# Two new species and one new record of Clavella (Copepoda: Lernaeopodidae) from inshore fishes of Antofagasta, Chile

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# TWO NEW SPECIES AND A NEW RECORD OF *Clavella* OKEN, 1815 (Copepoda, Lernaeopodidae) PARASITIC ON FISHES FROM THE CHILEAN COAST.

# DOS NUEVAS ESPECIES Y UN NUEVO REGISTRO DE *Clavella* OKEN, 1815 (Copepoda, Lernaeopodidae) PARÁSITOS DE PECES EN LA COSTA CHILENA.

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ABSTRACT

Two new species of the genus ***Clavella*** (**Copepoda: Lernaeopodidae**) from Chilean waters are described and illustrated. ***Clavella convergentis*** sp. nov, parasitic on ***Nezumia convergens***, is distinguished from its congeners by the shape of its second maxillae and trunk. ***Clavella chiloensis***, parasitic on ***Eleginops maclovinus*** is distinguished by the absence of genital process, structure of both pairs of antennae and mandibular formula. ***Clavella adunca*** is recorded from ***Coryphaenoides*** sp. This paper brings up to seven the number of species of ***Clavella*** known to occur along the coast of Chile.

KEY WORDS: copepods, taxonomy, parasites, lernaeopodids

RESUMEN

Dos nuevas especies de ***Clavella*** (**Copepoda: Lernaeopodidae**), desde la costa de Chile, se describen e ilustran. ***Clavella convergentis*** sp. nov. parasita sobre ***Nezumia convergens*** se distingue de sus congéneres por la forma de su segunda maxila y el tronco. ***Clavella chiloensis*** sp.nov. sobre ***Eleginops maclovinus*** se diferencia de sus más cercanas en el género, con ausencia de proceso genital, por la estructura de ambos pares de antenas y la fórmula mandibular. ***Clavella adunca*** se cita parasitando a ***Coryphaenoides*** sp. Con las nuevas especies y el nuevo registro se eleva a 7 el número de especies de ***Clavella*** conocidas a lo largo de la costa de Chile.

PALABRAS CLAVES: Copepoda, taxonomia, parásitos, Lernaeopodidae

## INTRODUCTION

The genus ***Clavella*** Oken, 1815 (**Copepoda: Lernaeopodidae**), contains currently some 31 species, taking into account those listed by KABATA (1979) and those described subsequently (CASTRO & BAEZA, 1985a, 1985b; DOJIRI, 1981, 1993; KABATA, 1992; KAZACHENKO & AVDEEV, 1977). The validity of some species was questioned by KABATA (1979).

The literature contains only scant information on ***Clavella*** in the South Pacific. CASTRO & BAEZA (1985a, 1985b) recorded for this region ***Clavella parva*** WILSON, 1922, ***C. simplex*** CASTRO and BAEZA, 1985, ***C. caudata*** CASTRO and BAEZA, 1985, and ***C. applicata*** CASTRO and BAEZA, 1985, all taken off the coast of Northen Chile. LUQUE & FARFAN (1990) found ***C. simplex*** and ***C. applicata*** in the Peruvian waters on their original hosts. WILSON'S(1923) record of ***C. adunca*** on ***Doydixodon fasciatus*** has not been corroborated by subsequent researchers. The lernaeopodid copepod normally occurring on this fish is ***Clavellotis dilatata*** (cf. CASTRO and BAEZA, 1984).

The small size of these copepods, and their low abundance on their host fishes result in the scarcity of material available for examination. Consequently, good descriptions are often lacking, particularly of species described by early investigators. Hence it is difficult to make a firm specific diagnosis for several

species of ***Clavella***. Nevertheless, examination of some nothoteniid and macrourid fishes caught off the coast of Chile yielded a sufficient number of specimens to permit me to describe two new species of ***Clavella*** and to record, for the first time in this region a third. In consequence, the number of species of ***Clavella*** known to occur along the coast of Chile rose to seven.

## MATERIAL AND METHODS

The specimens were cleared in lactic acid for examination. Drawings were made with the aid of a camera lucida. All measurements are in micrometers. Terminology follows that adopted by KABATA (1979).

## RESULTS

### *Clavella convergentis* sp. nov.
(Figs. 1-9)

**Records of specimens**: Two females, one with a male attached were taken on February 02, 1981.One female becomes the Holotype and is deposited at MNHN Santiago. Reg.MNHN CP-N 15086. The male allotype is deposited in the same collection, Reg. MNHN CP -N.15087.

