b) occur in a single row, generally with one cuspid. However, some spines may have three cuspids; the central is the largest and the laterals appear as projections from the base of the central spine. The mean length of the central is 6.4 micrometers. The pharynx has a central constriction, the an-

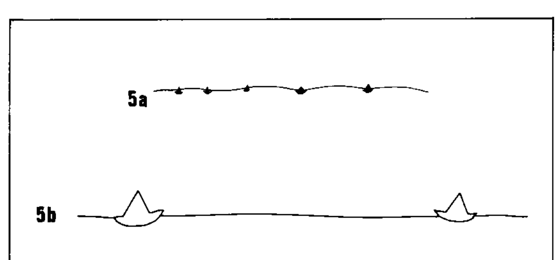

FIG. 5a-5b: C. australis. Marginal spines.
C. australis. Espinas marginales.

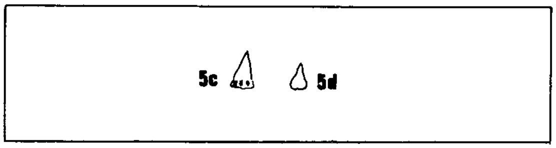

FIG. 5c-5d: C. manteri (Price 1951) Dorsomarginal spines. c = dorso marginal spines from a paratype. d = dorsomarginal spines, original of Price (1951).

C. manteri (Price 1951). Espinas dorsomarginales. c = espinas dorsomarginales de un paratipo. d = espinas dorsomarginales, original de Price (1951).

terior portion is wider than the posterior one. The oral aperture opens at the level of the posterior end of the prohaptor.

The male reproductive system (Fig. 3) is composed of 30-34 testes, all of which are post-ovaric and within the intercecal field. *Vas deferens* (Fig. 6) ascends the left side of the ovary, extends over the ovary to its right margin, where it forms a loop prior to ascending and entering the cirrus sac. The uterus joins the *vas deferens* at that point to form the genital atrium, which opens on the left side of the body, at the pharynx level.

The ovary (Fig. 6) has a smooth margin. There is a kidney-shaped projection at the medial zone of the anterior side. The oviduct is formed from this projection. The ducts from the seminal and vitelline recep-

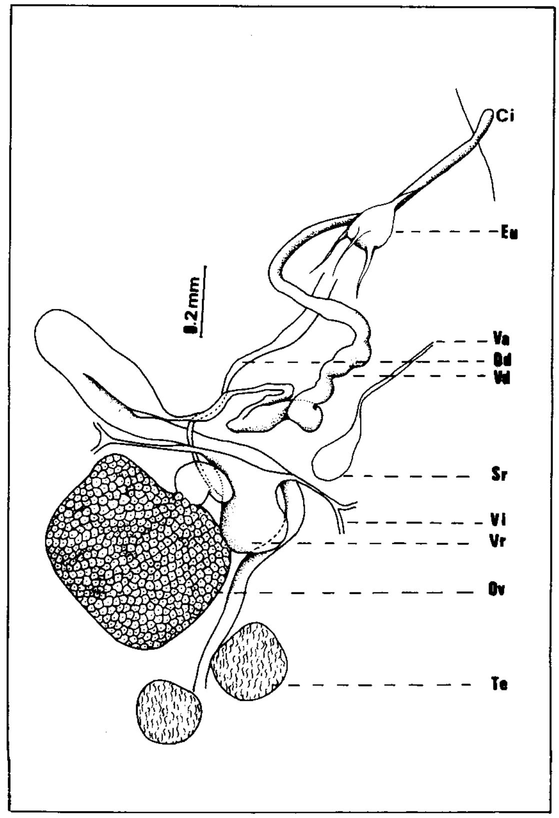

FIG. 6: C. australis. Reproductive system of the Holotype.

