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Article in *Journal of Natural History* · December 1991

DOI: 10.1080/00222939100770901

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**Two new species of *Eudactylina* van Beneden, 1853 (Copepoda: Eudactylinidae) and a new record of *E. acanthii* A. Scott, 1901, from Chilean waters**

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(Accepted 3 June 1991)

*Eudactylina indivisa* sp. nov., parasitic on *Myliobatis peruvianus* (Garman) and *M. chilensis* Philippi, 1892 and *E. parva* sp. nov., parasitic on *Sympterigia brevicaudata* Cope, 1877 are described and illustrated. The new species differ from existing specimens of *Eudactylina* by a combination of characters. Also a new record of *E. acanthii* A. Scott, 1901 from the type host is given. The two new species were collected in Antofagasta northern Chile and *E. acanthii* was captured in southern Chile. The present paper raises to five the *Eudactylina* species present in Chilean waters.

KEYWORDS: Eudactylinidae, *Eudactylina*, parasitic copepod, South Pacific, key.

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**Introduction**

The genus *Eudactylina* van Beneden, 1853, parasitic on elasmobranch fishes, is poorly known from South Pacific waters. The only records of this genus from Chilean waters are those of Ho and McKinney (1981), who reported *E. chilensis* from *Aculeola nigra* De Buen, 1959, and of Castro and Baeza (1987), who described *E. tuberifera* from *Squatina armata* (Philippi, 1887). This lack of knowledge extends throughout the Pacific Ocean, with only four species reported previously for this area (Kabata, 1979); a low number if it is considered that the genus comprises 29 species.

During their studies of the parasitic copepods from Chilean fishes and review of the elasmobranchs from Antofagasta, the authors took specimens from three rays *Myliobatis peruvianus* (Garman), *M. chilensis* Philippi, 1892 and *Sympterigia brevicaudata* (Cope, 1877). The specimens belong to two new species which are described and illustrated herein. Also recorded is *E. acanthii* A. Scott, 1901 from the type host caught in southern Chile.

**Methods**

The methods adopted in the examination of material and the preparation of the illustration follow those described by Castro and Baeza (1984). Terminology follows that proposed by Kabata (1979).

*Eudactylina indivisa*

(Figs 1-13)

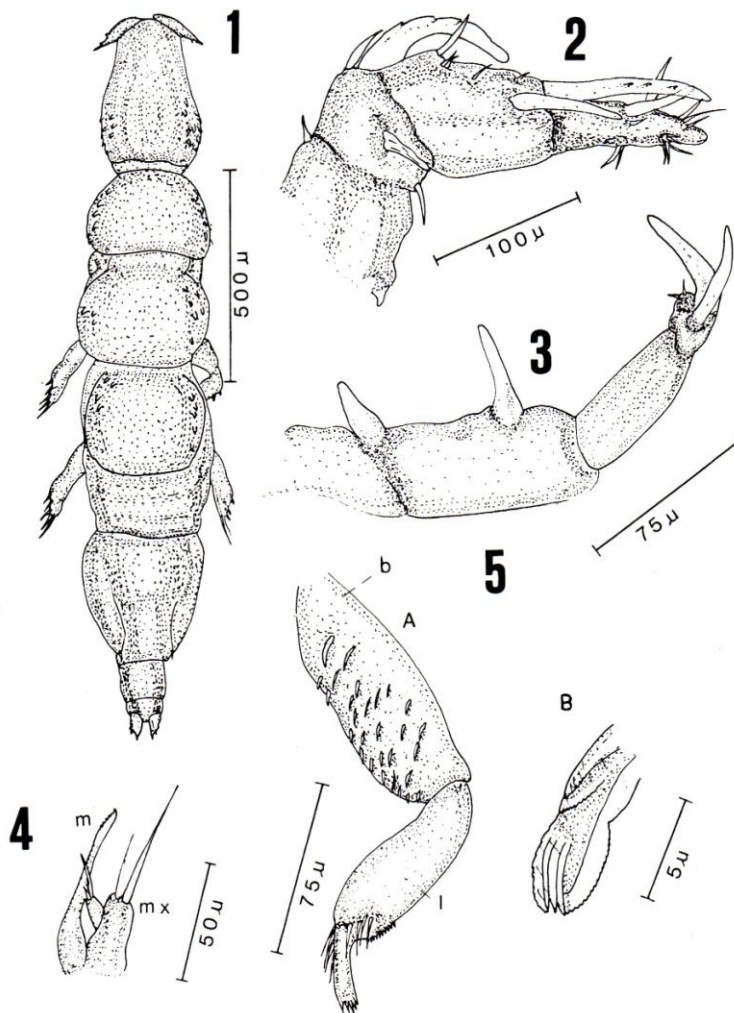
*Host.* *Myliobatis peruvianus* (Garman). Type host: V. N. 'Ray'. *Myliobatis chilensis* Philippi, 1892 V. N. 'Ray'.