**Host**. ***Nezumia convergens***
**Loc**. Arica, Chile (952 m deep)
**Habitat**. Gills

***Description***. Female (Fig. 1a, b ): cephalothorax subcylindrical three times as long as trunk, with tapering apex; dorsal shield (Fig. 10) with nearly parallel lateral margins. Trunk wider than long, wider posteriorly, with posterior margin forming three lobes; lateral parts of ventral surface forming pairs of indistinct swellings; genital process and caudal rami absent. Dimensions (based on one specimen) in micrometers: Cephalothorax length 3,51, wide 434; trunk length 1,15, wide 1,94; eggs sacs length 2,79 width 485. First antenna (Fig. 2 a, b ) apparently two-segmented; its armature comprising six apical setae and one short spine on basal segment. Second antenna (Fig. 3a, b, c) with exopod reduced to short seta on dorsomedial margin; endopod with reduced hook (1), slender seta (2) and pad of minute spinules. Mandible (Fig. 4) with dental formula P3, B4 apparently without secondary teeth or diastemes. First maxilla (Fig. 5): endopod with two subequal setiferous papillae and fine denticulations on dorsal surface; exopod ventral, digitiform, surmounted by two setae. Second maxilla (Fig.1a, b) short, completely fused with its opposite member, with inflated base ventrally forming conspicuous swelling, apically produced into short digitiform process. Bulla with moderately long manubrium and circular anchor with somewhat concave subanchoral surface. Maxilliped (Fig. 6) with squat, robust corpus; myxal area armed with single short spine and small patch of denticles; shaft of subchela straight, with blunt spine on proximal half and small patch of denticles on inner distal surface; claw gently curving, barb more than half length of claw.

Male (Fig. 7): Typical of ***Clavella*** group. First antenna (Fig. 8) indistinctly two-segmented; apical armature of four setae. Second antenna (Fig. 9) with endopod bearing three apical setae and much shorter, bulbous, apparently unarmed exopod. Other appendages not examined. Total length 435 um.

**Comments**: The species decribed above is unique among its 17 congeners that lack a genital process in the shape of the second maxillae. No other species of ***Clavella*** is known to have this appendage equipped with basal ventral swellings of the type illustrated in Fig. 1a. Only two other species (***C. stellata*** and ***C. squamigera***) of this group have second maxillae with adventitious structure, but these structures are quite unlike those of ***C. convergentis***. This unique feature justifies the establishment of the new species.