C. australis. Sistema reproductor del Holotipo.

TABLE 1

Measurements (in mm, unless otherwise stated) of *Caballerocotyla australis*
N = Number of Measurements, $\overline{X}$ = mean, R = range S.D. = standard deviation

Medidas (en mm, al menos que se indiquen otras unidades).
N = Número de mediciones, $\overline{X}$ = media, R = rango, S.D. = desviación estándar

	N	$\overline{X}$	R	S.D.
Body length (posthaptor excluded)	11	4.62	3.94-5.08	0.330
Total length	11	5.25	4.38-5.79	0.460
Maximum width	10	2.38	2.08-2.73	0.220
Pharynx length	11	0.52	0.43-0.62	0.055
Anterior section pharynx	11	0.56	0.48-0.65	0.053
Posterior section pharynx	11	0.37	0.31-0.42	0.034
Sucker diameter	22	0.48	0.39-0.55	0.042
Distance between suckers	11	0.39	0.31-0.46	0.040
Posthaptor diameter	11	1.00	0.89-1.13	0.064
Anchors (micrometer)	11	46.7	36.9-67.6	0.008
Testes (number)	11		30-34	
Testes (diameter)	109	0.21	0.11-0.28	0.028
Ovaric diameter	10	0.42	0.38-0.48	0.032
Eggs (micrometer)	4	143 x 105	138-149x102-110	2.9 x 3.13
Distance genital pore to left sucker	7	0.199	0.17-026	0.030

tacles are confluent to this projection. The oviduct ascends so that it forms the uterus prior to joining the cirrus sac. The vaginal aperture opens at the same level as the genital atrium, but posterior to it. Except for the region including the ovary and reproductive ducts, the vitellogenic follicles occur throughout the body, even extending among the testes.

Eggs are yellow, with filaments, one anterior and three posterior. Only three specimens had eggs, one of them carried two, the others, one each.

Remarks. The genus *Caballerocotyla* was erected by Price (1960) for those species of Capsalinae characterized by a constricted pharynx, central area of posthaptor open, diameter of posthaptor equal to 1/3 or less of length of the body proper, diameter of prohaptor equal to 1/3 to 1/2 of posthaptoral diameter, posterior end of body not deeply notched and numerous testes confined to the intercecal field. The following species were included in this genus: *C. gouri* (Chauhan 1952), *C. caballeroi* (Winter 1955), *C. magronum* (Ishii 1936), *C. manteri* (Price 1951), *C. foliacea* (Goto 1894), *C. biparasitica* (Goto 1894), *C. pelamydis* (Taschenberg 1879), and *C. katsuwoni* (Ishii 1936). Yamaguti (1963, 1968) confined the genus to a subgeneric rank, within the genus *Capsala* Bosc 1811, because the testicular distribution is not constant, with testes not only intracecal, but also extracecal. This is true for *Capsala nozawae* (Goto 1894); moreover, this species was placed in the genus *Tristomella* Guiart 1938 by Price (1960). Other characteristics of the genus are not discussed by Yamaguti (1963, 1968).

The genus *Caballerocotyla,* according to Price's diagnosis, has a high degree of host specificity. All the known species of the genus are parasites of scombrid fishes of the sub-family Scombrinae, as defined by Nelson (1976). The known species of *Capsala* (in the sense of Price 1960) have low host specificity and are parasites of both teleostei and elasmobranchii. In spite of Price's diagnosis of *Caballerocotyla,* the species *Capsala gotoi* Yamaguti 1968, and *C. neothunni* Yamaguti 1968, are considered herein as members of *Caballerocotyla,* because their characteristics agree well with this genus.

The genus *Nasicola* was erected by Yamaguti (1968) to accommodate the species *Caballerocotyla klawei,* because its habitat in the host (nasal capsule), and its testicular number and testes distribution. But, the characteristics described by Yamaguti do not seem adequate for the recognition of a new genus. Thus, *C. klawei* should remain in the genus *Caballerocotyla.*

At present, and as a consequence of the works of Dollfus (1962), Stunkard (1962), Wagner & Carter (1967), Lamothe-Argumedo (1968), Yamaguti (1968), Bussieras & Baudin-Laurencin (1970), Bussieras (1972), and Velásquez (1982), the genus comprise 17 species. The new species described here is similar to those with a single row of dorsomarginal spines, namely *C. manteri, C. biparasitica, C. gouri,* and *C. albsmithi* Dollfus 1962. The last three species are easy to differentiate from *C. australis* n. sp. because their dorsomarginal spines have 5-6 cuspids. In *C. manteri* and *C. australis* n. sp. the spines have one cuspid, but the new species can have 3-cuspid spines. The base of the spines are different in both species. In *C. manteri* the base of the spine is narrow, forming an obelisk-like structure (Fig. 5c). In *C. australis* n. sp. the base is wider than the length of the spine (Fig. 5b).