*Locality.* Antofagasta, Chile (23°29'S, 70°25'W).

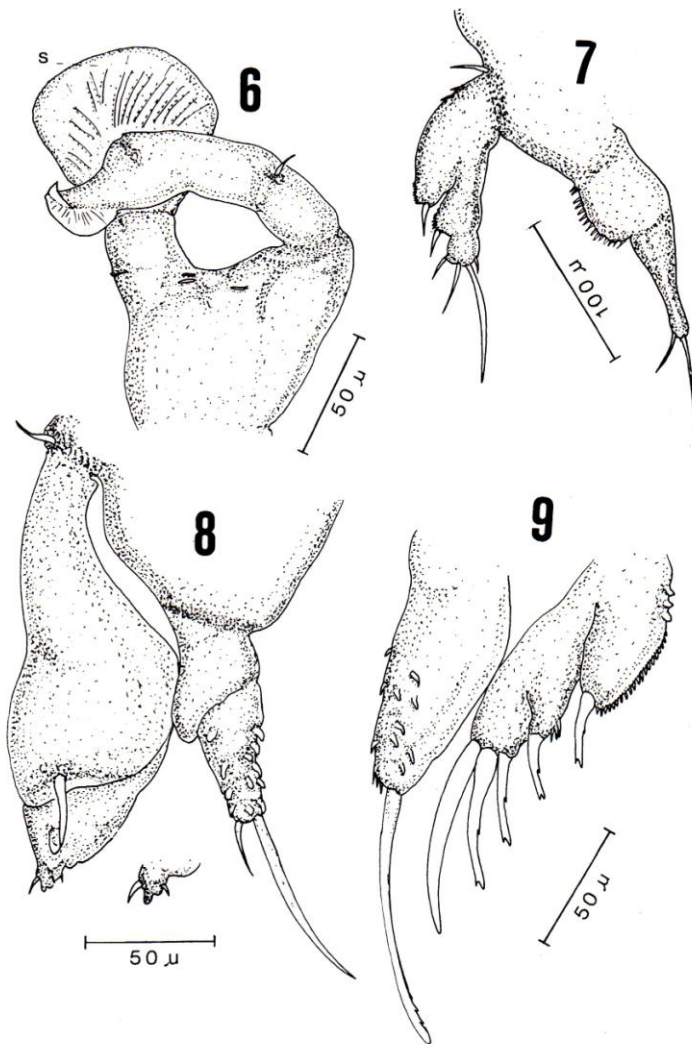
*Habitat.* Gills.

*Record of specimens.* Five females, January, 1984; 8 females, September, 1984 (from *M. chilensis*) and 14, females, March 1985 (from *M. peruvianus*). The type material is deposited in Museo Nacional de Historia Natural, Santiago, Chile. Holotype Reg. no. 15061 MNHN-CP. Paratype (3 females) Reg. no. 15081 MNHN-CP.