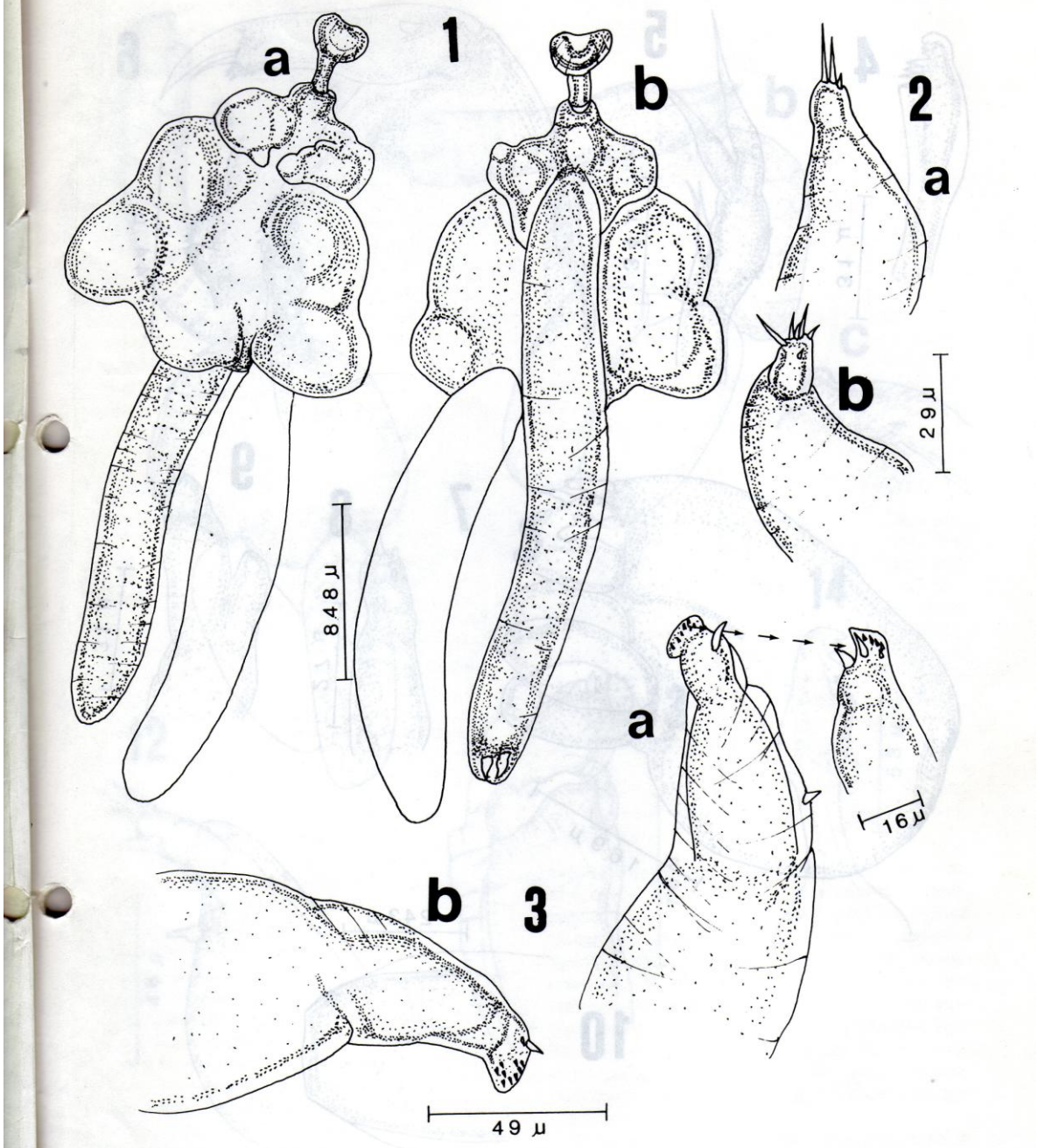
**Etymology**. The specific name ***convergentis*** refers to the specific name of the host.

### *Clavella chiloensis* n. sp.
(Figs. 10-23)

**Record of specimens**: Thirteen ovigerous females were taken on January 01, 1987. One of them becomes the holotype and is deposited in MNHN Santiago. Reg. MNHN CP-N.15088. A male deposited in the same collection become the allotype Reg.N MNHN CP-N.15090. 5 females are designated paratypes Reg. MNHN CP-N. 15089.

**Host**. ***Eleginops maclovinus***
**Habitat**. Gills
**Loc**. Chiloé, Quehui

**Description**. Female (Fig.11a, b) cephalothorax subcylindrical; its cephalic area somewhat enlarged; dorsal shield (Fig. 23) slightly tapering, wider than long, either wider posteriorly (Fig. 11a) or subquadrangular (Fig. 11b); perianal area slightly inflated in some specimens. Dimensions (based in 10 specimens): in micrometers: cephalothorax length 2,045 (1,515-3,091), wide 515 (424-667); trunk length 1,647 (1,212-2,061), wide 1,673 (1,333-1,939); se-




FIGS. 1-3 ***Clavella convergentis*** n.sp. Fig.1a Female ventral view, 1b, dorsal view. Fig.2a, b First antenna different view Fig. 3a,b Second antenna different view, c: detail of distal end.

