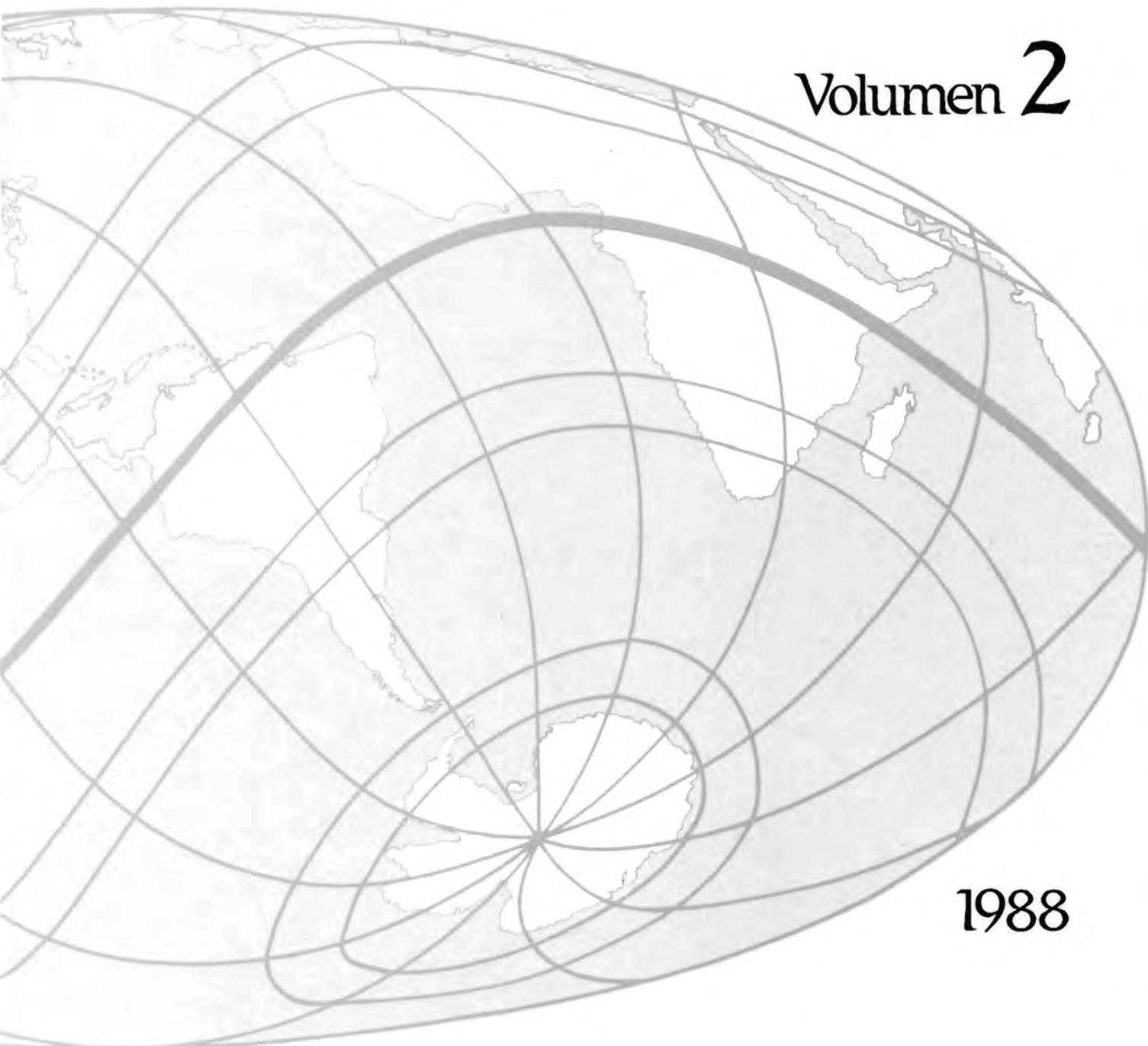


MONOGRAFÍAS DE ZOOLOGÍA MARINA

Volumen 2



1988

INSTITUTO DE CIENCIAS DEL MAR. BARCELONA

CONSEJO SUPERIOR
DE
INVESTIGACIONES CIENTÍFICAS

MONOGRAFÍAS DE ZOOLOGÍA MARINA

CEP de la Biblioteca Nacional (Madrid)

MACPHERSON, E.

Revision of the family lithodidae samouelle, 1819 (crustacea, decapoda, anomura) in the Atlantic Ocean / by E. Macpherson. - Barcelona: Instituto del Mar, Consejo Superior de Investigaciones Científicas, 1988. - (Monografías de zoología marina, ISSN 0213-4020; v.2)

ISBN: 84-00-06807-6

I. Anomuros-Oceanó Atlántico. I. Instituto de Ciencias del Mar. II. Título.
595.384.8 (261)



© 1988, INSTITUTO DE CIENCIAS DEL MAR. BARCELONA del
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS
INCIMAR Paseo Nacional, s/n. - 08003 Barcelona (España)
C.S.I.C. Serrano, 117 - 28006 Madrid (España)

Reservados todos los derechos.

Prohibida la reproducción total o parcial de esta obra
bajo ninguna forma ni por ningún procedimiento, incluido el microfilm,
sin autorización expresa y por escrito.

Fecha de publicación: 1 de mayo de 1988

Depósito legal: B. 15.760-1988

ISSN: 0213-4020, por la obra completa

ISBN: 84-00-06807-6, por el segundo volumen

Printed in Spain

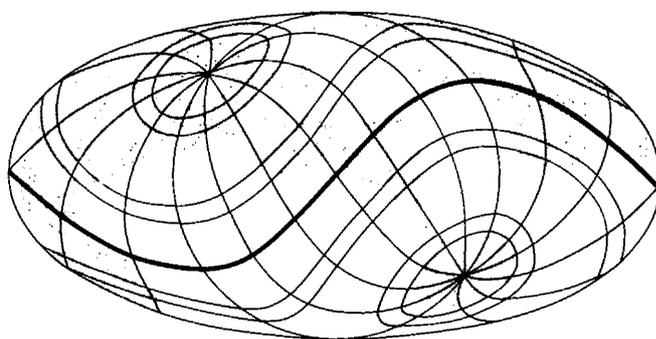
Cubierta, diseño y montaje: Charo Ferrández

Fotolitos ilustración: Reprocolor Llovet, S.A.

Fotocomposición e impresión: Imprenta Juvenil, S.A.

MONOGRAFÍAS DE ZOOLOGÍA MARINA

Volumen II
1988



INSTITUTO DE CIENCIAS DEL MAR
BARCELONA

CONSEJO SUPERIOR
DE
INVESTIGACIONES CIENTÍFICAS

REVISION OF THE FAMILY
LITHODIDAE SAMOUELLE, 1819
(CRUSTACEA, DECAPODA, ANOMURA)
IN THE ATLANTIC OCEAN

by

E. Macpherson

Instituto de Ciencias del Mar, Paseo Nacional s/n,
08003 BARCELONA, Spain

Key words: Crustacea Decapoda Anomura, Lithodidae, systematic revision, new species, Atlantic Ocean.

Palabras clave: *Crustacea Decapoda Anomura, Lithodidae, revisión sistemática, especies nuevas, Océano Atlántico.*

CONTENTS

Summary/Resumen	11
Introduction	13
Family Lithodidae	17
Key to the subfamilies of the family Lithodidae	17
Key to the genera of the subfamily Lithodinae	20
Genus Neolithodes A. Milne Edwards & Bouvier, 1894	28
Key to the species of the genus <i>Neolithodes</i> in the Atlantic Ocean	28
<i>N. diomedea</i> (Benedict, 1894)	29
<i>N. agassizii</i> (Smith, 1882)	33
<i>N. asperrimus</i> Barnard, 1947	37
<i>N. capensis</i> Stebbing, 1904	40
<i>N. grimaldii</i> (A. Milne Edwards & Bouvier, 1894)	42
<i>N. vinogradovi</i> n. sp.	46
Genus Lithodes Latreille, 1806	47
Key to the species of the genus <i>Lithodes</i> in the Atlantic Ocean	49
<i>L. santolla</i> (Molina, 1782)	50
<i>L. confundens</i> n. sp.	55
<i>L. maja</i> (Linnaeus, 1758)	58
<i>L. manningi</i> n. sp.	62
<i>L. ferox</i> Filhol, 1885	64
<i>L. turkayi</i> n. sp.	68
<i>L. murrayi</i> Henderson, 1888	70
<i>L. unicornis</i> Macpherson, 1984	73
Genus Paralomis White, 1856	75
Key to the species of the genus <i>Paralomis</i> in the Atlantic Ocean	76
<i>P. spinosissima</i> Birstein & Vinogradov, 1972	78
<i>P. erinacea</i> n. sp.	82
<i>P. bouvieri</i> Hansen, 1908	85
<i>P. shinkaimaruae</i> Takeda, 1984	87
<i>P. formosa</i> Henderson, 1888	88
<i>P. spectabilis</i> Hansen, 1908	91
<i>P. granulosa</i> (Jacquinot, 1847)	94

<i>P. cubensis</i> Chace, 1939	97
<i>P. grossmani</i> n. sp.	99
<i>P. longidactyla</i> Birstein & Vinogradov, 1972	102
<i>P. pectinata</i> n. sp.	103
<i>P. serrata</i> n. sp.	105
<i>P. cristulata</i> n. sp.	108
<i>P. africana</i> Macpherson, 1982	110
<i>P. microps</i> Filhol, 1884	113
<i>P. anamerae</i> n. sp.	115
Acknowledgements	118
Plates	119
References	149

1. SUMMARY

A revision of the family Lithodidae Samouelle, 1819 in the Atlantic Ocean, with a total of 28 species, is presented. Nine new Atlantic Ocean species and one new Indian Ocean species are described. The family is divided into two subfamilies, Hapalogastrinae Brandt, 1850, found only in the Pacific Ocean, and Lithodinae Samouelle, 1819. Only three genera, *Neolithodes* A. Milne Edwards & Bouvier, *Lithodes* Latreille, and *Paralomis* White were found to be represented in the Atlantic Ocean.

There are five Atlantic species from the genus *Neolithodes*: *N. grimaldii*, *N. agassizii*, *N. capensis*, *N. diomedea*, and *N. asperrimus*. A new Indian Ocean species (*N. vinogradovi*, close to *N. grimaldii*) is also described in this revision. *N. martii* Birstein & Vinogradov, 1972 is reclassified as a synonym of *N. diomedea* (Benedict, 1894).

The genus *Lithodes* has seven Atlantic species: *L. maja*, *L. ferox*, *L. santolla*, *L. unicornis*, and three new species, *L. confundens*, *L. turkayi*, and *L. manningi*. A description of the Indian Ocean species *L. murrayi* Henderson has been included, given its proximity to several Atlantic species. The name *L. santolla* (Molina, 1782) is re-introduced for *L. antarcticus* Jacquinet, 1844. *Pseudolithodes zenkevitchi* Birstein & Vinogradov, 1972 is considered to be a synonym of *L. santolla*, and *P. pyriformis* Birstein & Vinogradov, 1972 is synonymized with *L. ferox* Filhol, 1885.

There are sixteen species of the genus *Paralomis* in the Atlantic Ocean: *P. granulosa*, *P. formosa*, *P. spinosissima*, *P. longidactyla*, *P. bouvieri*, *P. spectabilis*, *P. microps*, *P. cubensis*, *P. africana*, *P. shinkaimaruae*, and six new species, *P. anamerae*, *P. cristulata*, *P. erinacea*, *P. grossmani*, *P. pectinata* and *P. serrata*. The species *Rhinolithodes biscayensis* Bouvier, 1895 belongs to the genus *Paralomis* and is the junior synonym of *Paralomis microps* Filhol, 1884.

Resumen

Se hace una revisión de la familia Lithodidae Samouelle, 1819 en el océano Atlántico, habiéndose encontrado un total de 28 especies. Se describen 9 especies nuevas atlánticas y una del océano Indico. La familia está dividida en dos subfamilias: Hapalogastrinae Ortmann, 1901 y Lithodinae Samouelle, 1819, siendo la primera exclusiva del océano Pacífico. En el océano Atlántico tan solo se han encontrado representantes de los géneros *Neolithodes* A. Milne Edwards & Bouvier, *Lithodes* Latreille y *Paralomis* White.

El género *Neolithodes* está constituido por 5 especies atlánticas: *N. grimaldii*, *N. agassizii*, *N. capensis*, *N. diomedea* y *N. asperrimus*. Se incluye en este trabajo la descripción de una nueva especie, procedente del océano Indico (*N. vinogradovi*), próxima a *N. grimaldii*. *N. martii* Birstein & Vinogradov, 1972 se pone en sinonimia con *N. diomedea* (Benedict, 1894).

El género *Lithodes* tiene 7 especies atlánticas: *L. maja*, *L. ferox*, *L. santolla*, *L. unicornis* y tres especies nuevas, *L. confundens*, *L. turkayi* y *L. manningi*. Se incluye la descripción de *L. murrayi* Henderson, del océano Indico, por su proximidad a varias especies atlánticas. Se recupera el nombre de *L. santolla* (Molina 1782) para *L. antarcticus* Jacquinet, 1844, entrando en sinonimia *Pseudolithodes zenkevitchi* Birstein & Vinogradov, 1972 (= *L. santolla*) y *P. pyriformis* Birstein & Vinogradov, 1972 (= *L. ferox* Filhol, 1885).

El género *Paralomis* posee 16 especies en el océano Atlántico: *P. granulosa*, *P. formosa*, *P. spinosissima*, *P. bouvieri*, *P. spectabilis*, *P. longidactyla*, *P. microps*, *P. cubensis*, *P. africana*, *P. shinkaimaruae* y 6 especies nuevas, *P. anamerae*, *P. grossmani*, *P. pectinata*, *P. erinacea* y *P. cristulata*. La especie *Rhinolithodes biscayensis* Bouvier, 1895 pertenece al género *Paralomis* y es sinónima de *Paralomis microps* Filhol, 1884.

2. INTRODUCTION

Due to its great scientific interest and economic importance, the family Lithodidae has merited special attention among the many families of decapod crustaceans, attested to by the many symposia and meetings dealing exclusively with this group.

Despite its importance, the systematics of both the genera and the species of this family has been a subject of controversy, with frequent changes, and even so a number of difficulties still remain unresolved.

Brandt (1848, 1850) was the first to classify several of the species and genera of this family, although it was not until Bouvier (1895, 1896) that a clearer picture of the number of species and genera and their systematics began to emerge.

Subsequently, a number of authors (Schmitt, 1921; Makarov, 1938 (1962); and Sakai, 1976), to cite just three, produced quite thorough compilations of the available knowledge on the Pacific Ocean species. However, it is only recently that a revision of the family world-wide was first carried out (Dawson and Yaldwyn, 1985).

Thus far, the studies carried out in the Atlantic Ocean have mostly been limited to species descriptions, and have not taken up any detailed consideration of the systematics of any of the genera. In this same vein, only a fraction of the large amount of material collected by the United States in the Caribbean and the Antarctic, by France in the North and Northwest Atlantic, and Germany and the USSR in the Southwest Atlantic has been studied at all.

A revision of the existing material for the different Atlantic species was therefore called for, in order to try to clarify, to the extent possible, the systematics of this important family.

The inclusion of two Indian Ocean species (*Lithodes murrayi* Henderson and *Neolithodes vinogradovi* n. sp.) closely related to certain Atlantic species was considered appropriate, in order to help resolve certain problems traditionally encountered when dealing with this group.

The terminology for the morphological characters used in the present study and the measurements applied, illustrated in Figure 1, are similar to those used by Dawson and Yaldwyn (1985).

Every attempt has been made to include all possible references and synonyms at each of the taxonomic levels considered; nevertheless, a certain number of omissions is likely to be inevitable.

The abbreviations for the institutions whose collections were used in this study are as follows: USNM (National Museum of Natural History, Smithsonian Institution, Washington, D. C.), MUZM (Moscow University Zoological Museum), BM (British Museum, Natural History, London), MP (Muséum National d'Histoire Naturelle, Paris), RMNH (Rijksmuseum van Natuurlijke Historie, Leiden), ZMH (Zoologische Museum, Hamburg), ZMC (Zoologisk Museum, Copenhagen), SAM (South African Museum, Cape Town), and ICM (Instituto de Ciencias del Mar, Barcelona).

The carapace measurements used were length excluding the rostrum (CL) and maximum width (CW), not including marginal spines. The length and height measurements for the different articles of the chelipeds and walking legs are shown in Figure 1.