*Description.* Females (Fig. 1) cephalothorax longer than wide, somewhat widened posteriorly. Thoracic segments bearing legs 2 and 3 with well-developed terga. Fourth



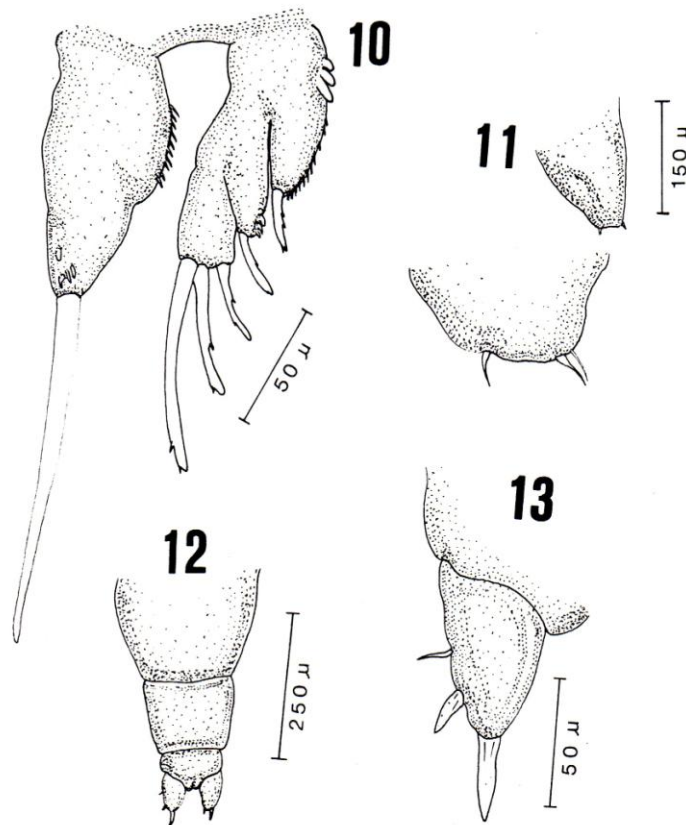
FIGS 1-5. *Eudactylina indivisa* n. sp.: (1) female, dorsal view *Eudactylina indivisa* n. sp.; (2) first antenna; (3) second antenna; (4) first maxilla (mx) and mandible (m); (5) (a) Second maxilla and (b) Claw distal end, details (b = brachium, l = lacertus).



FIGS. 6-9. *Eudactylina indivisa*: (6) Maxilliped (s = spoon-like structure); (7) first leg; (8) second leg; (9) third leg.

leg-bearing segment largest with tergum not covering entire dorsal surface. Genital segment slightly longer than fifth leg-bearing segment. Abdomen bi-segmented (Fig. 12). Measurements based on 14 specimens from *M. peruvianus* (in micrometres). Total length 1.630 (1.171-1.996). Cephalothorax length 320 (258-370), width 248 (225-306). First thoracic segment length 270 (225-322), width 300 (258-322). Third segment length 334 (258-435), width 289 (246-306). Fourth segment length 278 (113-382), width 273 (242-322). Genital segment and abdomen 274 (193-322), width 146 (97-161). Egg sac length (from three specimens) 501 (322-620), diameter 164 (129-192), sacs containing 4 (3-5) eggs. Dimensions of specimens found on *M. chilensis* are in the range of those collected from *M. peruvianus*.

First antenna (Fig. 2) with geniculate flexion, apparently four-segmented, distal segment without claw-like spine. First segment with 1 dorsodistal seta. Second segment



FIGS 10-13. *Eudactylina indivisa* n. sp.: (10) Fourth leg; (11) fifth leg detail of distal end; (12) abdomen; (13) uropod.

bearing 1 seta on ventral margin, 1 spine on posterior surface and 1 seta dorsodistally. Third segment, dorsal margin with 3 short denticles; also bearing 1 long and 4 short setae on dorsal margin, and 1 long spine on distoposterior surface; distal margin with a long claw slightly curved bearing 3 denticles, and extending nearly to apex of appendages. Distal segment with 2 setae at middle ventral margin and at the same level, but on posterior surface a short seta; 1 strong spine and seta on dorsal margin. The terminal part of the segment has 3 setae, on a ventral margin, 1 short seta on the posterior surface, and 3 setae on dorsal margin. Not bearing claw-like spine at distal end. Second antenna (Fig. 3) four-segmented; basal segment without armature, Second segment with a strong, subconical spine on its base and other longer and more slender distally. Third segment without armature. Distal one with ventral prominence bearing 2 setae and distally with 2 long curved claws. Mandible (Fig. 4m) short blade with 6 teeth, distal one biggest. First maxilla (Fig. 4mx) biramous, rami one-segmented. Exopod bearing 2 subequal setae. Endopod slender and shorter than exopod, with 1 long and other short seta. Second maxilla (Fig. 5) brachiform, brachium strong (Fig. 5b), its surface with cuticular flaps. Lacertus (Fig. 5l) with tuft of setae on both sides distally and row of spinules on ventral margin at distal end. Distal claw. characterized by the presence of several membranous flaps on lateral surface and 1 ventral.