The testes are similar in both species, 30-32 in *C. manteri* and 30-34 in *C. australis* n. sp. The two species can be differentiated by the relative position of the genital pore. In *C. manteri* it opens just below the left sucker of the prohaptor, but in *C. australis* n. sp. the pore opens at some distance (0.19) from the left sucker (Fig. 4). Other differences are related to the total length of the worms (2.1 to 2.6 in *C. manteri,* and 4.3 to 7.8 in *C. australis* n. sp.) and to their host *Euthynnus alleteratus* in *C. manteri,* and *Sarda chiliensis chiliensis* in the species now described.

ARTIFICIAL KEY TO THE KNOWN SPECIES OF *CABALLEROCOTYLA* PRICE, 1960

1.	Posthaptoral anchors and dorsomarginal spines absent . . . . *C. caballeroi* Winter 1955	
	Posthaptoral anchors present, dorsomarginal spines present or absent	2
2.	Dorsomarginal spines only in the anterior part of the body . . . . *C. verrucosa* Bussieras 1972	
	Dorsomarginal spines present in all the body	3
	Dorsomarginal spines absent	12

3. Dorsomarginal spines irregularly distributed, not in a single row . . . *C. magronum* Ishii 1936
Dorsomarginal spines in more than one row 4
Dorsomarginal spines in a single row 5
4. Dorsomarginal spines in 2 rows, spines with 2-4 cuspids . . . . *C. klawei* Stunkard 1962
Dorsomarginal spines in 2-8 rows, spines with 1 cuspid . . . . *C. gotoi* n. comb.
5. Dorsomarginal spines in a continuous row 6
Dorsomarginal spines in a single row, but interrupted, with 7-10 spines in the anterior section and 29-44 in the posterior section . . . . *C. marielenae* Lamothe-Argumedo 1968
6. Dorsomarginal spines with 1-3 cuspids 7
Dorsomarginal spines with more than 3 cuspids 8
7. Dorsomarginal spines with 1 cuspid, genital pore just below posthaptoral sucker . . . . *C. manteri* Price 1951
Dorsomarginal spines with 1-3 cuspids, genital pore at some distance from the haptoral sucker . . . . *C. australis* n. sp.
8. Dorsomarginal spines with 4 cuspids, posthaptoral anchors relatively slender . . . . *C. biparasitica* Goto 1894
Dorsomarginal spines with more than 4 cuspids 9
9. Dorsomarginal spines with 5-6 cuspids 10
Dorsomarginal spines with 4-16 cuspids 11
10. Dorsomarginal spines with 5-6 cuspids, posthaptoral anchors relatively stout, with tip straight . . . . *C. gouri* Chauhan 1952
Dorsomarginal spines with 5-6 cuspids, anchors with curved tip, similar to hooks . . . . *C. albsmithi* Dollfus 1962
11. Dorsomarginal spines with 4-12 cuspids . . . . *C. neothunni* n. comb.
Dorsomarginal spines with 14-16 cuspids . . . *C. abidjani* Bussieras & Baudin-Laurencin 1970
12. Marginal papillae present . . . . *C. pelamydis* Taschenberg 1879
Marginal papillae absent 13
13. Posthaptor pedunculate, diameter about 1/6 of the body proper . . *C. katsuwoni* Ishii 1936
Posthaptor sessile 14
14. More than 100 testes . . . . *C. foliacea* Goto 1894
Less than 50 testes 15
15. Posthaptoral with 1 pair of anchors, an accesory anchor may be present . . . . *C. gregalis* Wagner & Carter 1967
Posthaptoral with 3 pairs of anchors . . . . *C. philippina* Velasquez 1982

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