Considerations on the morphological characters used

Dawson and Yaldwyn (1985) called attention to the sometimes substantial variability in certain of the characters used in species identification, which can lead to errors in classification.

For instance, the anterior projection of the rostrum in the species of the genus *Lithodes* may be broken off or in the process of regeneration, which might give rise to difficulties in species identification when few specimens are available. On the basis of the material examined and the results reported by various authors, it seems clear that the most consistent rostral characters are the thickness and orientation of the anterior projection and the number of dorsal spines. In this revision the thickness of the

anterior projection (AP in Figure 1) has been related to the distance between the external orbital spines, in order to establish a comparative measurement between species.

In like fashion, examination of the material for the different genera studied has shown that the spinulation on the carapace, chelipeds, and walking legs may appear quite different in its development, not only between juveniles and adults, but even between specimens of the same size. Differences in the size of spines are frequently encountered, and the most striking instances have been recorded for *L. ferox* and *L. santolla*. In contrast, the number of spines on the carapace and pereopods seems to be one of the most constant characters and is easily

applied in species identification and differentiation.

Furthermore, morphometric characters exhibit a certain degree of variability between specimens of different size and sex, which makes their use in keys and in differentiating between closely related species more difficult. Both the chelipeds and the walking legs tend to be more developed in males than in females and, for the same sex, to vary with size. Such differences have been described for certain species, e.g., *L. santolla* (Stuardo and Solís, 1963) and *L. murrayi* (Arnaud and Do-Chi, 1977). For this reason, in the present revision morphometric characters have been used mainly as complementary features, and only in cases in which differences were very large have they been used to differentiate species.

3. FAMILY LITHODIDAE

- Samouelle, 1819, p. 90 (Lithodiadae)
- de Haan, 1833, p. 14 (Lithodeacea)
- Brandt, 1848, p. 171 (Lithodea)
- Brandt, 1850, p. 91 (Lithodina)
- Dana, 1852, p. 1430
- Ortmann, 1892, p. 271
- Bouvier, 1895, p. 160 (Lithodinès)
- Bouvier, 1896, p. 1 (Lithodinés)
- Ortmann, 1898, p. 1147
- Alcock, 1901, p. 231 (Lithodea)
- Stebbing, 1910, p. 349
- Schmitt, 1921, p. 146
- Schellenberg, 1928, p. 96
- Makarov, (1938) 1962, p. 221
- Bouvier, 1940, p. 152
- Barnard, 1950, p. 407
- Sakai, 1971, p. 3
- Sakai, 1976, p. 688
- Williams, 1984, p. 230

Description

More or less calcified, crab-like carapace, with the abdomen appressed underneath. Dorsal carapace regions usually well-defined, bearing granules or

spines variable in number and size (except in the genus *Cryptolithodes* Brandt).

Rostrum variable in size and shape, but always present.

Eyes with pigmented, terminal-ventral cornea.

Scaphocerite present or reduced to a small granule.

First pair of pereopods chelate, bearing a well-developed claw, the right cheliped more robust than the left. Next three pereopods more or less elongate walking legs. Fifth pair subchelate and folded underneath the carapace.

Short, broad, more or less calcified abdomen covered with nodules or plates variable in size and number. First segment practically covered by carapace, second to seventh segments clearly visible. Plates on the right side frequently more developed than those on the left in females, resulting in an asymmetrical abdomen, although this is not always readily apparent in some genera.

Pleopods absent in males. Females with a pair of small pleopods on the first segment and a single, simple, uniramous pleopod on the left side of the second to fifth segments. Uropods absent.

The family Lithodidae is divided into two subfamilies, Hapalogastrinae Brandt, 1850 and Lithodinae Samouelle, 1819.

KEY TO THE SUBFAMILIES OF THE FAMILY *LITHODIDAE* Samouelle, 1819

- Third to fifth abdominal segments not fully calcified and normally covered by small, thin plates. Abdomen usually soft, in the form of a membranous sac. Short, broad, triangular rostrum not usually overreaching the ends of the corneas Subfamily Hapalogastrinae Brandt, 1850
- Third to fifth abdominal segments usually well-calcified, sometimes with membranous areas medially. Abdomen generally flat and firm, with larger or smaller plates. Rostrum well-developed, prominent, truncate or spiniform, overreaching the ends of the corneas Subfamily Lithodinae Samouelle, 1819

The subfamily Hapalogastrinae comprises the genera *Hapalogaster* Brandt, 1850, *Dermaturus* Brandt, 1850, *Placetrion* Schalfeev, 1892, and *Oedignathus* Benedict, 1894. All the representatives of this subfamily are Pacific Ocean dwellers, with no reports to date of any from the Atlantic Ocean.

The subfamily Lithodinae comprises ten genera: *Lithodes* Latreille, 1806, *Lopholithodes* Brandt, 1848, *Paralithodes* Brandt, 1848, *Cryptolithodes*

Brandt, 1848, *Rhinolithodes* Brandt, 1848, *Phyllolithodes* Brandt, 1848, *Paralomis* White, 1856, *Neolithodes* A. Milne Edwards & Bouvier, 1894, *Glyptolithodes* Faxon, 1895, and *Sculptolithodes* Makarov, 1934.

Only three of these genera (*Lithodes*, *Neolithodes*, and *Paralomis*) are represented in the Atlantic Ocean. Attempts to introduce *Paralithodes camtschatica* (Tilesius, 1815) in the Barents Sea have

been made, but no stable populations have been formed (Orlov and Ivanov, 1978). In 1895 Bouvier described a new species in the Bay of Biscay, which he assigned to the genus *Rhinolithodes* Brandt (*R. biscayensis*); however, as will be seen later (p. 113), this species should be assigned to the genus *Paralomis* White.

The present revision therefore deals exclusively with the subfamily Lithodinae, the only one represented in the Atlantic Ocean.

Subfamily Lithodinae Samouelle, 1819

- Samouelle, 1819, p. 90 (Lithodiadae)
- Brandt, 1850, p. 234 (Ostracogastrica)
- Brandt, 1851, p. 91 (Lithodina)
- Stimpson, 1857, p. 32 (Lithodea)
- Ortmann, 1898, p. 1148
- Balss, 1957, p. 1591 (Ostracogastrinae)
- Makarov, 1962 (1938), p. 236
- Sakai, 1971, p. 3
- Sakai, 1976, p. 690
- Sakai, 1978, p. 12
- Dawson & Yaldwyn, 1985 (key and list of genera and species)

	Maxillipeds			Pereiopods				
	1st	2nd	3rd	1st	2nd	3rd	4th	5th
Pleurobranchs	—	—	—	—	—	—	—	—
Arthrobranchs	—	—	2	2	2	2	2	—
Podobranchs	—	—	—	—	—	—	—	—
Epipods	—	—	—	—	—	—	—	—
Exopods	1	1	1	—	—	—	—	—

The key to the genera was compiled from the following material:

Genus *Rhinolithodes* Brandt, 1848

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

R. wosnessenski Brandt, 1848

- 1 ♂, Alaska, 24 September 1940
- 1 ♂, Alaska, 26 September 1940
- 1 ♂, 1 ♀, Albatross, St. 4778

Genus *Cryptolithodes* Brandt, 1848

National Museum of Natural History (Smithsonian Institution), Washington, D. C.

C. sitchensis Brandt, 1853

- 2 ♂, 1 ♀ ov., 17 July 1931, Pacific Ocean

C. typicus Brandt, 1848

- 1 ♂, Seymour Inlet, B.C., Canada
- 1 ♂, 1 ♀ ov., Monterrey Bay

C. expansus Miers, 1879

- 1 ♂, Miyako, Rikuzen, Japan

Genus *Phyllolithodes* Brandt, 1848

Description

Carapace more or less oval, triangular, or pentagonal, normally well-calcified. Carapace covered with granules or spines variable in size and number except in the genus *Cryptolithodes* Brandt, in which it is practically smooth. Rostrum generally well-developed, extending beyond the corneas. Abdomen usually well-calcified, with the second segment formed by one, three, or five plates. Medial portion of the third to fifth segments possibly membranous or bearing small, calcareous plates.

Antennular peduncle consisting of four articles and two small flagella, the last two articles longer and more slender than the first two. Antennal peduncle consisting of four articles, the second usually bearing a more or less developed scaphocerite which may be reduced to a simple granule. A single antennal flagellum, variable in length. Maxillipeds with well-developed exopods. Third maxilliped with a crista dentata with numerous corneous denticles and one to three accessory denticles (Figure 2).

The branchial formula, based on a number of species from the genera *Lithodes*, *Neolithodes*, and *Paralomis* is set out below:

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

P. papillosus Brandt, 1848

- 1 ♂, Kivosta Village, Parry Passage
- 1 ♂, location unknown
- 1 ♂, Killisnow, Alaska
- 1 ♀, Monterrey Bay
- 1 ♂, 1 ♀ ov., Monterrey
- 1 ♂, California

Genus *Sculptolithodes* Makarov, 1934

National Museum of Natural History (Smithsonian Institution), Washington, D. C.

S. derjugini Makarov, 1934

- 1 ♀ ov., Rishiri Islands, Japan

Genus *Lopholithodes* Brandt, 1848

National Museum of Natural History (Smithsonian Institution), Washington, D. C.

L. mandtii Brandt, 1848

- 1 ♂, Monterrey
- 1 ♂, Alaska
- 1 ♀, California

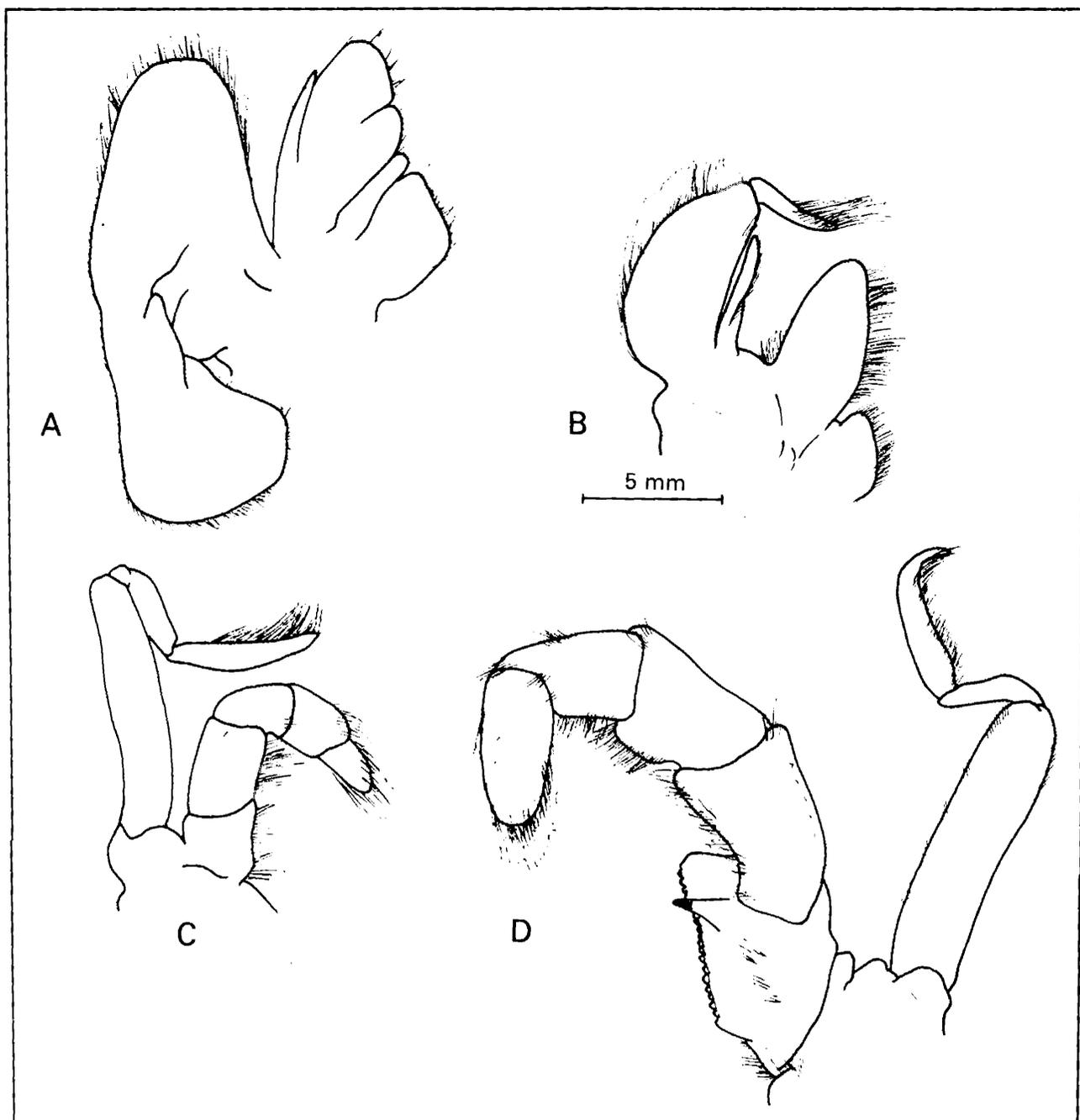


FIG. 2. *Paralomis africana* Macpherson (ICM ♂, CL = 57 mm, Benguela IV, P-119, Namibia): A) second maxilla; B) first maxilliped; C) second maxilliped; D) third maxilliped.

L. foraminatus (Stimpson, 1859)

- 1 ♂, 1 ♀, 1 ♀ ov., Southwest of the Columbia River mouth, 12 September 1961, 46°04' N, 124° 43' W
 1 ♂, Santa Rosa Island, California, 7 miles east of East Point
 2 ♀, Monterrey Bay
 1 ♀, ov., San Diego, Point Loma, Albatross Exp. St. 4368, 16 March 1904

Genus *Glyptolithodes* Faxon, 1895
 Zoologisches Museum, Hamburg

G. cristatipes (Faxon, 1893)

- 2 ♂, 1 ♀ ov., Peru, 1 September 1975

Genus *Paralithodes* Brandt, 1848

National Museum of Natural History (Smithsonian Institution), Washington D.C.

P. camtschatica (Tilesius, 1815)

- 3 ♂, 3 ♀, Alaska
 Muséum National d'Histoire Naturelle, Paris

P. brevipes (A. Milne Edwards & Lucas, 1841)

- 1 ♀, Pacific Ocean

The material used for *Paralomis*, *Lithodes*, and *Neolithodes* is set out in each of the sections dealing with these genera.