Maxilliped (Fig. 6) indistinctly segmented, basal part strong, square, distal end forming sub-cylindrical projection, with broad membranous spoon-like apical part (Fig. 6s). Opposable segment cylindrical, distally curved, with 1 seta on its surface and membranous fringe distally. First leg (Fig. 7) biramous. Endopod bi-segmented, first segment square, with row of spinules on external margin. Second segment slender, conical, longer than first, with 2 distal setae. Exopod apparently tri-segmented (boundaries ill-defined), first segment biggest, its distolateral corner extended into a lobe overlapping the second segment and armed with a distal seta, and row of spinules on its distolateral end, also 2 setae on its basal lateral margin. Second segment bearing 1 seta and spinules on its lateral margin. Third segment shortest, square and distally bearing 4 setae. Second leg (Fig. 8) biramous, with modified exopod. Endopod apparently bi-segmented. Last segment armed with 1 long and 1 short seta and with cuticular flaps on both anterior and posterior surfaces. Exopod bi-segmented, basal segment inflated, longer than second, armed with seta on its disto-medial part. Second segment with short spiniform process on its medial part (anterior surface) and distally with 1 seta on latero-external margin, a short distal projection with a short seta on both sides. Third leg (Fig. 9) biramous, exopod tri-segmented. First and second segment armed with 1 spine. Third segment bearing 3 spines. Endopod apparently without segmentation, equipped with 1 long seta and cuticular flaps on anterior surface. Fourth leg (Fig. 10) similar to third. Fifth leg (Fig. 11) armed with 3 setae distally.

Uropods (Fig. 13) sub-triangular, armed with 1 long spine on apex, 1 spine and 1 seta on lateral border.

*Male.* Unknown.

*Etymology.* The specific name *indivisa*, from Latin *indivisus* (= individed), refers to the ill-defined segmentation of the first, third and fourth leg.

***Eudactylina parva* sp. nov.**

(Figs 14–25)

*Host.* *Sympterygia brevicaudata* Cope, 1877.

*Locality.* Antofagasta, Chile (23°29'S, 70°25'W).

