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)

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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 genus *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.

INTRODUCTION

Only thirteen species of monogenetic flukes have been reported as parasites from marine fishes of Chile (Brinkmann 1952, Baeza & Castro 1975, Jaramillo 1977, Suriñano & 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.

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

(Received 17 June 1985. Accepted 12 May 1986).
Entobdella squamula (Heath 1902)

Host: Hippoglossina macrops Steindachner 1876 “Lenguado de ojo grande”.

Site of infection: Skin.

Locality: Coloso.

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 post-testicular 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-

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**LEGENDS OF FIGURES:**

Ci = Cirrus  
Eu = Egg in uterus  
Ev = Excretory vessels  
Gp = Genital pore  
Od = Oviduct  
Ov = Ovary  
Sr = Seminal receptacle  

Te = Testes  
Va = Vaginal aperture  
Vd = Vas deferens  
Vr = Vitelline receptacle  
Cg = Cephalic Glands

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

Entobdella squamula (Heath 1902), vista ventral.

**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.
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. longiprostata is from Mazatlan (Mexico) to Chile. Thus, the discovery of this parasite in two disjoint 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 Hemispheres.

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 mazatlanensis (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 girellose 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 .......................................... 2
   Testes smooth and afenestrated ........................................... 3
   N. melleni Yamaguti 1963
   Testes smooth and afenestrated ........................................... 4
   N. vermiculariacola Gupta & Khanna 1975
3. Crenulated and fenestrated testes .......................................... 5
   Testes smooth and afenestrated ........................................... 7
   Prostatic glands cluster-like, they reach posterior end of the body ........................................... 8
4. Prostatic glands fan-like, prostatic canalicles do not exceed the testicular field ........................................... 9
   Prostatic glands cluster-like, they reach posterior end of the body ........................................... 10
   N. longiprostata Bravo-Hollis 1971
5. Vitelline receptacle with a central constriction ........................................... 11
   Vitelline receptacle without constriction ........................................... 12
   N. isabellae Meserve 1938
6. First pair of haptoral hooks with an anterior projection .............. 13
   First pair of haptoral hooks without anterior projection .............. 14
   N. pacifica Bravo-Hollis 1971
6. First pair of haptoral hooks without anterior projection .............. 15
   N. girellose Hargis 1955
7. Prohaptoral sucker surpassing the anterior end of the body .......... 16
   Prohaptoral sucker not surpassing the anterior end of body .......... 17
   N. muelleri Meserve 1938
8. Eggs with polar filaments and appendages .................................. 18
   Eggs without polar filaments and appendages .......................... 19
   N. manilae Velásquez 1982
   N. adenea Meserve 1938

Caballerocotyla australis n. sp.

Host: Sarda chiliensis (Cuvier 1831) “Mono”.
Site of infection: Gills.
Locality: Antofagasta.

IIO: Eight stained whole mounts.

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

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 cusps: 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. 3: Caballeroctyla australis n. sp. Holotype, ventral view.
Caballeroctyla 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.

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 para-type. d = dorsomarginal spines, original of Price (1951).


The anterior 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 intercelal 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-

**TABLE 1**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>X</th>
<th>R</th>
<th>S.D.</th>
</tr>
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<tbody>
<tr>
<td>Body length (posthaptor excluded)</td>
<td>11</td>
<td>4.62</td>
<td>3.94-5.08</td>
<td>0.330</td>
</tr>
<tr>
<td>Total length</td>
<td>11</td>
<td>5.25</td>
<td>4.38-5.79</td>
<td>0.460</td>
</tr>
<tr>
<td>Maximum width</td>
<td>10</td>
<td>2.38</td>
<td>2.08-2.73</td>
<td>0.220</td>
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<tr>
<td>Pharynx length</td>
<td>11</td>
<td>0.52</td>
<td>0.43-0.62</td>
<td>0.055</td>
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<tr>
<td>Anterior section pharynx</td>
<td>11</td>
<td>0.56</td>
<td>0.48-0.65</td>
<td>0.053</td>
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<tr>
<td>Posterior section pharynx</td>
<td>11</td>
<td>0.37</td>
<td>0.31-0.42</td>
<td>0.034</td>
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<tr>
<td>Sucker diameter</td>
<td>22</td>
<td>0.48</td>
<td>0.39-0.55</td>
<td>0.042</td>
</tr>
<tr>
<td>Distance between suckers</td>
<td>11</td>
<td>0.39</td>
<td>0.31-0.46</td>
<td>0.040</td>
</tr>
<tr>
<td>Posthaptor diameter</td>
<td>11</td>
<td>1.00</td>
<td>0.89-1.13</td>
<td>0.064</td>
</tr>
<tr>
<td>Anchors (micrometer)</td>
<td>11</td>
<td>46.7</td>
<td>36.9-67.6</td>
<td>0.008</td>
</tr>
<tr>
<td>Testes (number)</td>
<td>11</td>
<td>30-34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testes (diameter)</td>
<td>109</td>
<td>0.21</td>
<td>0.11-0.28</td>
<td>0.028</td>
</tr>
<tr>
<td>Ovaric diameter</td>
<td>10</td>
<td>0.42</td>
<td>0.38-0.48</td>
<td>0.032</td>
</tr>
<tr>
<td>Eggs (micrometer)</td>
<td>4</td>
<td>143 x 105</td>
<td>138-149 x 102-110</td>
<td>2.9 x 3.13</td>
</tr>
<tr>
<td>Distance genital pore to left sucker</td>
<td>7</td>
<td>0.199</td>
<td>0.17-0.26</td>
<td>0.030</td>
</tr>
</tbody>
</table>
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: Capsala gouri (Chauhan 1952), C. caballeroi (Winter 1955), C. magronum (Ishii 1936), C. manteri (Price 1951), C. foliacea (Goto 1894), C. biparasa (Goto 1894), C. pelymydis (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 intercecal, 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 gouri 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), Lamotho-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 dorso-marginal 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 dorso-marginal spines have 5-6 cusps. In C. manteri and C. australis n. sp. the spines have one cusp, 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