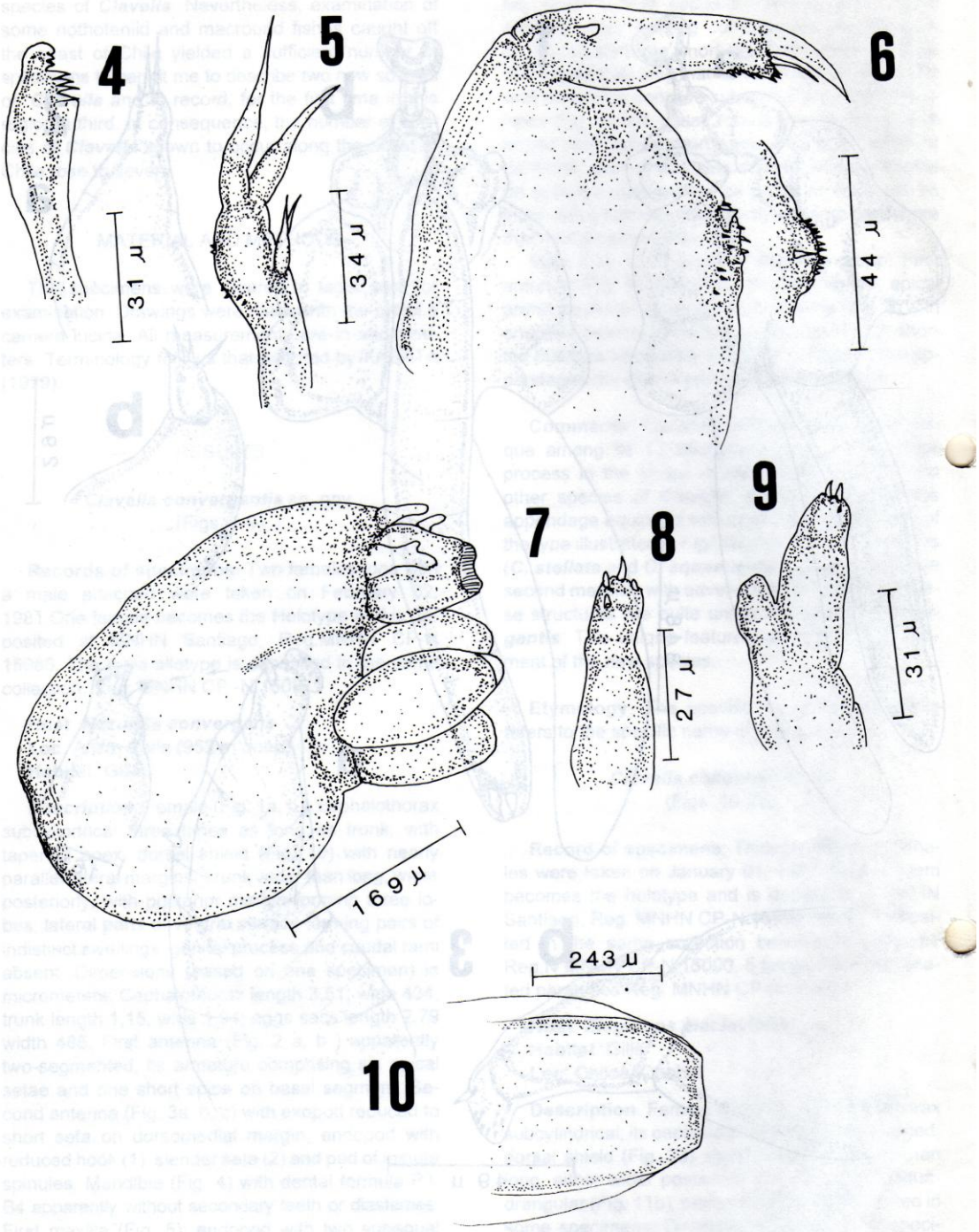
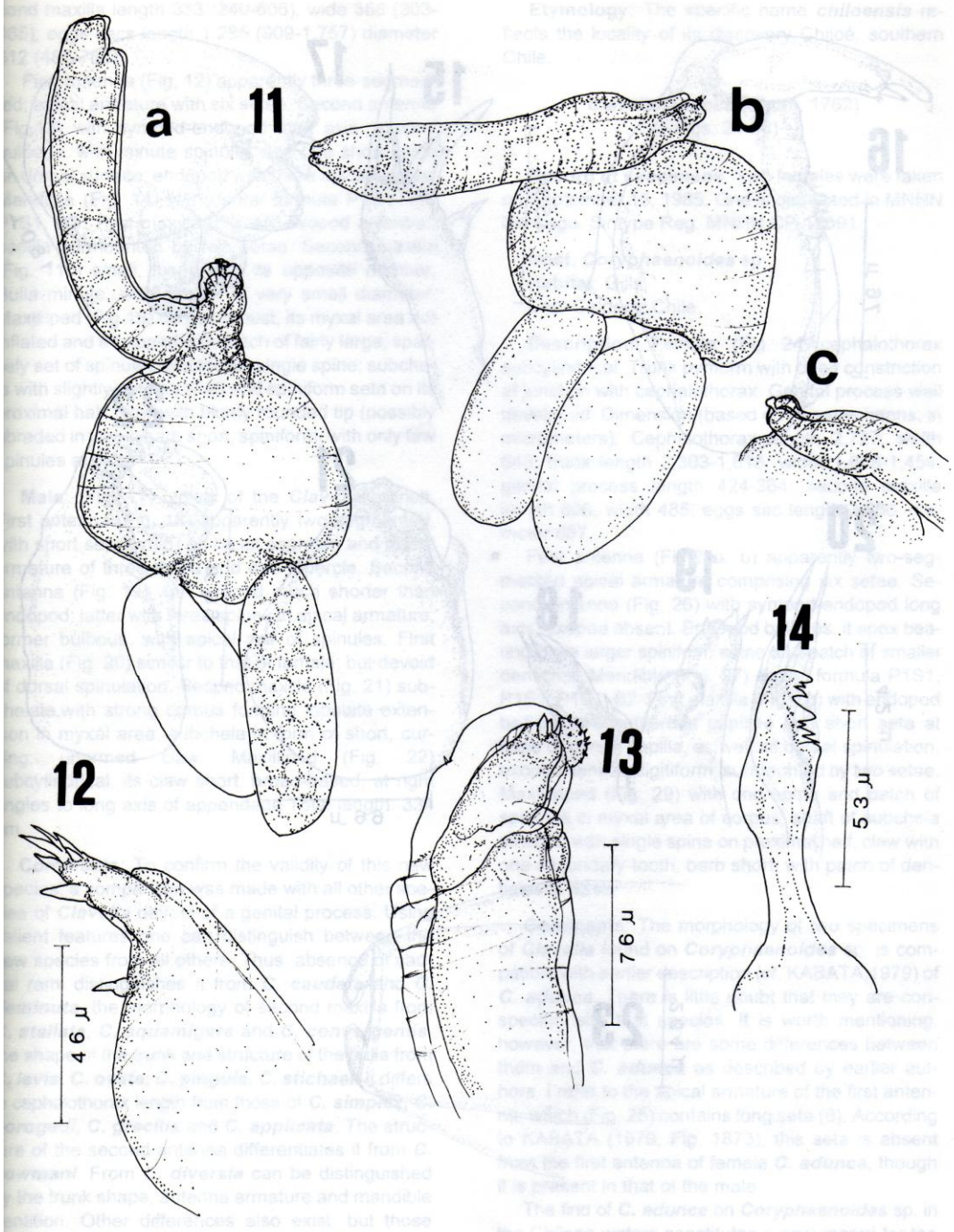