KEY TO THE THE GENERA OF THE SUBFAMILY *LITHODINAE*, Samouelle, 1819

- Nearly smooth carapace without protuberances, granules, or spines, wider than long, covering the walking legs entirely when the legs are drawn in. Broad rostrum, compressed, truncated at the end (Figure 3) *Cryptolithodes* Brandt, 1848
- Carapace with more or less numerous protuberances, granules, or spines. Walking legs never completely covered by carapace when drawn in. Rostrum variable in shape, but the end never truncated or compressed 2
- 2. Sternite located between the first pair of walking legs, with a deep, longitudinal, medial groove (Figure 4A) 3
- Sternite located between the first pair of walking legs but without a deep, longitudinal, medial groove (Figure 4B) 5
- 2. Second abdominal segment composed of five plates, one median, one lateral pair, and one marginal pair (Figure 5) 4
- Second abdominal segment composed of three plates occasionally fused into a single plate (Plate 10) *Lithodes* Latreille, 1806
- 4. Third to fifth segments comprising small, more or less spiniform nodules. Males lacking well-defined plates (Plate 2B), females with a well-developed lateral plate on the left side of each segment (Plate 4C). Scaphocerite normally absent *Neolithodes* A. Milne Edwards & Bouvier, 1894
- Third to fifth segments bearing calcified nodules medially, with well-defined lateral and marginal plates on each side in both sexes (Figure 5). Scaphocerite present *Paralithodes* Brandt, 1848
- 5. Lateral plates on third to fifth segments bearing concave, membranous areas (Figure 6A). Second abdominal segment with a median plate and a marginal pair fused with the lateral plates. Rostrum more or less long, with two rounded terminal knobs (Figures 6B, 6C) *Phylloolithodes* Brandt, 1848
- Lateral plates on third to fifth segments lacking concave, membranous areas 6
- 6. Second abdominal segment composed of five distinct plates. Marginal plates on third to fifth segments fused with the lateral plates (Figure 7) *Rhinolithodes* Brandt, 1848
- Second abdominal segment entire, formed by a single plate 7
- 7. Rostrum thick, non-spiniform, hammer-shaped (Figure 8B). Scaphocerite small, rudimentary (Figure 8C). Median plates on third to fifth segments subdivided (Figure 8A) *Sculptolithodes* Makarov, 1934
- Rostrum more or less spiniform. Scaphocerite well-developed. Median plates on third to fifth segments entire 8
- 8. Rostrum formed by a basal spine and a dorsal spine or granule (Figure 9) *Glypholithodes* Faxon, 1893
- Rostrum formed by a basal spine and at least one pair of dorsal spines 9
- 9. Median plate on third abdominal segment subdivided into three (Figures 10A, 10B). Scaphocerite extremely spinulated (Figure 10C). Third walking leg never equal to or longer than carapace width *Lopholithodes* Brandt, 1848
- Median plate on third abdominal segment entire (Figure 37). Scaphocerite moderately spinulated (Figure 35). Third walking leg always equal to or longer than carapace width *Paralomis* White, 1856

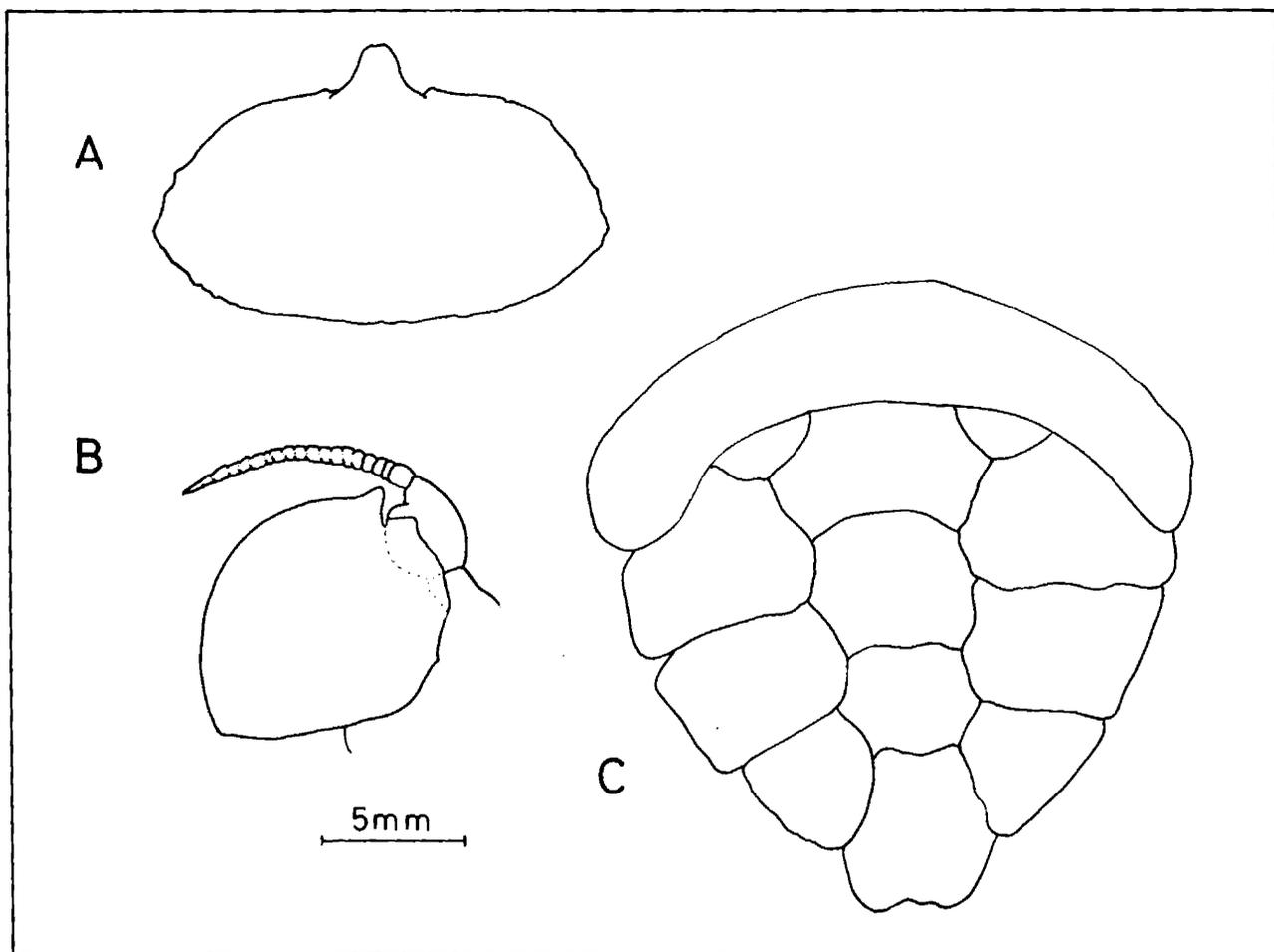


FIG. 3. *Cryptolithodes typicus* Brandt (USNM ♀ ov., CL = 22 mm. Monterrey, California): A) dorsal view of carapace; B) left antenna; C) abdomen

Brandt (1848) was the first to divide the family Lithodidae into various tribes and genera, and his systematics has since been modified by a number of authors. Certain genera offer few difficulties thanks to their readily differentiable characters, but three (*Paralomis*, *Lopholithodes*, and, to a lesser extent, *Glytholithodes*) have been a source of controversy, not only as genera but also with respect to their component species.

The most important generic characters in the subfamily Lithodinae are: the shape and armature of the carapace, chelipeds and walking legs, the sternal region, the abdominal structure, the shape of the rostrum, and the presence and shape of the scaphocerite. Even allowing for variability in certain of these characters within a genus, they nonetheless permit ready differentiation of genera.

The genus *Paralomis* was established by White in 1856 for the classification of *P. granulosa* (Jacquinot). The validity of this genus has been called into question on numerous occasions, and over the years some of its species have been reclassified to other genera.

In 1858 Stimpson proposed a new genus (*Acantholithus*) for *Lithodes hystrix* de Haan, 1849; but, as Ortmann (1892) suggested, not only this species but the genus *Acantholithus* as well should be included in the genus *Paralomis*.

Bouvier (1896) retained the name *Acantholithus* for the species described by de Haan, because he regarded the large number of spines on the carapace, the shape of the scaphocerite, and the fusion of marginal and lateral plates on the third segment as generic characters. The later description of spiny species, the recognition of certain variability in the shape of the scaphocerite, and the extent of the fusion of the marginal plates on the third abdominal segment have shown that the genus *Acantholithus* is in fact congeneric with *Paralomis* and that, in consequence, *A. hystrix* (de Haan, 1849) should be included under the genus *Paralomis* (e.g., Sakai, 1976).

In addition, in his list of crustaceans for the British Museum in 1847, White included, but did not define, a new genus, *Echidnocerus*, and a new species, *E. cibarius*, which was not described and illustrated until

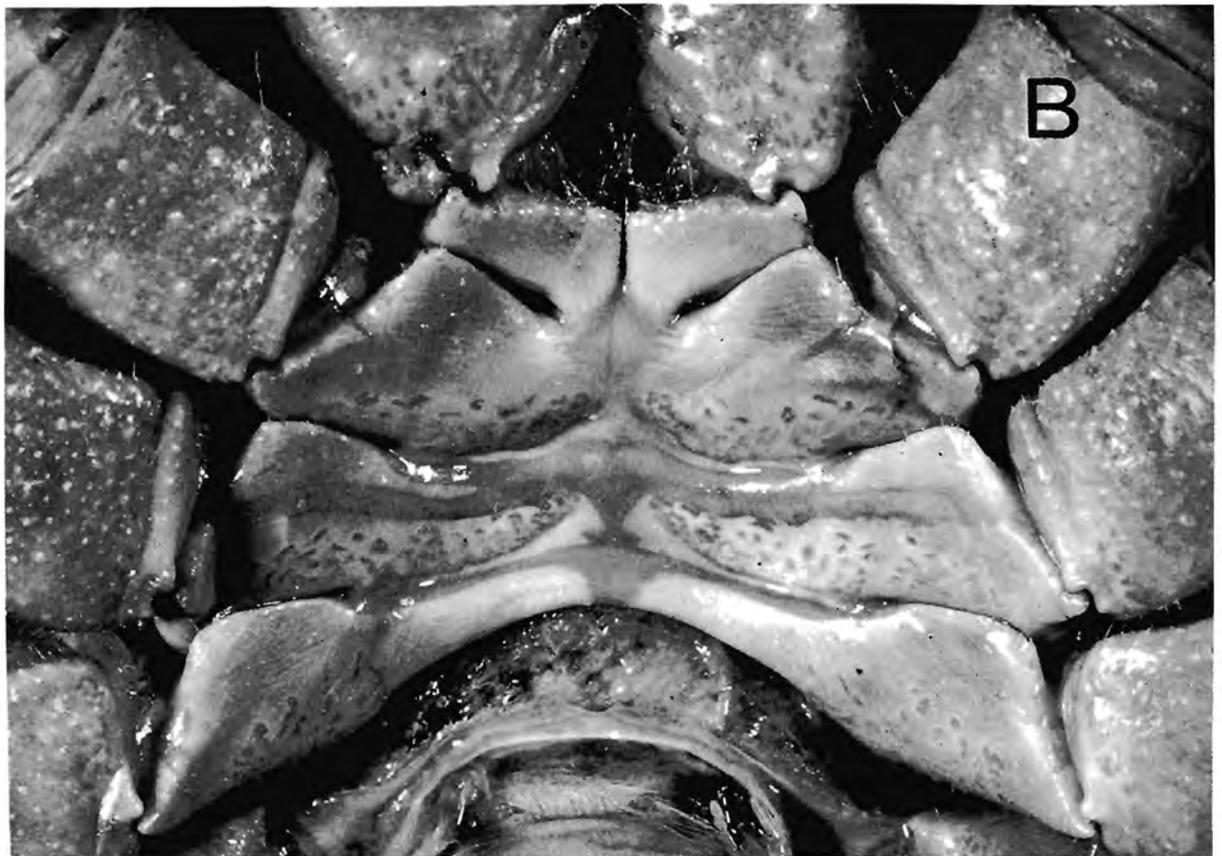


FIG. 4. Sternal region: A) *Lithodes ferox* Filhol (ICM, ♀, CL = 68 mm, Benguela IX, P-63, Namibia); B) *Paralomis africana* Macpherson (ICM, ♂, CL = 57 mm, Benguela IV, P-119, Namibia).

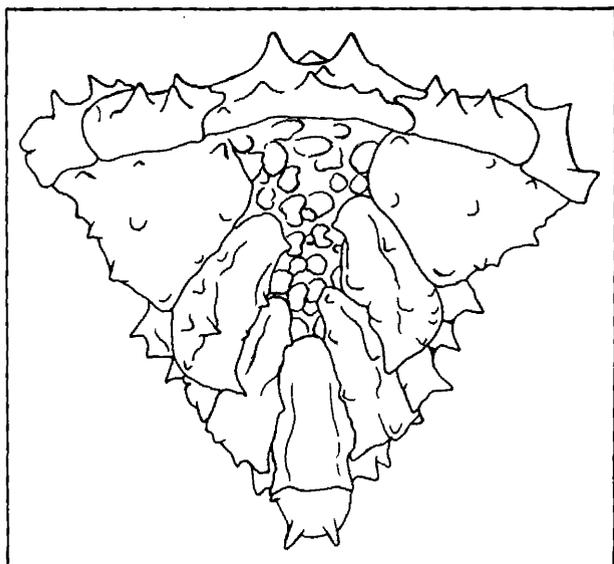


FIG. 5. *Paralithodes camtschatica* (Tilesius) (USNM, ♂, CL = 132 mm, Alaska): abdomen.

November 1848, under the generic name *Echinocerus* in the text and *Echidnocerus* in the figures. A few months earlier (June), Brandt had described several new genera and species, including the genus *Lopholithodes*, a synonym for *Echinocerus*, and the species *L. mandtii*, a synonym for *E. cibarius*.

Benedict (1894) later reused the genus *Echinocerus*, this time for *Paralomis granulosa* (Jacquinot), thereby establishing synonymy between the genera *Paralomis* and *Echinocerus*. In that same work, Benedict erected a new genus (*Leptolithodes*) for *Paralomis aculeata* Henderson, *P. aspera* Faxon, *P. longipes* Faxon, and two new species, *P. multispina* and *P. papillata*, along with a second new genus (*Pristopus*) for *P. formosa* Henderson and yet another new species, *P. verrilli*.

The differences between the genera *Leptolithodes* and *Pristopus* were based exclusively on leg shape and the spinulation around the carapace edge. As other authors (e.g., Hansen, 1908; Stebbing, 1914) have pointed out, such differences are vague and not in fact generic, and consequently these two genera should be considered synonymous with the genus *Paralomis* (see the revision by Dawson and Yaldwyn, 1985).

The classification by Benedict of *Paralomis granulosa* to the genus *Echinocerus*, and thus to the genus *Lopholithodes* Brandt, was also incorrect. These two genera are quite close, and this has been and remains a source of confusion between the species of which they are composed.

Examination of the specimens of *L. mandtii* Brandt and *L. foraminatus* (Stimpson) showed that there are several generic characters always present in both species which clearly separate the genus *Lopholithodes* from *Paralomis* (accessory plates on the third abdominal segment, an extremely spiny scaphocerite, and the length of the third walking leg, which is always shorter than carapace width).

A further species of the genus *Lopholithodes*, *L. diomedea* (Faxon, 1893) was initially described as belonging to the genus *Echinocerus*, although in 1895 Faxon himself assigned it to *Paralomis*. Del Solar (1972), Haig (1974), and Dawson and Yaldwyn (1985) eventually reclassified it under *Lopholithodes*. Examination of the type material for this species (p. 110) showed it to have an abdomen typical of the genus *Paralomis*.

Moreover, the scaphocerite is less spiny than that of other known *Lopholithodes* species, and the third walking leg is the same length as maximum carapace width. In both *L. mandtii* and *L. foraminatus* the length of the third walking leg is 0.7 times maximum carapace width, whereas in all the *Paralomis* species it is equal to or longer than carapace width. As will be seen later in the species descriptions, this character is highly variable among the species of the genus *Paralomis*, and therefore species with shorter walking legs have, on occasion, been incorrectly assigned to the genera *Lopholithodes* or *Echinocerus*. The species *L. odawarai* Sakai, 1980 should, based on the illustrations provided with the description, also be assigned to the genus *Paralomis*.

The genus *Glyptolithodes* Faxon is also closely related to *Paralomis*, and the abdomens in both share similar characters. To date there is only a single species in this genus (*G. cristatipes* Faxon, 1893), from off the coasts of Peru and Chile, characterized by a cardiac region separated from the rest of the carapace by a clearly visible depression bordered by ridges and by more or less conical protuberances on the branchial borders. The scaphocerite is moderately spinulated, and the rostrum is formed by a basal spine and a dorsal spine (Figure 9). The broad range of variability in the shape and armature of the carapace, chelipeds, and walking legs in the genus *Paralomis* suggests that rostral shape is the most consistent character for differentiating these two genera.

However, since the rostrum in the genus *Paralomis* is itself variable (e.g., in *P. dofleini* and *P. haigae* the lateral spines are inconspicuous), the taxonomic position of the genus *Glyptolithodes* is not clear.