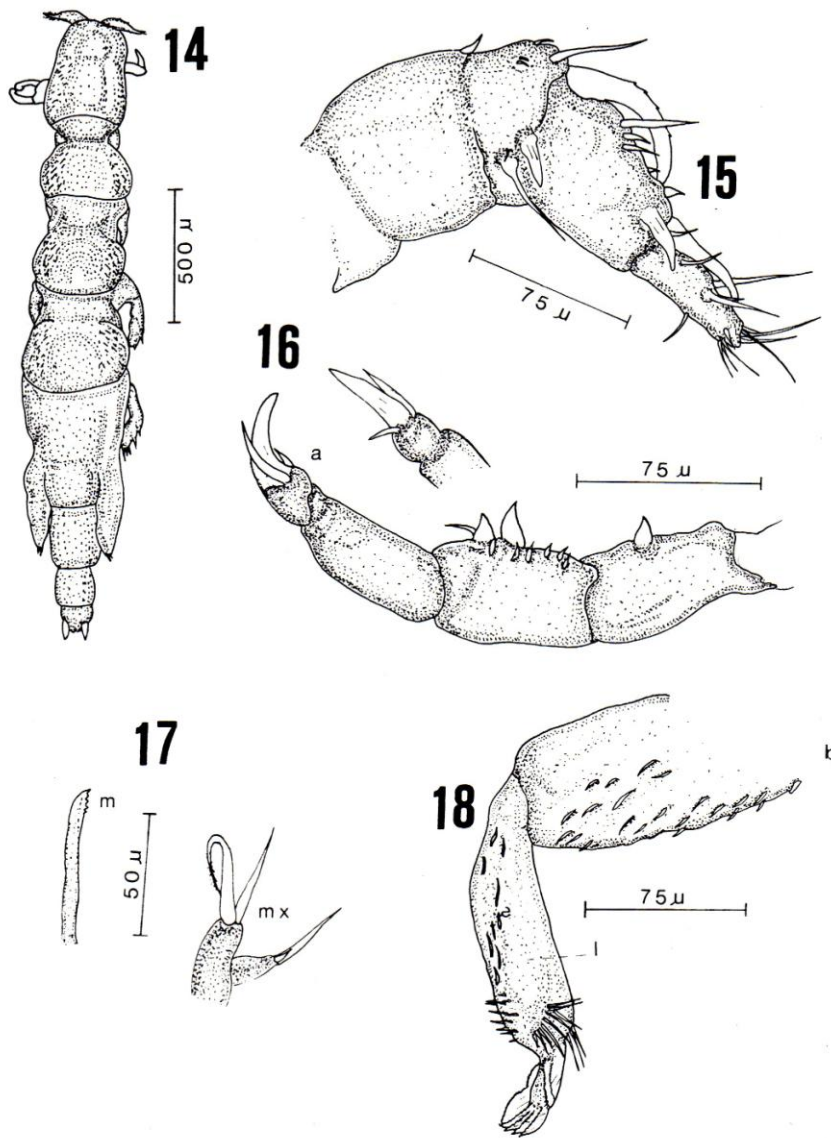
*Habitat.* Gills.

*Record of specimens.* Two females, May 1984 and 1 female, January 1985. Material deposited in Museo Nacional de Historia Natural, Santiago, Chile. Holotype Reg. no. 15062 NMHN-CP.

*Description.* Female (Fig. 14) cephalothorax slightly longer than wide, about the same width throughout. Thoracic segments bearing legs 2 and 3 with terga completely covering each segment. Fourth and fifth leg-bearing segments with a terga covering about half of their length. Abdomen bi-segmented.

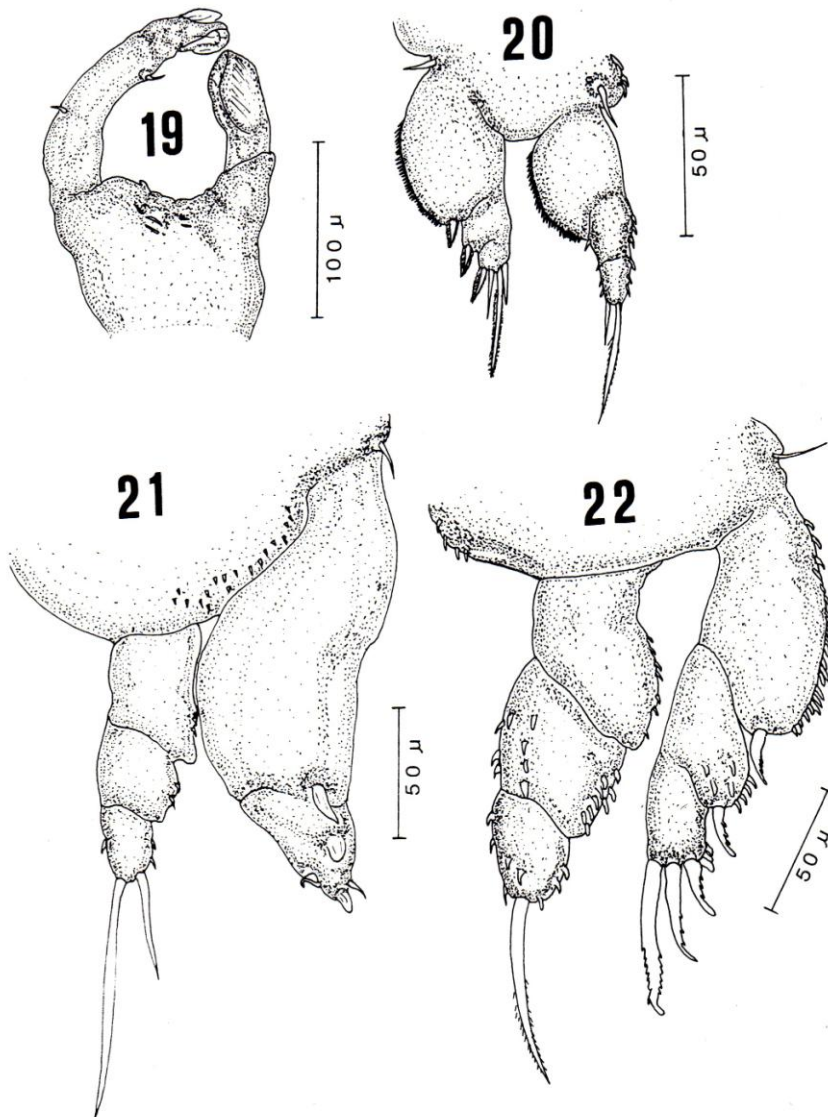
Measurement (mean of 2 specimens) in micrometres: total length 1.826. Cephalothorax length 346, width 322. Second free segment length 201, width 314. Third segment length 250, width 346. Genital segment–abdomen length 362, width 185.