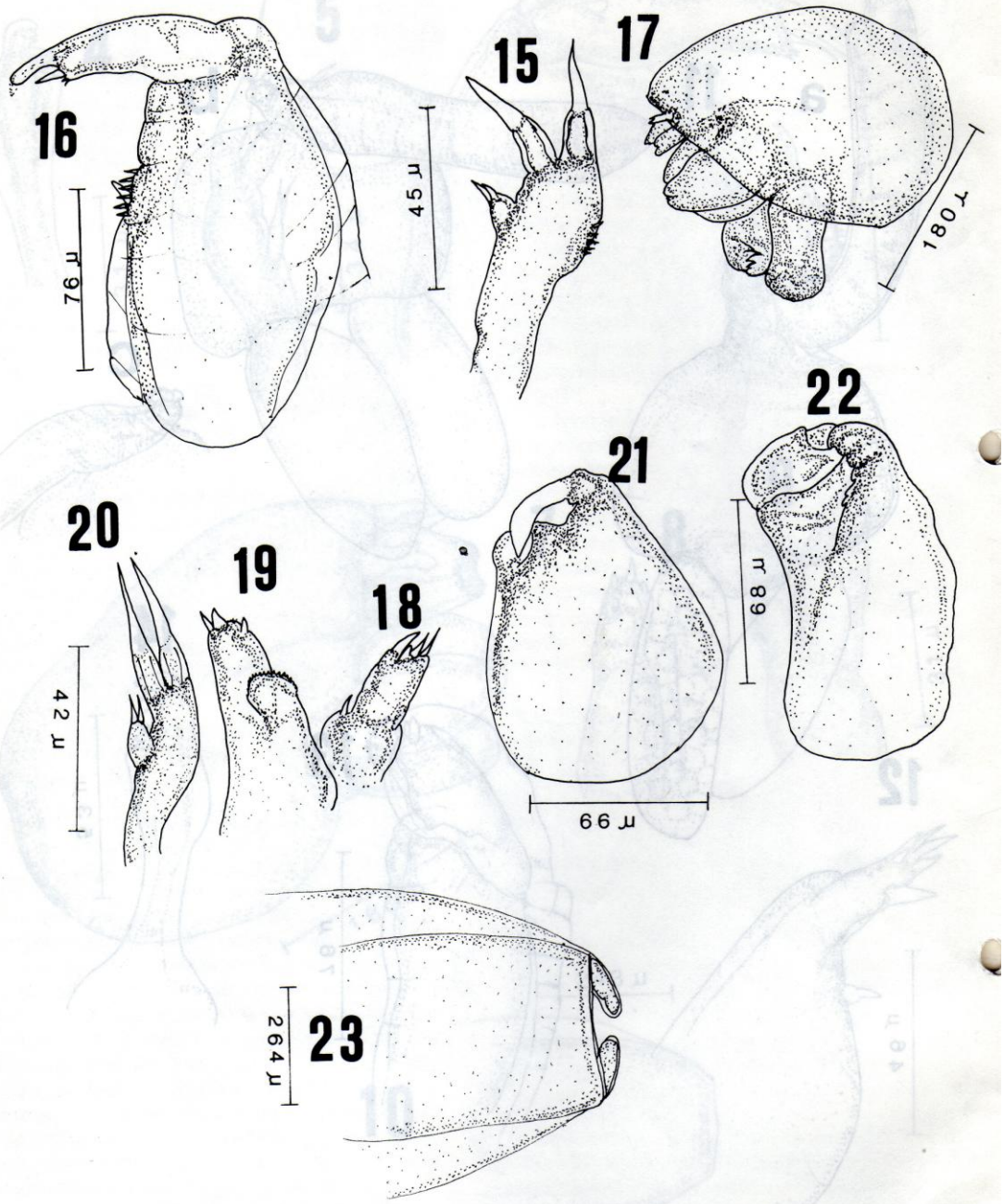