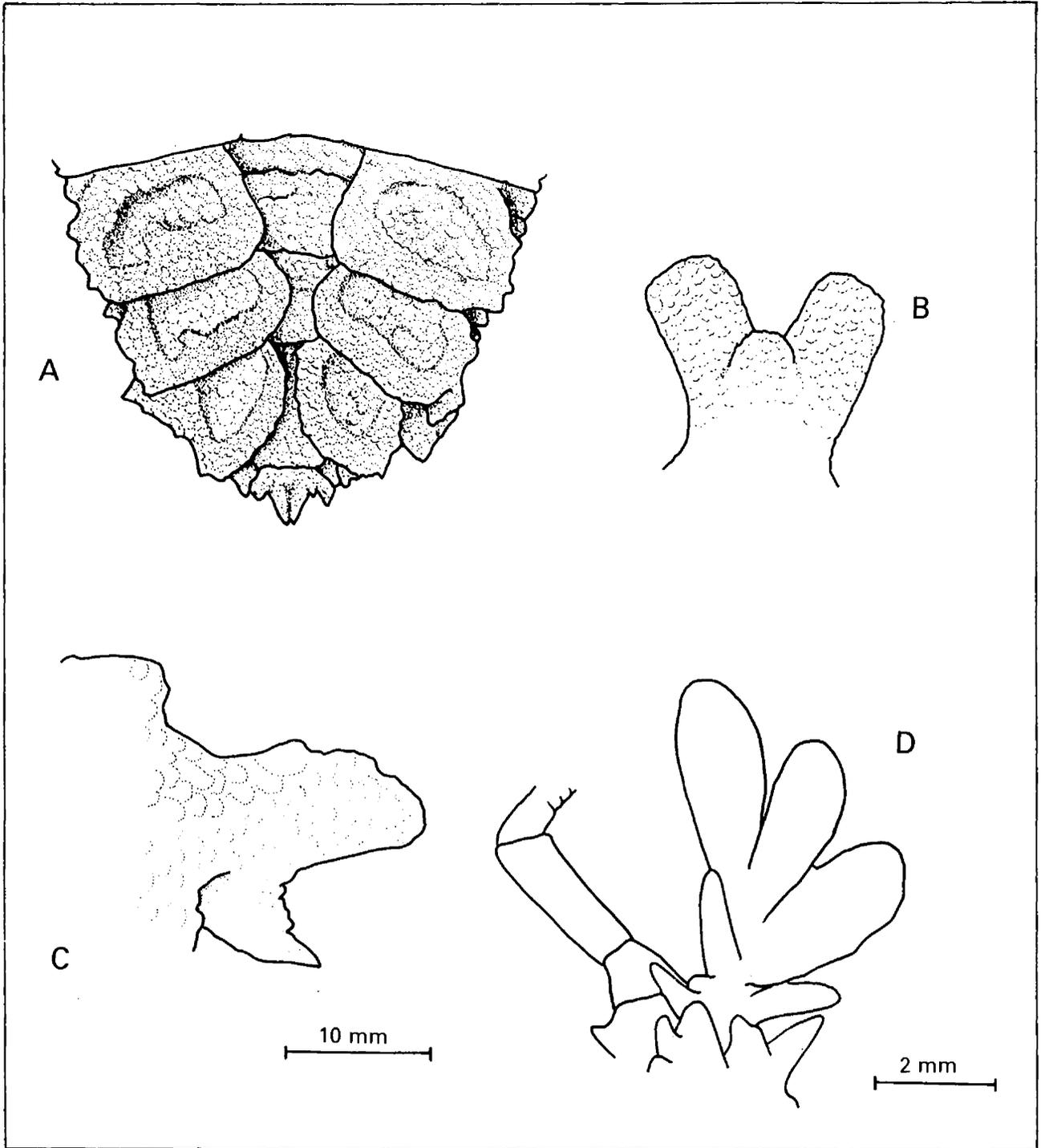


FIG. 6. *Phylolithodes papillosus* Brandt (USNM, ♀, CL = 33 mm, California): A) abdomen; B) dorsal view of rostrum; C) lateral view of rostrum; D) right antenna.

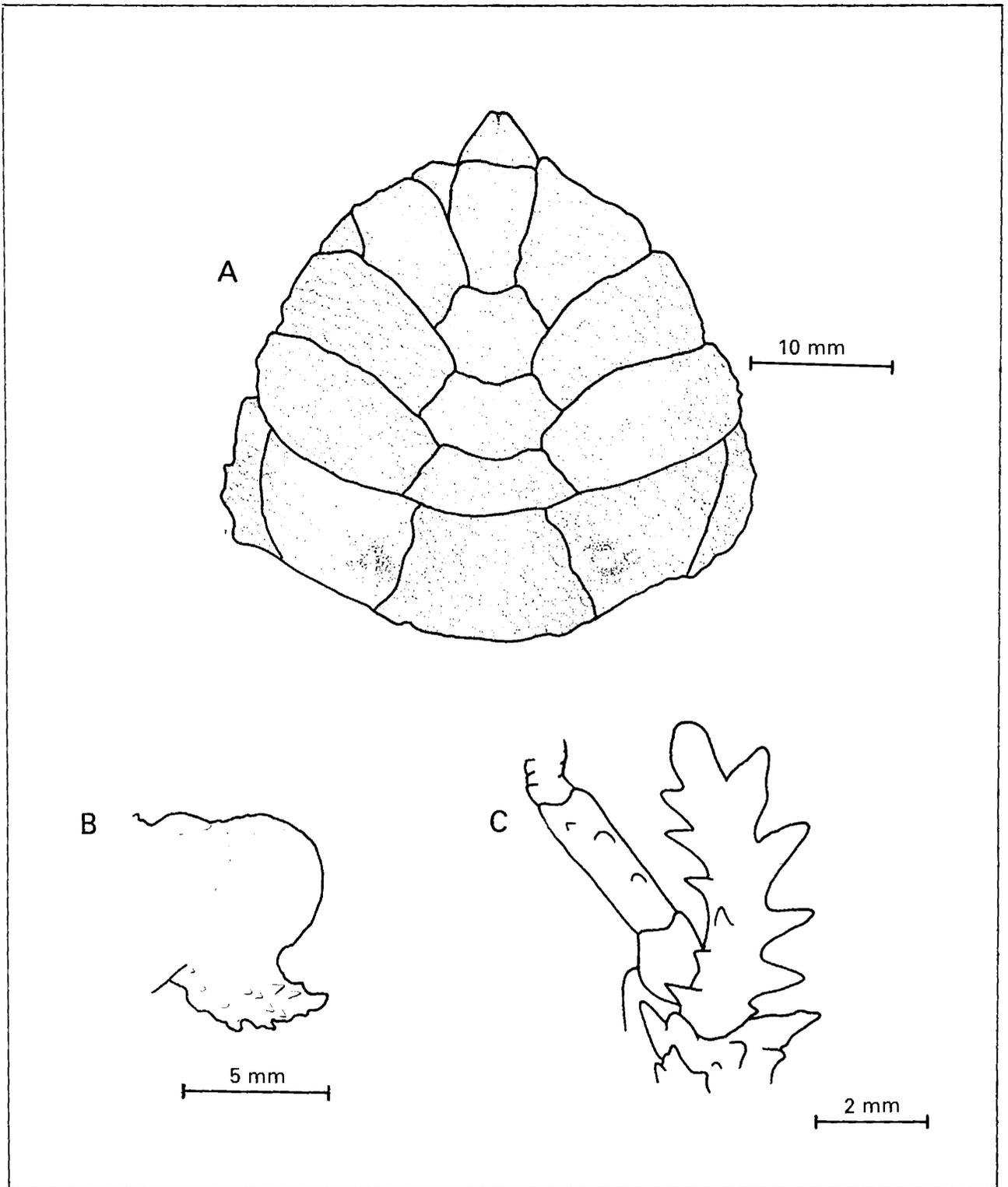


FIG. 7. *Rhinolithodes wosnessenski* Brandt (USNM, ♀, CL = 24 mm, Alaska): A) abdomen; B) lateral view of rostrum; C) right antenna.

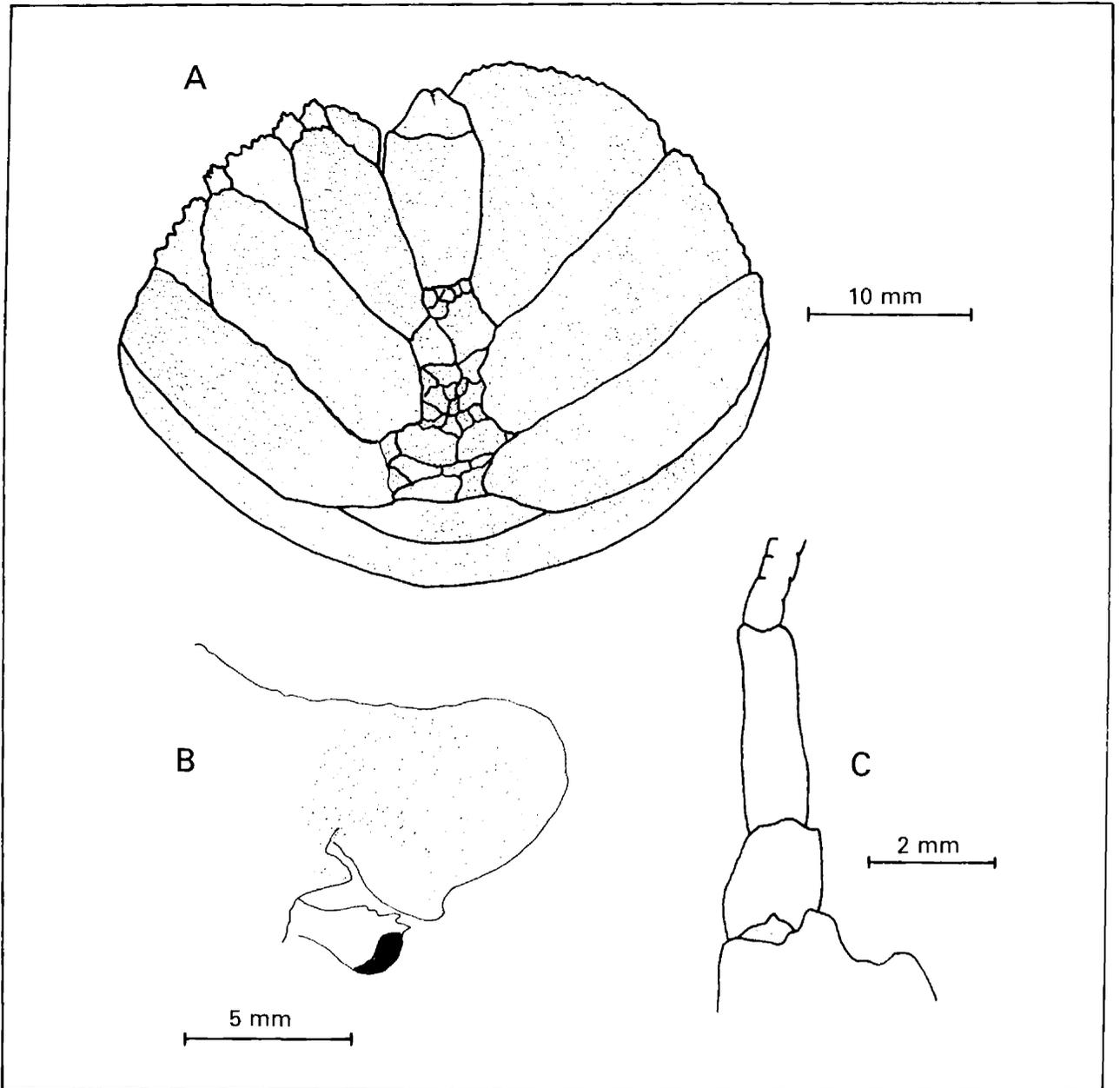


FIG. 8. *Sculptolithodes derjugini* Makarov (USNM, ♀ ov., CL = 24 mm, Rishiri Islands, Japan): A) abdomen; B) lateral view of rostrum; C) right antenna.

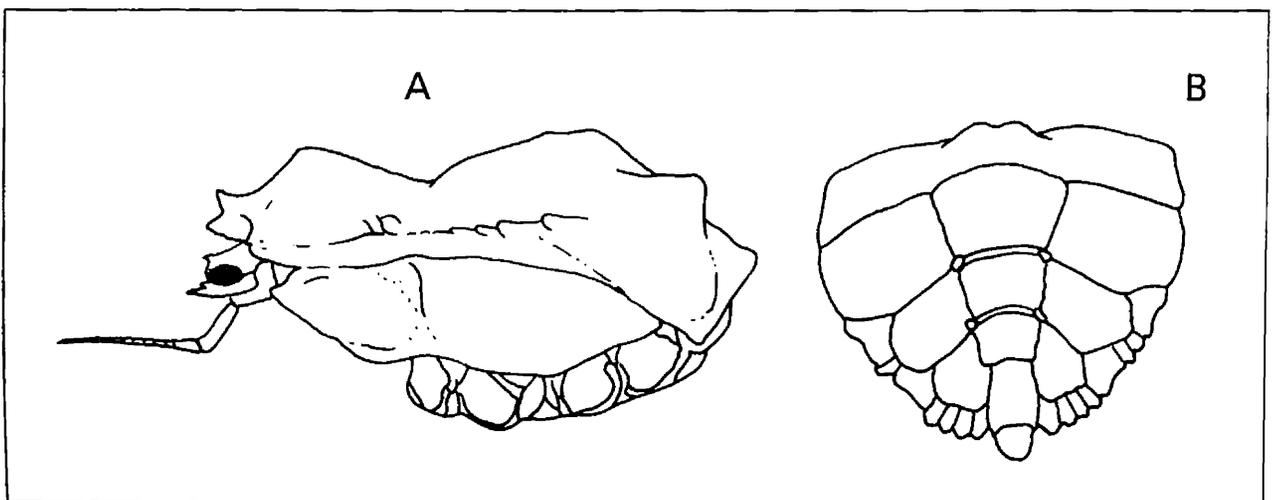


FIG. 9. *Glypholithodes cristatipes* Faxon: A) lateral view of carapace; B) abdomen, ♂ (after Haig, 1974).

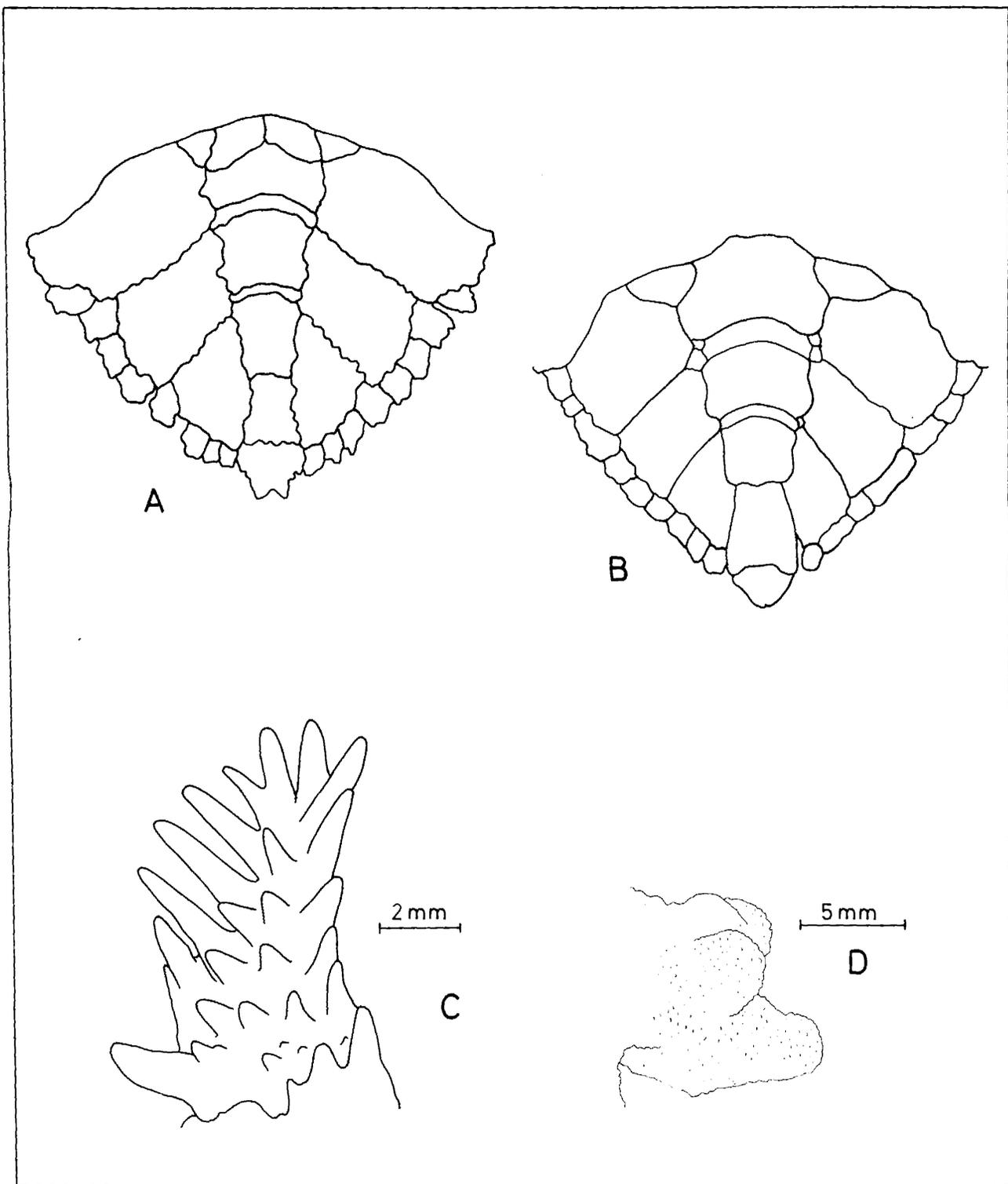


FIG. 10. *Lopholithodes foraminatus* (Stimpson) (USNM, ♂ CL = 81 mm, Santa Rosalia Island, California): A) abdomen. *Lopholithodes mandtii* Brandt (USNM, ♂, CL = 55 mm, Alaska), B) abdomen; C) left scaphocerite; D) dorsal view of rostrum.