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Species</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Posthaptoral anchors and dorso-marginal spines absent</td>
<td>.</td>
<td>C. caballeroi</td>
</tr>
<tr>
<td></td>
<td>Posthaptoral anchors present, dorso-marginal spines present or absent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Dorso-marginal spines only in the anterior part of the body</td>
<td></td>
<td>C. verrucosa</td>
</tr>
<tr>
<td></td>
<td>Dorso-marginal spines present in all the body</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dorso-marginal spines absent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Acknowledgements

The author is deeply indebted to Dr. R. Lichtenfels (U.S. Helminthol. Coll.), who kindly sent me the type of *Caballerocotyla abidjani*; to Mr. C. Sandivari (Universidad de Antofagasta) for the scanning electron micrograph, and to Mr. C. Sandivari (Universidad Catolica de Chile), for the drawings. This research was supported by Grant 66/82 Dirección de Investigaci6n, Pontificia Universidad Catolica de Chile.

### Literature Cited


### Table

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>DorsoMarginal spines irregularly distributed, not in a single row</td>
<td><em>C. magronum</em> Ishii 1936</td>
</tr>
<tr>
<td>4.</td>
<td>DorsoMarginal spines in a single row</td>
<td><em>C. klawei</em> Stunkard 1962</td>
</tr>
<tr>
<td>5.</td>
<td>DorsoMarginal spines in 2-8 rows, spines with 1 cuspid</td>
<td><em>C. gotoi</em> comb.</td>
</tr>
<tr>
<td>6.</td>
<td>DorsoMarginal spines in a continuous row</td>
<td><em>C. marileanae</em> Lamothe-Argumedo 1968</td>
</tr>
<tr>
<td>7.</td>
<td>DorsoMarginal spines with 1-3 cusps</td>
<td><em>C. manteri</em> Price 1951</td>
</tr>
<tr>
<td>8.</td>
<td>DorsoMarginal spines with 4 cusps, posthaptoral anchors relatively slender</td>
<td><em>C. australis</em> n. sp.</td>
</tr>
<tr>
<td>9.</td>
<td>DorsoMarginal spines with more than 4 cusps</td>
<td><em>C. neothunni</em> n. comb.</td>
</tr>
<tr>
<td>10.</td>
<td>DorsoMarginal spines with 5-6 cusps</td>
<td><em>C. philippina</em> Velasquez 1982</td>
</tr>
<tr>
<td>11.</td>
<td>Posthaptor sessile</td>
<td><em>C. pelamydis</em> Taschenberg 1879</td>
</tr>
<tr>
<td>12.</td>
<td>Posthaptor pedunculate, diameter about 1/6 of the body proper</td>
<td><em>C. klawei</em> Stunkard 1962</td>
</tr>
<tr>
<td>13.</td>
<td>Posthaptor pedunculate, diameter about 1/6 of the body proper</td>
<td><em>C. gotoi</em> Ishii 1936</td>
</tr>
<tr>
<td>14.</td>
<td>Posthaptor sessile</td>
<td><em>C. foliacea</em> Goto 1894</td>
</tr>
<tr>
<td>16.</td>
<td>Posthaptor with 1 pair of anchors, an accessory anchor may be present</td>
<td><em>C. abidjani</em> Bussieras &amp; Baudin-Laurencin 1970</td>
</tr>
<tr>
<td>17.</td>
<td>Posthaptor with 3 pairs of anchors</td>
<td><em>C. marileanae</em> n. sp.</td>
</tr>
</tbody>
</table>

### Table Explanation

- **DorsoMarginal spines**: These are spines that run along the edge of the body. The table lists the number of cusps (points) each spine has.
- **Posthaptor**: This is a structure on the body that may have an anchor or not. The table lists the presence or absence of these structures.
- **Species**: The specific species of the monogenetic trematodes described in the study.


WAGNER E & C CARTER (1967) Caballerocotyla gregalis sp. n. (Trematoda: Monogenea) from the gills of Sarda lineolata (Girard) Journal of Parasitology 53: 277-279