FIG. 4-10 ***Clavella convergentis*** n.sp. Fig. 4 Mandible. Fig.5 First maxilla. FIG. 6 Maxilliped. Fig.7 Male. Fig.8 Male first antenna. Fig. 9 Male second antenna. Fig.10 Female cephalothorax dorsal shield.




G. 11-14 ***Clavella chiloensis*** n.sp. Fig. 11.-a,b Female of ***C. chiloensis*** different specimens, c: second maxilla detail, lateral ew; c: lateral view of second maxilla. Fig.12.- First antenna. Fig.13.- Second antenna. Fig. 14.- Mandible.




FIGS. 15-23 ***Clavella chiloensis*** n.sp. Fig. 15.- First maxilla. FIG. 16.- Maxilliped. Fig. 17.- Male of ***C. chiloensis***. Fig. 18.- First antenna. Fig. 19.- Second antenna. Fig. 20.- First maxilla. FIG. 21.- Second maxilla. Fig. 22.- Maxilliped. Fig. 23.- Female cephalothorax, dorsal shield.

cond maxilla length 333 (240-606), wide 388 (303-485); eggs sacs length 1,285 (909-1,757) diameter 612 (485-788).

First antenna (Fig. 12) apparently three-segmented; apical armature with six setae. Second antenna (Fig.13) with sympod-endopod long axis; exopod bulbous, with minute spinules and one short spine on dorsal surface; endopod with three apical spines. Mandible (Fig. 14) with dental formula P1S1, P1, P1S1, B2 . First maxilla (Fig. 15) exopod a ventral, papilla surmounted by two setae. Second maxilla (Fig. 11c) small, fused with its opposite number. Bulla minute, with anchor of very small diameter. Maxilliped (Fig.16) corpus robust, its myxal area not inflated and equipped with patch of fairly large, sparsely set of spinules and robust single spine; subchela with slightly curving shaft and spiniform seta on its proximal half; claw with blunty rounded tip (possibly abraded in vivo ); barb short, spiniform, with only few spinules at base.

**Male**: (Fig. 17) typical of the ***Clavella*** branch. First antenna (Fig. 18) apparently two-segmented, with short seta (whip) on basal segment and apical armature of three setae and one tubercle. Second antenna (Fig. 19) with exopod much shorter than endopod; latter with three spines in apical armature; former bulbous, with apical row of spinules. First maxilla (Fig. 20) similar to that of female; but devoid of dorsal spinulation. Second maxilla (Fig. 21) subchelate,with strong corpus forming lobulate extension in myxal area; subchela in form of short, curving, unarmed claw. Maxilliped (Fig. 22) subcylindrical, its claw short, broad-based, at right angles to long axis of appendage.Total length: 334 um.