GENUS *NEOLITHODES* A. Milne Edwards & Bouvier, 1894

(Masculine gender)

Neolithodes A. Milne Edwards and Bouvier, 1894a, p. 120; A. Milne Edwards and Bouvier, 1894b, p. 92; Bouvier, 1895, p. 177; Bouvier, 1896, pp. 8, 20; Ortmann, 1898, p. 1148; Stebbing, 1905, p. 69; Stebbing, 1910, p. 349; Bouvier, 1922, p. 37; Barnard, 1950, p. 407; Sakai, 1976, p. 696; Dawson and Yaldwyn, 1985 (in key, species list)

Type species: *Neolithodes grimaldii* (A. Milne Edwards & Bouvier, 1894)

Description

Carapace not heavily calcified. Carapace shape more or less pentagonal or pyriform. Regions well-defined, convex. Cardiac region triangular in shape, separated from the gastric region by a deep, transverse groove and from the branchial regions by a shallow groove. Cervical groove not well-defined. Gastric and branchial regions slightly more prominent than the cardiac region. Spines on carapace, chelipeds, and walking legs variable in size and number, more developed in juveniles. Rostrum formed by a basal spine slanting slightly upwards and a pair of divergent, upwardly directed, dorsal spines. Spine length tending to decrease with size.

Second abdominal segment formed by five plates, one median, two lateral, and two marginal. Third to fifth segments formed by small, more or less spiniform nodules. Plates not well-defined in males; in females a well-developed lateral plate on the left side, making the abdomen asymmetrical.

Sternal region between the first pair of walking legs with a deep longitudinal groove medially.

Eyes with pigmented corneas. Scaphocerite normally absent; simple when present, formed by a single spine with some spinules on the borders.

Chelipeds subequal in length, the right cheliped more robust than the left. Cutting edges of right cheliped bearing thick, rounded teeth on the proximal two-thirds, terminal third bearing a corneous unguis. Fingers of both chelipeds curved slightly inwards.

Walking legs long, the second somewhat longer than the first and the first, somewhat longer than the third, which is twice carapace length.

Remarks

The genus *Neolithodes* comprises nine species. Five are found in the Atlantic Ocean: *N. agassizii* (Smith, 1882), *N. grimaldii* (A. Milne Edwards & Bouvier, 1894), *N. diomedae* (Benedict, 1894), *N. capensis* Stebbing, 1905, and *N. asperrimus* Barnard, 1947. *N. diomedae* and *N. asperrimus* are also found in the Southeast Pacific and Southwest Indian Oceans, respectively (Figure 11). *N. brodiei* Dawson & Yaldwyn, 1970 and *N. nipponensis* Sakai, 1971 are found in the Pacific, while *N. alcocki* Dawson & Yaldwyn (Ms) and *N. vinogradovi* n. sp. are Indian Ocean species.

The present revision describes the five Atlantic Ocean species mentioned above and a new species (*N. vinogradovi*) from the Southeast Indian Ocean, included because of its proximity to *N. grimaldii*.

KEY TO THE SPECIES OF THE GENUS *NEOLITHODES* IN THE ATLANTIC OCEAN

1. Fingers on chelipeds triangular in section, equal to or more than twice hand length. Dorsal border of movable finger and ventral border of fixed finger flat (Figure 12) *N. diomedae* (p. 29)
- Fingers on chelipeds more or less rounded in section, less than twice hand length. Dorsal border of movable finger and ventral border of fixed finger convex (Figure 16) 2
2. Carapace, cheliped, and walking leg surfaces covered with numerous spinules or spiniform granules in addition to the main spines (Figure 13). Dactylus on walking legs flattened (Figures 16F, G) 3
- Carapace, cheliped, and walking leg surfaces smooth, apart from the main spines, with at most a few isolated granules (Figure 18). Dactylus on walking legs usually rounded (Figures 17G, H) 4
3. Main spines on walking legs well-developed, even in very large specimens (Figure 14). Numerous small spines on carapace, cheliped, and walking leg surfaces (Figures 13, 14, 15A; Plate 2C). Merus on third walking leg longer than carapace length in males *N. agassizii* (p. 33)

- Main spines on walking legs well-developed in juveniles, turning into more or less large and more or less spiniform granules in adults (Figures 15D, 16). Carapace, cheliped, and walking leg surfaces profusely covered with small spines (Plate 3). Merus on third walking leg shorter than carapace length in males *N. asperrimus* (p. 37)
- 4. Spines on rostrum, carapace, chelipeds, and walking legs extremely long in juveniles, thick but short in large specimens (Figure 18, 19). In specimens smaller than 100 mm, basal spine of rostrum and several spines on carapace equal to or exceeding one-half carapace length 5*
- Spines on rostrum, carapace, chelipeds, and walking legs well-developed but never extremely long, becoming shorter in adults (Figure 17). In specimens smaller than 100 mm, basal spine of rostrum and larger spines on carapace less than one-fourth carapace length
..... *N. capensis* (p. 40)
- 5. Basal spine of rostrum on specimens larger than 100 mm less than one-half carapace length. Spines of the carapace, chelipeds and walking legs, in large specimens, of moderate size.
..... *N. grimaldii* (p. 42)
- Basal spine of rostrum in specimens larger than 100 mm more than one-half carapace length. Spines of the carapace, chelipeds and walking legs, in large specimens, very long.
..... *N. vinogradovi*** (p. 46)

* N.B. Only a single, large specimen of *N. vinogradovi* (holotype, CL = 109 mm) has been found; it is nevertheless assumed that the spines on smaller specimens will be more developed.

** Not present in the Atlantic Ocean.

Neolithodes diomedea (Benedict, 1894)

(Figures 12, 15c; Plates 1, 2A, B)

Lithodes diomedea Benedict, 1894, p. 480
Neolithodes diomedea Bouvier, 1896, p. 22; Porter, 1903, p. 263; Haig, 1955, p. 13; Retamal, 1981 (in list); Dawson and Yaldwyn, 1985 (in list); Baez *et al.*, 1986, p. 106, Fig. 1
Neolithodes martii Birstein and Vinogradov, 1972, p. 361, Figs. 8 (5-7), 9; Dawson and Yaldwyn, 1985 (in list)

Muséum National d'Histoire Naturelle, Paris
 1 ♀, paralectotype, Albatross, St. 2788, 11 February 1888, 45°35' S, 75°55' W, 1 920 m
 1 ♂, paralectotype, Albatross, St. 2789, 12 February 1888, 42°36' S, 75°28' W, 2 450 m

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.
 10 ♂, 8 ♀, paralectotypes, Albatross, St. 2788, 11 February 1888, 45°35' S, 75°55' W, 1 920 m
 3 ♂, paralectotypes, Albatross, St. 2789, 12 February 1888, 42°36' S, 75°28' W, 2 450 m
 1 ♂, 1 ♀, Albatross, St. 4654, 12 November 1884, 05°46' S, 81°32' W, 1 895 m
 1 ♀, USARP, Cruise no. 575, 11 May 1975, 53°31.2' S, 37°50.9' W, 1 267 - 1 599 m
 1 ♂, 1 juvenile, USARP, Cruise no. 575, St. 6, 9 May 1975, 51°02.2' S, 42°47.6' W, 1 480 - 1 545 m

Moscow University Zoological Museum
 1 ♂, Akadiemik Knipovich, St. 171, 28 February 1965, 53°37' S, 36°13.5' W, 640 - 650 m (holotype of *N. martii*)
 1 ♂, MUZM no. 2315, 26 February 1981 (no position listed)

Description

Carapace, cheliped and walking leg surfaces armed with, numerous, thick, well-developed spines and some scattered small spines. Relative size difference between spines on juveniles and adults not so marked as in other species. Rest of surface smooth, with some scattered granules tending to be more acute in juveniles.

Gastric region bearing four long spines in a pattern describing a square, the anterior two longer. A small spine outside the anterior pair. Another small spine in the centre of the square, sometimes turning into a tubercle in larger specimens. A transverse row of four granules, more acute in juveniles and sometimes not readily apparent in adults, between the anterior pair and the base of the rostrum. Cardiac region also with four spines in a square-shaped pattern, the

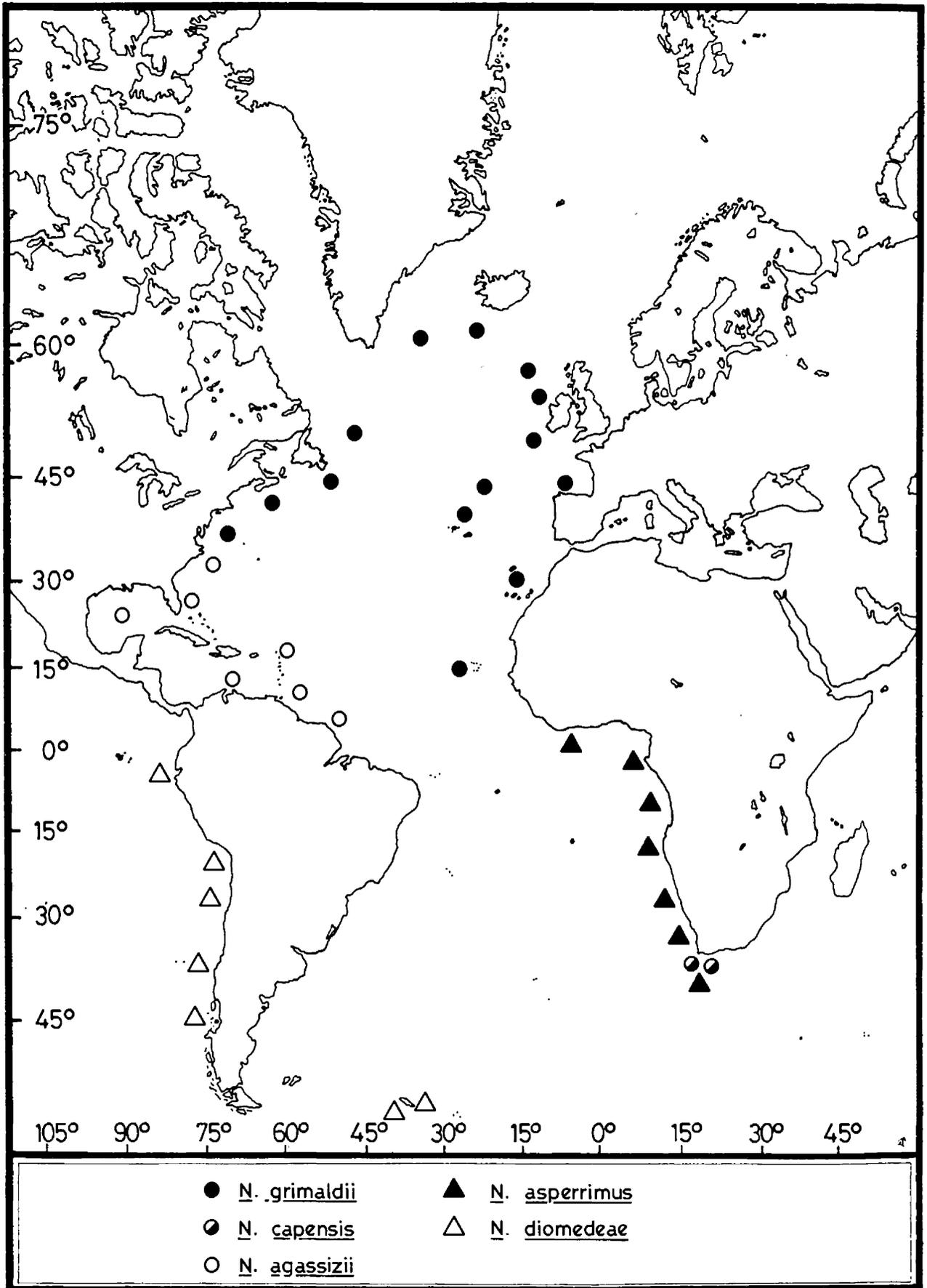


FIG. 11. Species distribution for the genus *Neolithodes* A. Milne Edwards & Bouvier in the Atlantic Ocean.

anterior pair somewhat longer than the posterior pair. A granule, sharper in juveniles, near the intestinal region. Branchial regions bearing six well-developed spines, with some small spines or more or less spiniform granules interspersed. Intestinal region with two long spines near the posterior edge of the carapace. Pterygostomial region with a small spine on the anterior terminal angle.

Rostrum extending well beyond the corneas. In small and medium size individuals (CL < 100 mm), basal spine length up to one-half carapace length. Dorsal spines well-developed.

External orbital spine normally overreaching the corneas. Spines on the antero-external angle much shorter than the external orbital spine. One long hepatic spine. Branchial edge with two long spines and, anterior to these, two-three shorter spines to the

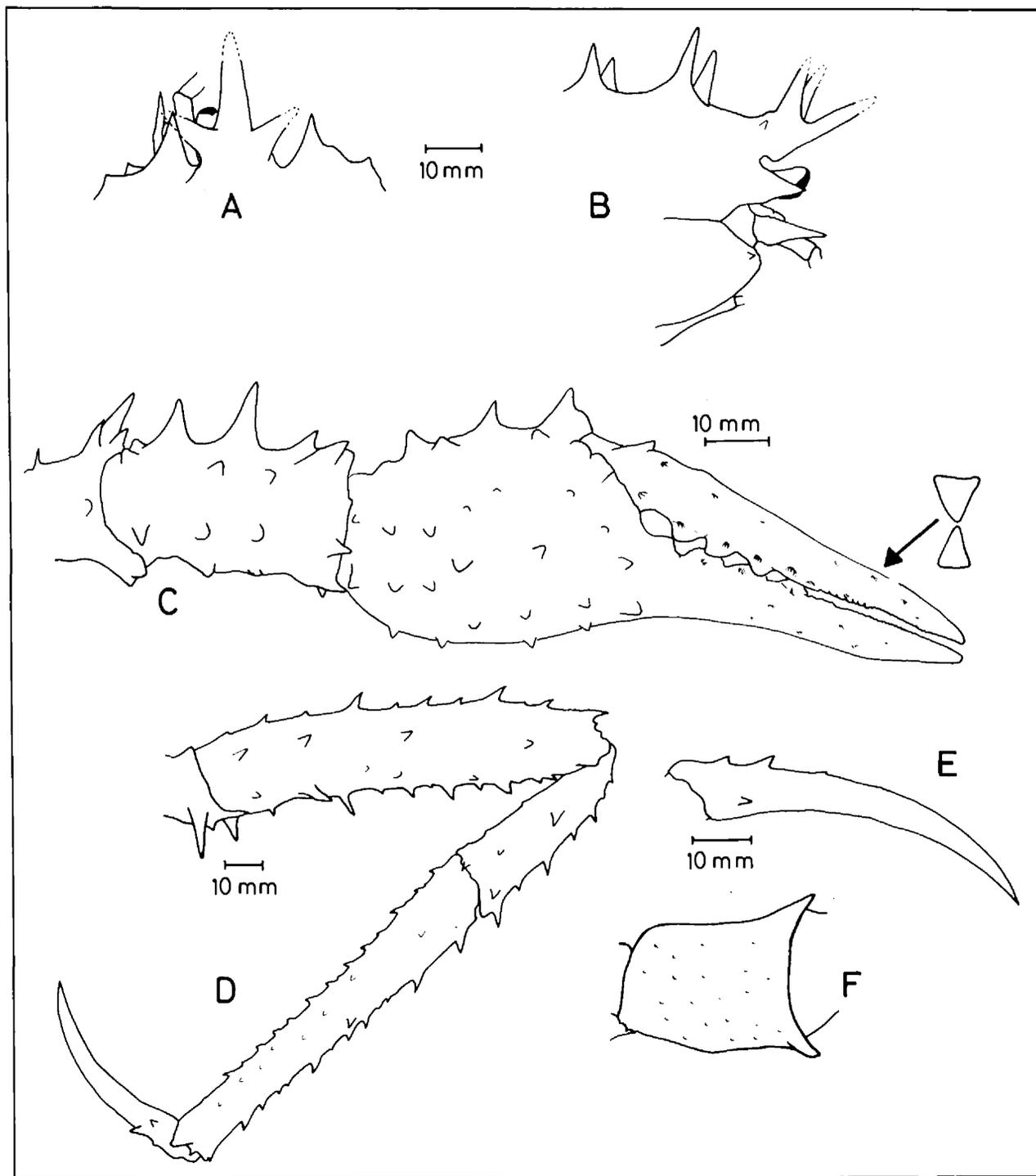


FIG. 12. *Neolithodes diomedea* (Benedict) (MP, paralectotype, ♂, CL = 127 mm. Albatross, St. 2789, Chile): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg; E) dactylus, right third walking leg; F) basis-ischium, right third walking leg.

level of the gastro-cardiac groove. One-three well-developed spines similar to the hepatic spine in length and six-eight smaller spines posterior to the gastro-cardiac groove.