First antenna (Fig. 15) four-segmented, basal segment with spine on dorsal border. Second segment with seta and 1 spine on anterior surface; 3 short setae and 1 long, slender seta on distodorsal margin. Third segment bearing on dorsal margin of its base a long, curved and denticulated claw and 5 setae, also a spine near distal end on anterior surface. Fourth segment with a slightly curved claw, 1 seta on mid-anterior margin and



FIGS 14–18. *Eudactylina parva* n. sp.: (14) Female, dorsal view *Eudactylina parva* n. sp.; (15) first antenna; (16a) second antenna, (b) second antenna, distal end posterior view; (17) mandible (m); first maxilla (mx); (18) second maxilla, (b = brachium, l = lacertus).

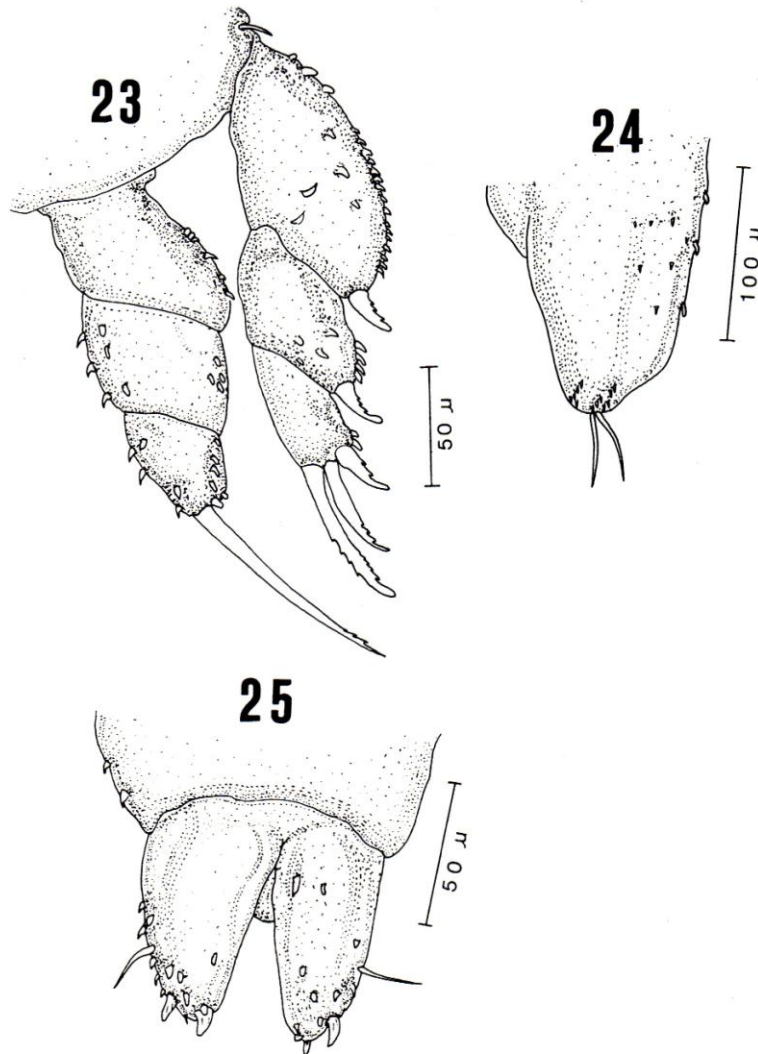
other four on dorsal surface, as well as 8 setae distally. Second antenna (Fig. 16a,b) four-segmented. Basal segment with one sub-triangular spine on ventromedial part. Second segment with 2 spines (of about similar size), 1 seta on ventral margin, and 6 small membranous flaps. Third segment unarmed. Distal segment (Fig. 16a,b) with strong, curved claw, 1 long and 1 short seta at its base. Mandible (Fig. 17a) blade short, apparently with 5 teeth. First maxilla (Fig. 17b) biramous, rami one-segmented. Exopod with 1 long other short seta. Endopod shorter than exopod, bearing 1 long seta and other minute. Second maxilla (Fig. 18) uniramous. Brachium (Fig. 18b) covered by fine