**Comments**: To confirm the validity of this new species, a comparison was made with all other species of ***Clavella*** devoid of a genital process. Using salient features one can distinguish between the new species from all others. Thus, absence of caudal rami distinguishes it from ***C. caudata*** and ***C. deminuta***, the morphology of second maxilla from ***C. stellata, C. squamigera*** and ***C. convergentis***, the shape of the trunk and structure of the bulla from ***C. levis, C. ovata, C. pinguis, C. stichaei***. It differs in cephalothorax length from those of ***C. simplex, C. porogadi, C. gracilis*** and ***C. applicata***. The structure of the second antenna differentiates it from ***C. bowmani***. From ***C. diversia*** can be distinguished by the trunk shape, antenna armature and mandible dentition. Other differences also exist, but those single characters demostrate that this species is a distinct taxon.

**Etymology**: The specific name ***chiloensis*** reflects the locality of its discovery Chiloé, southern Chile.

***Clavella adunca*** (Strom, 1762)
(Figs. 24-28)

**Record of specimens**: Two females were taken on September 15, 1985. One is deposited in MNHN Santiago. Sintype Reg. MNHN CP-15091.

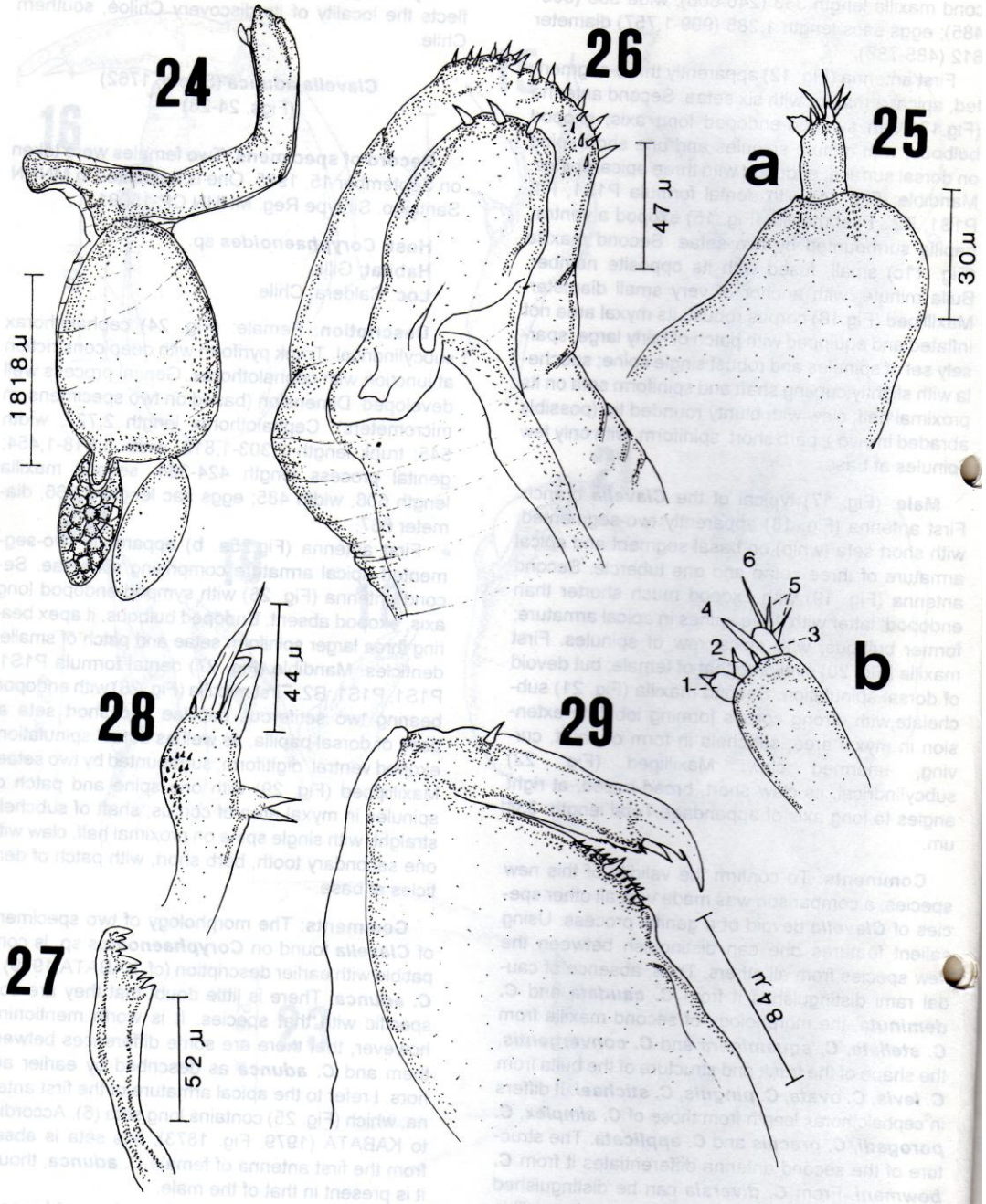
**Host**. ***Coryphaenoides*** sp.
**Habitat**: Gills
**Loc**. Caldera, Chile.