Second abdominal segment with six-seven thick spines on the median plate, three spines on the terminal border of the lateral plates, and some smaller spines on the marginal plates. Plates and nodules of remaining segments with small, more or less acute spines, although in some females the asymmetrical plates may bear some thick spines.

Ocular peduncles with a few dorsal granules, more acute in small individuals. Basal segment of antenna with a small, terminal, outer spine. Second segment with a long, terminal, outer spine extending beyond the base of the last antennal segment.

Chelipeds with merus bearing some spines, well-developed dorsally on the terminal outer border. Carpus with four-five well-developed spines on the dorsal surface, several on the outer surface, and some small spines ventrally. Five short, dorsal spines on hand and two rows of four-five small spines each on the outer surface. Fingers twice hand length, with some small spines on base. Sides of both movable and fixed fingers rather flat, especially dorsally (on movable finger) and ventrally (on fixed finger), giving them a very characteristic triangular section. Tufts of setae not numerous. Left cheliped with corneous denticles instead of white teeth on both cutting edges.

Second walking leg somewhat longer than the first and third walking legs.

Third walking leg less than three times carapace length. Two-three spines on terminal border of coxa. Basis-ischium with two long, thick spines on the posterior, terminal border. Merus shorter than carapace length, about five times longer than high, somewhat longer than the propodus, and 1.8 times longer than the carpus. Anterior border bearing two rows of spines, the more dorsal of the two with six-eight spines somewhat longer than the similar number of spines in the more ventral row. Several spines on the dorsal surface and a row of eight-nine spines on the posterior border that are usually smaller than the anterior spines. Carpus with four-five spines on the anterior margin and four-five on the dorsal surface, the most proximal and the most terminal of these thicker and longer than the rest. Propodus some six times longer than high, with 10-12 spines on the anterior margin and several spines on the dorsal surface. Posterior border with a row of 13-14 spines. No differences in the number of spines observable between juveniles and adults. Inner border of articles practically smooth. Dactylus slightly curved and dorso-ventrally flattened in both juveniles and adults. Some small spines on the base, with the remaining two-thirds (in adults) or one-half (in juveniles) completely unarmed.

Size

Carapace length in the males examined ranged from 26 to 135 mm, carapace width from 24 to 135 mm. Females measured between 31 and 94 mm in length and between 27 and 85 mm in width. The juvenile specimen taken on USARP Cruise no. 575 was 10 mm long and 8 mm wide.

Distribution

Off the coast of Chile, in Southeast Atlantic waters around South Georgia Island at depths between 640 and 2 450 m.

The material used by Benedict to describe the species was collected between 42° and 45° S, although the R/V Albatross had taken some specimens further north (05° S) a few years earlier.

Parker (1964) reported it off west coast of América at 23°39' N (1 382 m). Haig (1974) mentioned a juvenile specimen of indeterminate species reported by Faxon (1895) taken off the same coast between 16°33' N and 00°04' S (1 207 - 1 847 m). Del Solar (1981) found a *Neolithodes* specimen which he thought was probably *N. diomedae* off the coast of Peru.

Recently, Báez *et al.* (1986) redescribed the species and reported it between the Pájaros Islets (29°35' S) and the Chonos archipelago (45° S). Wilson (personal communication) reported catches further north, between Antofagasta and Mejillones (23° S) and south of Iquique (21° S).

This species has been found in the stomach contents of the sperm whale, *Physeter catodon* (Báez *et al.* 1986).

Common name: In Spanish, "centolla de la Isla Grande de Chiloé" (Retamal, 1981); "centolla patache" (Báez *et al.*, 1986); in English, king or stone crab.

Remarks

Neolithodes diomedae is readily distinguishable from the other species in its genus because of the shape of the cheliped fingers. Both the fixed and movable fingers are triangular in section, with flattened edges. Moreover, the fingers are twice as long as the palm, in contrast to the other species, in which they are around 1.5 times palm length. Birstein and Vinogradov (1972) described *Neolithodes martii* from three males taken in the Southeast Atlantic. Comparison of the type material for these two species showed them to be conspecific, hence *N. martii* should be regarded as a synonym for *N. diomedae*.

Neolithodes agassizii (Smith, 1882)

(Figures 13, 14, 15A; Plate 2C)

Lithodes Agassizii Smith, 1882, p. 8, Pl. 1, Fig. 1 (Fig. 2 = *N. grimaldii*) (in part, only adults); Agassiz, 1888, p. 39, Fig. 232

Neolithodes Agassizii Bouvier, 1895, p. 178

Neolithodes Agassizii Bouvier, 1896, p. 8, 22

Neolithodes agassizii Takeda and Okutani, 1983, p. 106

(figure text); Dawson and Yaldwyn, 1985 (in list)

no *Lithodes Agassizii* Smith, 1883, p. 25; Smith, 1884a,

p. 351; Smith 1884b, p. 54; Smith, 1886, p. 34, Pl. 3,

Figs. 1, 2 (= *N. grimaldii*)

no *Lithodes agassizii* Henderson, 1888, p. 42 (= *N. grimaldii*)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀, lectotype, USNM 13974, R/V Blake, Summer 1880, St. 329, 34°39.4' N, 75°14.4' W, 1 100 m

4 ♂, R/V Oregon II, St. 10879, 19 January 1970, 25°23' N, 96°14' W, 980 m

1 ♂, R/V Oregon II, St. 11739, 25 January 1972, 32°44' N, 76°49' W, 730 m

1 ♂, 1 ♀ (broken), R/V Oregon, St. 14267, 24 September 1955, 29°07' N, 87°54' W, 1 100 m

3 ♀ (broken), R/V Albatross, 1885, St. 2628, 32°24' N, 76°55' W, 966 m

1 ♂, R/V Iselin, St. 125, 25 September 1973, 24°30.2' N, 77°21.5' W, 1 485 m.

1 ♀, R/V Oregon, St. 10878, 16 January 1970, 28°54' N, 87°29' W, 1 850 m.

1 ♀, R/V Oregon II, St. 11564, 30 September 1971, 28°35' N, 88°58' W, 740 m

1 ♂, R/V Oregon II, St. 10876, 15 January 1970, 28°55' N, 87°23' W, 1 480 m

1 ♂, R/V Oregon II, St. 10877, 16 January 1970, 28°34' N, 87°26' W, 1 647 m

1 ♂, R/V Pillsbury, St. 117, 18 July 1964, 31°51' N, 77°29' W, 732 m

1 ♂, R/V Oregon II, St. 10870, 13 January 1970, 29°02' N, 88°08' W, 915 m

1 ♂, R/V Oregon II, St. 10956, 3 June 1970, 21°33' N, 96°48' W, 1 098 m

1 ♂, R/V Oregon II, St. 11245, 8 November 1970, 11°07' N, 75°30' W, 1 098 m

1 ♂, R/V Oregon II, St. 11240, 4 November 1970, 09°58' N, 76°29' W, 1 272 m

1 ♂, R/V Oregon II, St. 10618, 15 May 1969, 07°51' N, 54°42' W, 834 m

1 ♂, R/V Oregon II, St. 10609, 11 May 1969, 07°28' N, 53°14' W, 686 m

1 ♂, R/V Oregon II, St. 10611, 12 May 1969, 07°13' N, 52°52' W, 769 m

1 ♀ ov., R/V Oregon II, St. 10616, 13 May 1969, 07°37' N, 53°32' W, 723 m

2 ♀ ov., R/V Oregon II, St. 10615, 13 May 1969, 07°22' N, 53°02' W, 723 m

1 ♀ ov., R/V Oregon II, St. 10614, 13 May 1969, 07°06' N, 52°44' W, 668 m

2 ♀, 1 ♀ ov., R/V Oregon II, St. 10607, 11 May 1969, 07°42' N, 53°36' W, 783 m

1 ♀, R/V Oregon II, St. 10814, 23 November 1969, 07°32' N, 53°19' W, 659 m

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♀, R/V Pillsbury, St. 675, 08°26' N, 54°17' W, 1 230 - 1 270 m

1 ♀, R/V Iselin, St. 147, 23°56' N, 77°14.4' W, 1 378 m

1 ♂, R/V Iselin, St. 168, 24°26.5' N, 77°23.3' W, 1 570 m

1 ♂, R/V Pillsbury, St. 892, 14°17' N, 60°45.2' W

Description

Carapace, cheliped, and walking leg surfaces armed with numerous well-developed spines and a large number of spinules or denticles, evenly distributed. Size of largest spines varies with specimen size, longest in juveniles. Small spines present on small and large specimens alike. Gastric region armed with four large spines in a pattern describing a square, the anterior pair slightly larger than the posterior pair. Another, usually smaller spine outside this region between the two pairs. One-two rather smaller spines in the centre of the square. A transverse row of four spines between the anterior pair and the base of the rostrum, the two middle spines larger than the two outer ones but all four smaller than the spines arranged in the square-shaped pattern. Cardiac region bearing four large spines similar in size to the larger gastric spines, also in a square-shaped pattern. A smaller, single spine near the intestinal region. A pair of small spines near the gastro-cardiac groove. Branchial regions with 10-12 long spines, six-eight of these similar in size to the cardiac spines, as well as some small spines. Intestinal region with two long spines near the posterior edge of the carapace. Pterygostomial region bearing a small spine on the anterior, terminal angle.

Basal spine of rostrum extending beyond the corneas in both juveniles and adults. Two well-developed, divergent, dorsal spines.

Carapace edge armed with numerous spines. External orbital spine reaching nearly to the end of

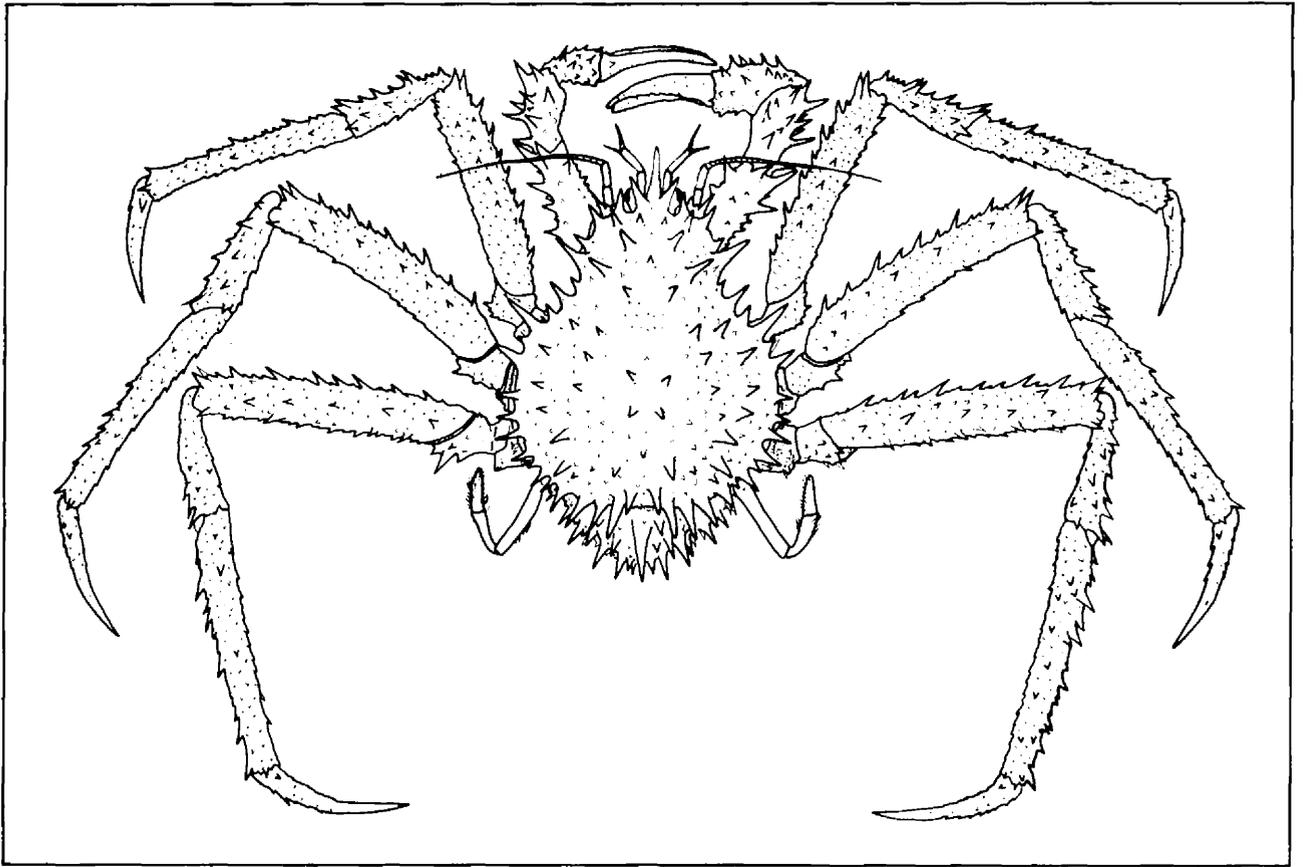


FIG. 13. *Neolithodes agassizii* (Smith) (USNM, ♀, lectotype, CL = 86 mm, Blake, St. 329): general appearance, dorsal view (after Smith, 1882).

the corneas in both large and medium size individuals, overreaching it in juveniles. A spine on the anterolateral angle smaller than the external orbital spine. One long hepatic spine. Branchial edge to the level of the gastro-cardiac groove bearing two very large spines and two other, smaller spines anterior to these. Usually another, smaller spine located between the two larger spines. Ten-twelve well-developed spines, six-seven of these larger than the others, along the remainder of the branchial edge.

Terminal border of median plate on second abdominal segment with some more or less thick spines. Both the plates and the nodules on the remaining segments bearing numerous spinules or spiniform granules.

Ocular peduncles with small granules dorsally, sharper in small individuals.

Outer surface of basal antennal segment bearing a small, terminal spine. Outer surface of base of second segment with one-two small denticles on base and a long, terminal spine extending beyond the base of the last segment.

Chelipeds with merus armed with three long, thick spines on the terminal dorsal edge and other, smaller spines chiefly on the anterior half of the article.

Carpus with three-four long dorsal spines and four-five thick but not very long spines on the outer surface. Some small spines on all the borders of this article. Hand armed with four-five short, thick spines on the dorsal border. Two poorly defined longitudinal rows of small spines on the outer surface, and some similar spines ventrally on the inner border. Fingers less than 1.5 times hand length. Some small spines on the bases of both the movable and fixed fingers. Dorsal border of movable finger and ventral edge of fixed finger rounded, with tufts of yellowish setae in rows.

Second walking leg somewhat longer than the first and third. Third walking leg a little more than three times carapace length in males, in females usually equal to or less than three times carapace length.