FIGS. 19-22. *Eudactylina parva* n. sp.: (19) Maxilliped (s = spoon-like structure); (20) first leg; (21) second leg; (22) third leg.

membranous flaps, wider than lacertus (Fig. 181); latter with tuft of setae distally on both sides. Claw with several rows of embranous flaps. Maxilliped (Fig. 19): basal part strong, subquadrate with short extension ending in a spoon-like membranous structure (Fig. 19s). Opposable segment with 2 setae, claw-like distal end with membranous rim. First leg (Fig. 20) biramous, both rami tri-segmented and of about equal size. Endopod with the first segment longest, enlarged, armed with a row of spinules on external margin. Second and third segment of about equal length, both armed with cuticular flaps on margins. Third segment with two setae distally. Exopod first segment similar to those of the endopod, but equipped with one distal seta. Second





FIGS 23–25. *Eudactylina parva* n. sp.: (23) Fourth leg; (24) fifth leg; (25) uropod.

segment armed with one seta. Third segment shortest, with four distal setae. Second leg (Fig. 21) biramous, with modified exopod. Exopod bi-segmented. First segment large, armed with distolateral spine. Second segment one-third as long as first, bearing spiniform process on medial surface, distally with 2 setae and short spine. Endopod tri-segmented. First segment sub-rectangular with 2 spines on its lateral margin. Second segment about quadrangular with 2 distal setae and 2 spines on external margin and 1 on inner rim. Third leg (Fig. 22) biramous, both rami clearly tri-segmented. Exopod first segment armed with 1 spine distally and cuticular flaps on the lateral margin. Second segment with 1 spine distally and armed with 4 cuticular flaps on lateral margin and other 4 on the anterior surface. Third segment with 3 spines, the most distal the longest, and 4 cuticular flaps on lateral margin. Endopod first segment armed with

cuticular flaps on lateral margin. Second segment with flaps on the anterior surface and 1 on both margins. Third segment bearing a long setae distally and cuticular flaps on the anterior surface and on both margins. Fourth leg (Fig. 23) biramous, rami tri-segmented armed as the former. Fifth leg (Fig. 24) sub-triangular, rounded distally, its surface bearing several membranous flaps.

Uropod (Fig. 25) oblong, armed with 2 short, blunt spines of equal size, 1 subterminal and 1 distal, as well as 1 seta on lateral margin; surface with irregularly distributed spinules.

*Male.* Unknown.

*Etymology.* *parva* from Latin *parvus* (=few; in number) refers to the small number of specimens found.