**Description**. Female: (Fig. 24) cephalothorax subcylindrical. Trunk pyriform with deep constriction at junction with cephalothorax. Genital process well developed. Dimension (based on two specimens, in micrometers): Cephalothorax length 2,727, width 545; trunk length 2,303-1,818, width 1,818-1,454; genital process length 424-364; second maxilla length 606, width 485; eggs sac length 2,666, diameter 667.

First antenna (Fig.25a, b) apparently two-segmented apical armature comprising six setae. Second antenna (Fig. 26) with sympod-endopod long axis, exopod absent. Endopod bulbous, it apex bearing three larger spiniform setae and patch of smaller denticles. Mandible (Fig. 27) dental formula P1S1, P1S1, P1S1, B2. First maxilla (Fig. 28) with endopod bearing two setiferous papillae and short seta at base of dorsal papilla, as well as dorsal spinulation, exopod ventral, digitiform, surmounted by two setae. Maxillipped (Fig. 29) with one spine and patch of spinules in myxal area of corpus; shaft of subchela straight, with single spine on proximal half, claw with one secondary tooth, barb short, with patch of denticles at base.

**Comments**: The morphology of two specimens of ***Clavella*** found on ***Coryphaenoides*** sp. is compatible with earlier description (cf. KABATA,1979) of ***C. adunca***. There is little doubt that they are conspecific with that species. It is worth mentioning, however, that there are some differences between them and ***C. adunca*** as described by earlier authors. I refer to the apical armature of the first antenna, which (Fig. 25) contains long seta (6). According to KABATA (1979, Fig. 1873), this seta is absent from the first antenna of female ***C. adunca***, though it is present in that of the male.

The find of ***C. adunca*** on ***Coryphaenoides*** sp. in the Chilean waters constitutes a new record for the Chilean fauna.




FIGS. 24-29 ***Clavella adunca Strom***, 1762. Fig. 24. ***Female C. adunca***. FIG. 25.a) First atenna, b) detail of apical armature. Fig. 26. Second antenna. FIG. 27. Mandible. Fig. 28. First maxilla. Fig. 29. Maxilliped.

## DISCUSSION

The description in this paper of two new species and the addition of one new record increase the number of the species of ***Clavella*** to seven occurring off the coast of Chile and, indeed, in South Pacific as whole (***C. adunca, C. applicata, C. caudata, C. parva, C. chiloensis, C. convergentis***, and ***C. simplex***). The relative paucity of ***Clavella*** in this part of the world is at least in part attributable to the inadequate study of the local fish parasites. The discovery described in this paper bear sufficient testimony to this state of affairs.

WILSON'S (1923) earlier record of ***C. adunca*** on ***Doydixodon laevigatum*** was not corroborated by subsequent finds. In all likelihood it is only a misidentification of ***Clavellotis dilatata*** (Kroyer, 1863), a copepod often found parasitizing this host along the coast of Chile (CASTRO & BAEZA, 1984). It can be verified by the examination of ***D. laevigatum*** from southern Chile, the locality of WILSON'S report.

The discovery of ***C. convergentis*** on ***Nezumia convergens*** (caugth in deep waters) and of ***C. chiloensis*** on ***Eleginops maclovinus*** raises to three the number of species of this genus infecting nototheniid fishes in the southern hemisphere. Both occur in South pacific, in contrast to ***C. bowmani***, parasitic on ***Notothenia sima*** in South Atlantic.

***Clavella adunca*** is the second species of its genus found in deep waters off the coast of Chile. It has been known previously from various gadid and macrourid fishes in the Atlantic Ocean (KABATA,1988).

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