On third walking leg, entire terminal edge of coxa armed with thick, short spines variable in size, even between specimens the same length. Posterior terminal border of basis-ischium bearing two thick spines, and six more, smaller spines on this article. Merus slightly longer than the propodus and between five and six times longer than high, somewhat longer than carapace length in males, shorter than carapace length in some females, with 14-18 spines of varying size in a row on the anterior border, the largest

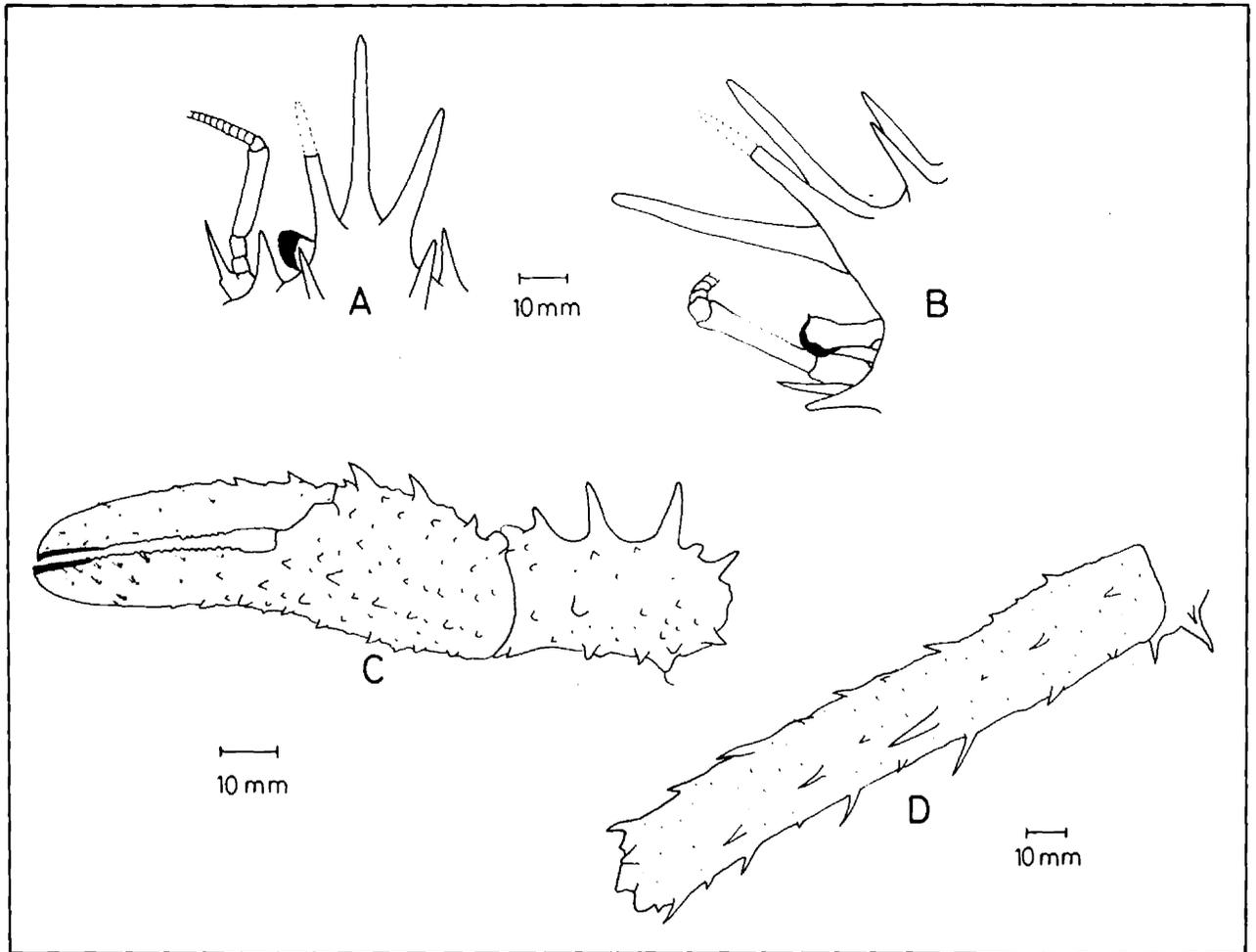


FIG. 14. *Neolithodes agassizii* (Smith) (USNM, ♂, CL = 137 mm, east coast of United States): A) dorsal view of rostrum; B) lateral view of rostrum; C) left cheliped; D) merus, right third walking leg.

located on the terminal portion. Several long spines on the posterior and, dorsal border, usually remaining well-developed in large specimens. Carpus bearing six-seven anterior spines, with some others on the dorsal surface. Propodus about seven times longer than high, with a row of 14-16 spines of different sizes on the anterior border and several more on the dorsal surface. Dactylus slightly curved, about half as long as the merus, dorso-ventrally flattened, particularly the terminal half, and armed with rows of numerous small spines on all borders, with the terminal third unarmed.

All article surfaces on both chelipeds and walking legs bearing spinules or small denticles in addition to the spines mentioned above. Such spinules sometimes practically disappearing on large specimens, and spine size decreases as well.

Size

Carapace length is 86 mm, breadth 75 mm on the

female lectotype. Carapace length of the remaining females examined ranged between 13.5 and 154 mm, width between 12.5 and 143 mm. Ovigerous females from 113 mm carapace length. Males ranged from 14 to 167 mm in carapace length and from 13 to 162 mm in carapace width.

Colour

Takeda and Okutani (1983) presented a colour photograph of this species. The colour is uniformly red on both the carapace and the pereiopods, with the spines darker.

Distribution

Eastern coast of America between 34°39.4' N and 07°22' N on muddy bottoms at depths between 650 and 1 900 m.

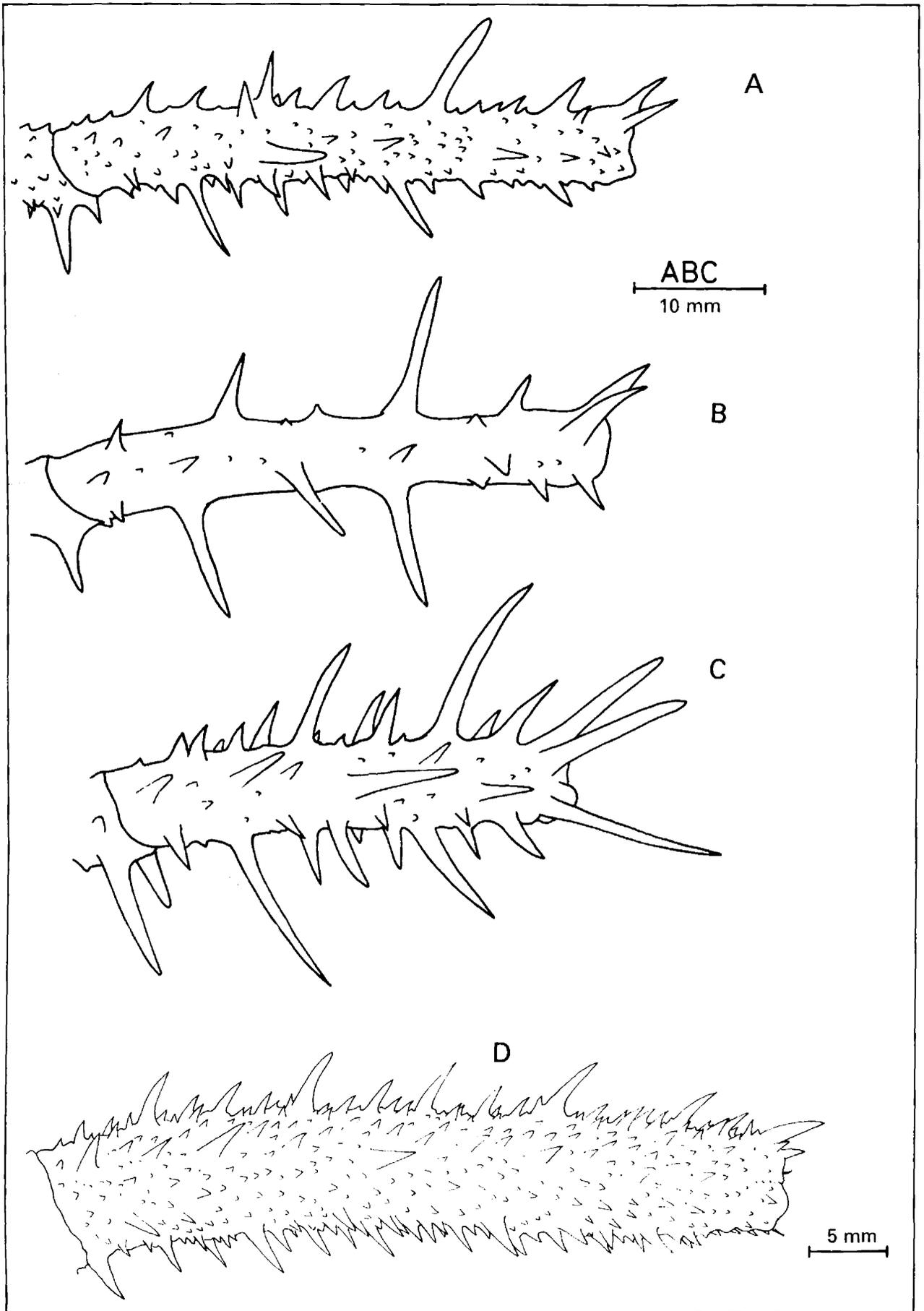


FIG. 15. Merus, right third walking leg: A) *Neolithodes agassizii* (Smith) (USNM, ♂, CL = 25 mm, Oregon II, St. 10877); B) *N. grimaldii* (A. Milne Edwards & Bouvier) (USNM, ♀, CL = 24 mm, GI-76-01, St. 28); C) *N. diomedae* (Benedict) (USNM, ♂, paralectotype, CL = 27 mm, Albatross, St. 2788); D) *N. asperrimus* Barnard (ICM, ♂, CL = 46 mm, Valdivia I, P-18).

Remarks

N. agassizii (Smith) is closely related to *N. asperrimus* Barnard from the Southeast Atlantic, but it is differentiated by the following characters:

—Spicules on carapace and pereopods much less numerous in *N. agassizii* than in *N. asperrimus* (Figures 14, 15A, D, 16).

—Between specimens of similar size, rostral spines longer in *N. agassizii*.

—Main spines on walking leg articles tending to be quite large in *N. agassizii*, even in large individuals, in *N. asperrimus* tending to be reduced to thick granules or very short spines (Figures 14D, 15A, D, 16F, G).

—Walking legs more elongate in *N. agassizii*. Third walking leg in males more than three times carapace length in *N. agassizii*, less in *N. asperrimus*. Merus generally longer than the carapace in *N. agassizii*, shorter in the African species.

In addition, smallest specimens of *N. agassizii* may be confused with specimens of *N. grimaldii* (A. Milne Edwards & Bouvier) of similar size. Some of the differentiating characters, e.g., the small spicules on the carapace and pereopods, are hard to distinguish in the smaller sizes, and their geographical proximity may lead to confusion. Nevertheless, certain characters are readily distinguishable and aid in identification:

—Merus on third walking leg in *N. grimaldii* patently shorter than carapace length, longer in *N. agassizii*.

—Merus, carpus, and propodus armed with long spines in *N. grimaldii*; such spines much shorter but more numerous in *N. agassizii* (Figure 15A, B).

—Inner edge of articles practically smooth in *N. grimaldii*, with small spinules in *N. agassizii*.

Anderson (1896) and Alcock (1901) reported *N. agassizii* in Indian Ocean waters. However, as Dawson and Yaldwyn (1985) pointed out, this was in fact a new species.

Neolithodes asperrimus Barnard, 1947

(Figures 15D, 16; Plates 3, 4)

Neolithodes asperrimus Barnard, 1947, p. 374; Barnard, 1950, p. 411, Figs. 77d-77f; Kensley, 1968, p. 287; Kensley, 1978 (in list); Kensley, 1981 (in list); Macpherson, 1983, p. 5, Figs. 1, 2

Material examined

South African Museum, Cape Town

- 1 ♂, syntype, dried, off Saldanha Bay, 550 m
- 1 ♀, dry, 25 August 1959, 33°50' S, 17°21' E, 1 100 m
- 1 ♀, 38 miles north of Cape Point, 870 - 1 100 m
- 1 ♀, dry, no data provided
- 1 ♂, no data provided

National Museum of Natural History, (Smithsonian Institution), Washington, D.C.

- 1 ♀, Pillsbury Exp., St. 19, 26 May 1964, 05°12' N, 00°12' E, no depth listed

Rijksmuseum van Natuurlijke Historie, Leiden

- 1 ♀ ov., Pillsbury, St. 309, 26 May 1965, 04°15' N, 04°27' E, 678 - 720 m
- 1 ♂, Pillsbury, St. 53, 31 May 1964, 04°51' N, 05°00' W
- 1 ♂, 1 ♀, Benguela IV, P-130, 25 April 1981, 26°32' S, 13°39' E, 531 m

Instituto de Ciencias del Mar, Barcelona

- 1 ♀ ov., 1 ♂ Benguela IV, P-80, 16 April 1981, 18°11' S, 11°24' E, 607 m
- 1 ♂, 1 ♀, Benguela IV, P-83, 17 April 1981, 18°41' S, 11°22', 531 m

- 1 ♀ ov., 1 ♂, Benguela IV, P-113, 22 April 1981, 23°34' S, 13°05' E, 607 - 615 m

- 1 ♂, 1 ♀, Benguela IV, P-130, 25 April 1981, 26°32' S, 13°39' E, 531 m

- 1 ♀ ov., 1 ♂, Benguela IV, P-140, 26 April 1981, 28°14' S, 14°26' E, 534 - 542 m

- 1 ♂, Valdivia I, P-18, 26 May 1982, 28°19' S, 14°18.6' E, 754 - 769 m

- 4 ♀, 5 ♂, Valdivia I, P-22, 28 May 1982, 26°35' S, 13°35' E, 765 m

- 1 ♂, Valdivia I, P-25, 29 May 1982, 24°50.7' S, 13°26.5' E, 776 m

- 2 ♀ ov., 3 ♀, 5 ♂, Benguela VII, PP1, 9 August 1984, 23°02' S, 12°46' E, 1 010 m

- 4 ♀, 1 ♂, Benguela IX, PP1, 15 February 1986, 24°01' S, 12°57' E, 1 153 m

Description

Carapace, cheliped, and walking leg surfaces armed with numerous, well-developed spines and a large number of small spicules, more or less evenly distributed. Size of largest spines varying with specimen size; largest in juveniles, sometimes reduced to thick, spiniform tubercles in large individuals. Small spicules present on both small and large specimens, somewhat sharper on juveniles.

Gastric region armed with four large spines in a pattern describing a square. Anterior pair slightly larger than the posterior pair. Another, somewhat

smaller spine situated externally to these spines. A spine smaller than the others located in the centre of the square. A transverse row of four spines between the anterior pair and the base of the rostrum, the two medial spines well-developed and the two outer spines smaller. Cardiac region armed with four long spines similar in size to the larger gastric spines, also arranged in a pattern describing a square. A single, smaller spine near the intestinal region. A pair of small spines near the gastro-cardiac groove. Each branchial region armed with 10-12 long spines and several small ones. Intestinal region bearing two long spines near the posterior edge of the carapace. A small spine on the terminal angle of the pterygostomial region.

Basal spine of rostrum usually extending beyond the corneas, though it may be shorter in some very large specimens.

Carapace edge armed with numerous spines. External orbital spine only overreaching the corneas in very small individuals. A spine on the anterolateral angle smaller than the external orbital spine. A long hepatic spine, followed by two more very large spines and, anterior to these, a further two smaller spines, to the level of the gastro-cardiac groove. Sometimes yet another small spine between the two long ones. Posteriorly to the level of the gastro-cardiac groove, 10-12 well-developed spines, eight-nine of which are similar in size to or somewhat smaller than the hepatic spine, with smaller spines interspersed.

Median plate on second abdominal segment bearing several well-developed spines. Lateral and marginal plates with some more or less thick spines on the terminal border. Both plates and nodules on all segments with numerous spinules or spiniform granules.

Ocular peduncles bearing small granules dorsally, more acute in juveniles.

Basal antennal segment with one small, terminal, outer spine. Second segment bearing one-two small denticles on the base and a long, terminal spine on the outer surface usually overreaching the base of the last segment of the peduncle. Scaphocerite seldom present, formed by a spine and some denticles.

Chelipeds with merus armed with three long, thick spines on the terminal, dorsal border and other, smaller spines on the anterior half. Carpus with three-four long, dorsal spines and four-five somewhat smaller spines on the outer surface. Some small spines on all the surfaces of this article. Hand bearing four-five thick but short spines on the dorsal border. Two poorly defined rows of small spines on the outer surface and some others, similar in size, on the ventral and inner borders. Fingers less than 1.5 times hand length, with some small spines on the base and tufts of yellow setae. Dorsal border of movable finger and ventral border of fixed finger rounded.

Second walking leg somewhat longer than the first walking leg, first somewhat longer than the third.