#### *Eudactylina acanthii* A. Scott, 1901

*Host.* *Squalus acanthias* Linneo.

*Habitat.* Gills.

*Locality.* Quehui, Chiloé, Chile.

*Record of specimens.* Five females, January 1986, Material deposited in Museo Nacional de Historia Natural, Santiago, Chile; 3 females, Reg no. 15063 MNHN-CP.

This widely distributed species has been reported from the type host, in the North Atlantic, North Pacific and South Atlantic Ocean (Angola), and from the South Pacific in Australian waters (Kabata, 1979). This is the first record for the South Pacific, Chilean waters, on the type host.

As the present specimens are in accord with those redescribed by Kabata (1979) other details are not necessary. The measurements based on 5 females are in micrometres: total length 1·920, cephalothorax length 487 (430–499), width 487 (451–515). Second thoracic segment length 303 (274–322), width 483 (419–547). Third thoracic segment length 351 (322–370), width 496 (451–564). Fourth segment length 341 (306–354), width 477 (403–547). Fifth segment length 277 (209–290), width 209 (193–242).

#### Discussion

In order to establish the identity of the specimens described herein, they must be compared with those species bearing the second exopod modified lobulate (cf. Laubier, 1968; Ho and McKinney, 1981). This can be done by means of the annexed key. The differences established justify the nomination of two new species for the specimens found parasitizing *Myliobatis peruvianus* and *M. chilensis*, and *Sympterygia brevicaudata* respectively.

The ill-defined boundaries between the leg segments, specifically of the endopod of the fourth and third legs (which appear to be completely fused), is an important character of *Eudactylina indivisa* n. sp. It represents part of a transformation from a well-defined intersegmental boundary to a partial or completely fused condition of these legs, as seen in other species of the genus. This trend to a simplification of the leg is presumably adaptive.

The present paper raises to five the number of species of *Eudactylina* recorded on elasmobranch fishes from the South Pacific Ocean (Chilean waters) and to eight for the entire Pacific Ocean. Other specimens, not previously reported from this area, or on the host examined, were found during the present study, but the small number of specimens recovered was insufficient to permit their description. Their identification must await the availability of more material.

Key to the *Eudactylina* species bearing a modified second exopod (a lobate ramus)

- 1 All legs tri-segmented (except second exopod) . . . . . 2  
 – First leg with reduced number of segments . . . . . 8
- 2 Second exopod tri-segmented (boundaries not well defined) . . . . . 3  
 – Second exopod bi-segmented (boundaries well defined) . . . . . 7
- 3 Second segment of the second antenna unarmed . . . . . 4  
 – Second segment of the antenna armed . . . . . 6
- 4 Second exopod equipped, distally, with 4 curved spines . . . . . *E. valei*  
 – Second exopod equipped, distally, with 1 or 2 spines . . . . . 5
- 5 Second exopod armed, distally, with 2 short spines . . . . . *E. squamosa*  
 – Second exopod armed distally with 1 seta . . . . . *E. spinula*
- 6 Second exopod armed with 1 spine on distal surface of last segment . . . . . *E. acuta*  
 – Second exopod armed with four spines on distal surface of last segment . . . . . *E. similis*
- 7 Third segment of the second antenna armed with 2 short processes (and 1 seta). Third tergum short . . . . . *E. parva*  
 – Third segment of the second antenna armed with only 1 short spiniform process. Third tergum normal . . . . . *E. tuberifera*
- 8 Both rami of the first leg bi-segmented . . . . . 9  
 – Exopod of the first leg tri-segmented. Endopod bi-segmented (cylindrical). Third and fourth legs with endopod of inconspicuous segmentation . . . . . *E. indivisa*
- 9 Second to fourth legs endopod tri-segmented (second segment of the first endopod cylindrical). Third and fourth tergum reduced . . . . . *E. turgipes*  
 – Second to fourth legs endopod bi-segmented . . . . . *E. corrugata*

## Acknowledgements

We wish to thank Dr Z. Kabata (Pacific Biological Station, Nanaimo, Canada) and an anonymous reviewer for their constructive criticism of the manuscript.

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