Third walking leg less than three times carapace length. Entire terminal border of coxa armed with thick, short spines varying in size. Basis-ischium with two thick spines on the posterior, terminal border and some smaller spines nearby. Merus slightly longer than the propodus, between five and six times longer than high, somewhat shorter than the carapace, armed with several spines on the anterior border, the two largest located on the terminal part and turning into more or less pointed granules in very large specimens. Some small spines dorsally and on the posterior border. Carpus a little less than twice merus length, bearing six-eight spines on the anterior margin, the most proximal and the most terminal larger than the others. Some spines on the dorsal surface. Propodus about seven times longer than high, with an anterior row of 10-12 spines and several more on the dorsal surface. Dactylus slightly curved, some 3.5 times smaller than the merus, dorso-ventrally flattened, particularly the terminal half, and armed on all surfaces with numerous small spines arranged in rows, with only the terminal third unarmed.

All article surfaces on chelipeds and walking legs bearing numerous spinules or denticles, blunter in large individuals.

Colour

More or less dark red on the carapace, chelipeds, and walking legs. In some individuals the colouration may exhibit an orange hue. The largest spines are usually bright red.

Size

The male syntype measures 161 mm in length and 155 mm in width. The males examined ranged from 13 to 195 mm long and from 11 to 189 mm wide. The females measured between 39 and 180 mm in length and between 34 and 156 mm in width. Oviparous females from 133 mm in length.

Distribution

Off western Africa, from the Ivory Coast to the Cape Peninsula, on muddy bottoms between 600 and 2 000 m in depth.

Remarks

N. asperrimus Barnard is closely related to *N. agassizii* (Smith), from off the east coast of North and Central America. Both species have numerous small spinelets distributed over the carapace and

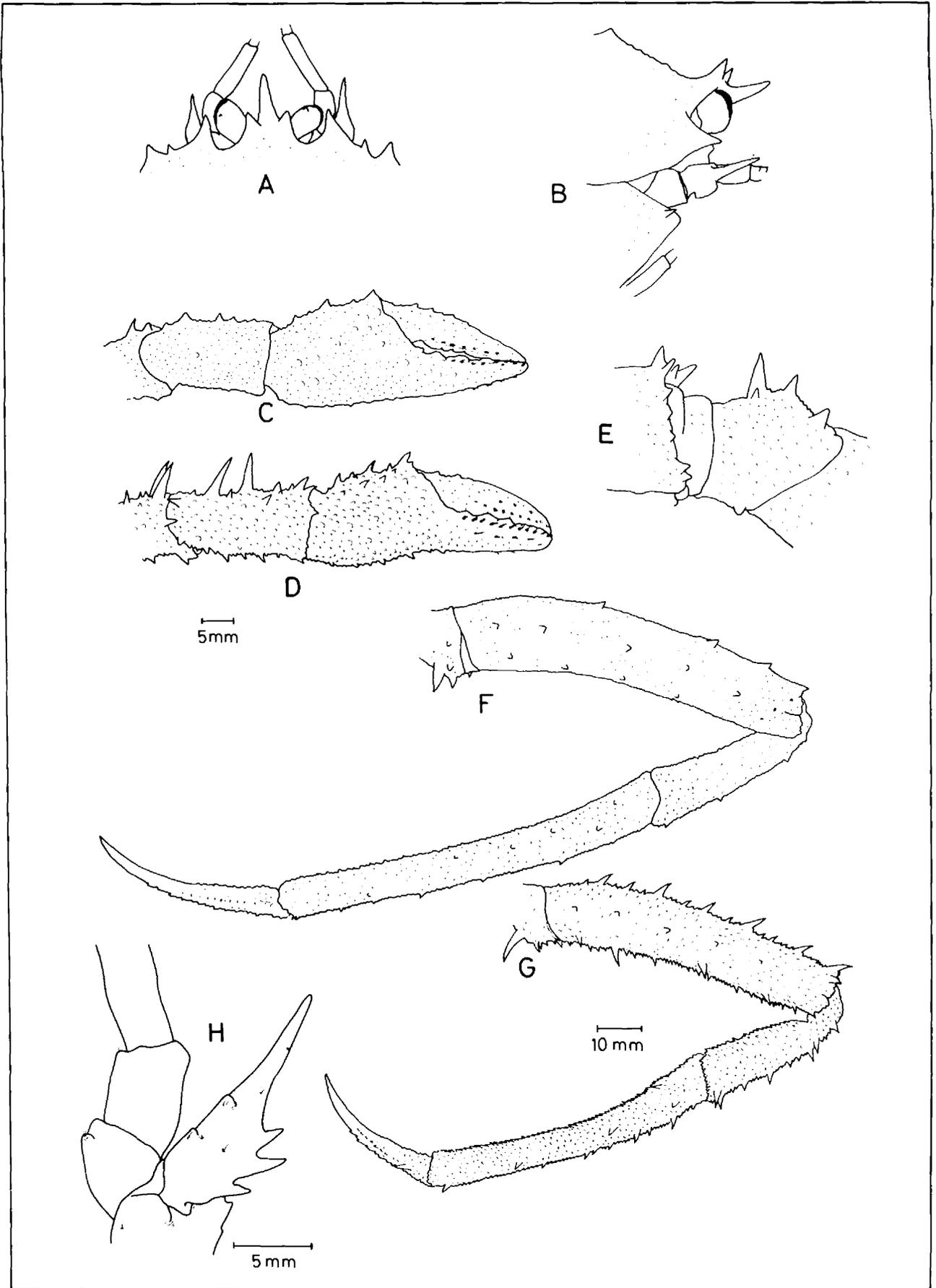


FIG. 16. *Neolithodes asperrimus* Barnard (A, B, C, E, F: ICM, ♂, CL = 141 mm, Benguela VI, P-BB1, Namibia); D, G: ICM, ♂, CL = 90 mm, Benguela VI, P-BB1, Namibia; H: RMNH, ♀ ov., CL = 130 mm, Gulf of Guinea): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) - D) right cheliped; E) basis-ischium, right third walking leg; F) - G) right third walking leg; H) right antenna.

pereiopods. They are differentiated, however, by both the number and the size of such spinelets (p. 33), along with other characters.

The region off the Cape Peninsula is also inhabited by another species, *N. capensis* Stebbing (p. 40), which is differentiated in that its carapace and pereiopods are not covered by such small spinelets.

Neolithodes capensis Stebbing, 1905

(Figures 17; Plate 5)

Neolithodes capensis Stebbing, 1905, p. 70, Pls. 19, 20; Stebbing, 1910, p. 349; Barnard, 1950, p. 410, Figs. 77a-77c; Kensley, 1968, p. 286; Kensley, 1981 (in list); Dawson and Yaldwyn, 1985 (in list)

Material examined

South African Museum, Cape Town

1 ♂, no information provided

1 ♀, D.S.F., 9 December 1959, 33°50' S, 16°30' E, 2 716 m

1 ♂, 1 ♀, D.S.F., 8 December 1959, 34°42' S, 16°54' E, 3 200 m

1 ♂, 10 December 1959, 34°36' S, 17°00' E, 2 745 m

1 ♀, R/S Africana, no information provided

1 ♂, R/S Africana, 9 December 1959, 34°05' S, 16°58' E, 2 745 m

The type series for this species is St. 17118 P.F. (Pieter Faure), 22nd July 1903, 1 480 m, Cape Point, 70° E, 40 miles. Ten specimens were collected (9 preserved dry, 1 in alcohol). Two of the dry specimens were sent to Stebbing (1 ♂ and 1 ♀), and these were the type specimens, but they have apparently been lost. The specimen preserved in alcohol (A 8230), listed as a topotype by Barnard and Kensley, remains in the collection at the South African Museum, although it was not available for examination by the author for this revision. The whereabouts of the remaining specimens of the type series are unknown.

Description

Carapace, cheliped, and walking leg surfaces armed with numerous, well-developed spines, appreciably larger in juveniles than in adults, in which they are much reduced in size. Rest of surface smooth, except for a few scattered granules.

Gastric region bearing four large spines in a pattern describing a square, the anterior pair slightly larger than the posterior pair. A spine externally to each of the spines in the anterior pair. Another small spine in the centre of the square, clearly visible even in adults. A transverse row of four granules, more acute in juveniles, between the anterior pair and the

base of the rostrum. Cardiac region armed with four spines also in a square-shaped pattern, the anterior pair somewhat larger than the posterior pair. One-two small spinelets or spiniform granules near the instestinal region.

Branchial regions with 10-12 spines, six of which are similar in size to those on the gastric and cardiac regions, the rest smaller. Intestinal region armed with two strong spines close to the carapace edge. Pterygostomial region bearing a small spine on the terminal angle.

Basal spine of rostrum extending past the cornea. Rostrum in the largest specimen (CL = 131 mm) much reduce, ratio of carapace length: rostral length = 8.3. Ratio in the remaining specimens examined ranging from 3.9 to 5.0. Two well-developed dorsal spines.

Carapace edge armed with numerous spines. External orbital spine normally not overreaching the end of the cornea. Antero-external spine smaller than the external orbital spine. One hepatic spine. Branchial edge bearing nine-eleven spines similar to or smaller than the hepatic spine in size, with several smaller spines interspersed.

Median plate on second abdominal segment bearing several thick spines. Lateral and marginal plates with several spines on the terminal borders. Plates and nodules on the remaining segments with spines that are less acute in large individuals.

Ocular peduncles bearing some granules dorsally.

Basal antennal segment with a small, anterolateral spine. Second segment with a long, antero-external spine slightly overreaching the base of the last segment of the peduncle. A small, outer tooth at the base of the spine.

Chelipeds with merus bearing some well-developed spines dorsally and externally on the terminal border. Carpus with four-five long spines on the dorsal surface, several on the outer surface, and some small, ventral spines. Hand armed with five spines dorsally and two more or less well-defined rows of four-five small spines each on the outer surface. Some small spines on the ventral border. Some small spines on the base of each of the fingers, which are less than 1.5 times hand length. Borders rounded, with tufts of setae in rows.

Second walking leg somewhat longer than the first and third walking legs.

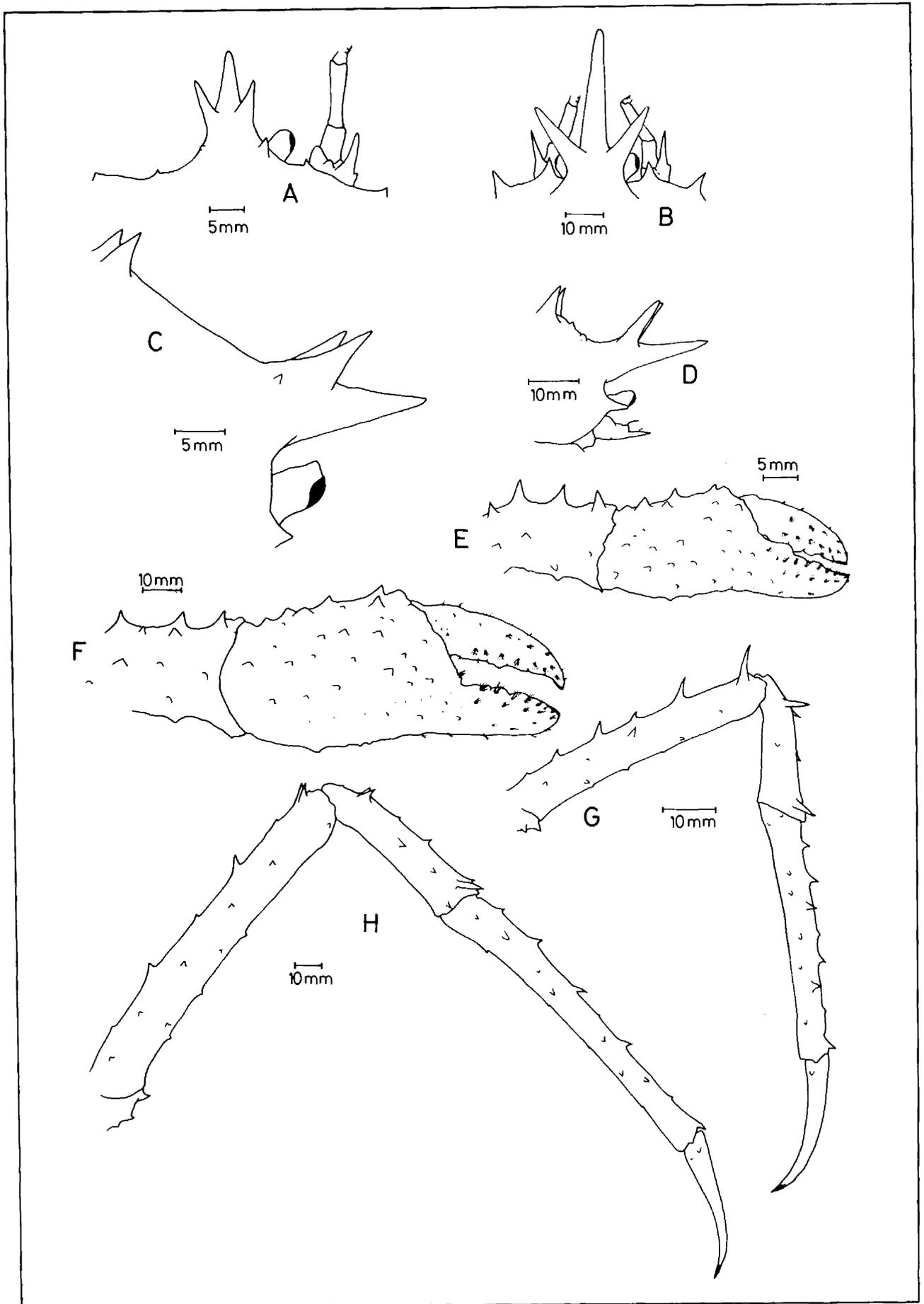


FIG. 17. *Neolithodes capensis* Stebbing (A, C, F, H: SAM, ♂, CL = 131 mm, South Africa; B, D, E, G: SAM, ♀, CL = 65 mm, South Africa): A) - B) anterior part of carapace, dorsal view; C) - D) anterior part of carapace, lateral view; E) - F) right cheliped; G) - H) right third walking leg.

Third walking leg less than three times carapace length, although in the largest male (CL = 131 mm) it equals three times carapace length. Coxa bearing some granules, rarely some small spines, on the terminal, ventral border. Basis-ischium with two thick but short spines and some smaller ones on the posterior, terminal border. Merus shorter than the carapace, a little more than twice the carpus, and from 5.5 to 7.5 times longer than high. A row of six-seven spines dorsally on the anterior border. A few scattered spines on the posterior and dorsal surfaces. Carpus bearing four-five anterior spines, the terminal and proximal spines longer than the others. Some spines on the dorsal surface. Propodus almost as long as the merus and some six-seven times longer than high. A row of six-eight spines on the anterior border. Some spines on the dorsal surface, with the ventral border completely unarmed. Dactylus cylindrical, slightly curved, with some small spines on the base, rest of article unarmed. Ventral border of all articles smooth, sometimes with a few isolated granules.

Size

The males studied ranged between 68 and 131 mm in carapace length and between 62 and 130 mm in

carapace width. The females measured from 65 to 86 mm long and from 59 to 86 mm wide.

Distribution

South Africa, Cape region. The type series was collected in the vicinity of Cape Point. The remaining specimens were caught in the same area. On muddy bottoms between 1 480 and 3 200 m in depth.

Remarks

Neolithodes capensis is closely related to *N. grimaldii* (A. Milne Edwards & Bouvier), from the North Atlantic, and to *N. vinogradovi* n. sp., from the Southeast Indian Ocean, in view of the absence of small spines in between the main spines on the carapace, chelipeds, and walking legs, yet it is easily differentiable on the basis of the size and number of its spines (p. 42 and p. 46).

The closest species geographically is *N. asperrimus*, which belongs to the group bearing numerous spinules and small spinelets in between the main spines on the carapace and pereopods. Moreover, in *N. asperrimus* the pereopod dactylus is dorso-ventrally flattened, rounded in *N. capensis*.

Neolithodes grimaldii (A. Milne Edwards & Bouvier, 1894)

(Figures 15B, 18; Plates 6, 7)

Lithodes Agassizii Smith, 1882, p. 8 Pl. I, Fig. 2 (in part, juveniles only); Smith, 1883, p. 25; Smith 1884a, p. 351; Smith, 1884b, p. 54; Smith, 1886, p. 34, Pl. 3, Figs. 1, 2 (no *N. agassizii* Smith, 1882)

Lithodes agassizii Henderson, 1888, p. 42 (no *N. agassizii* Smith, 1882)

Lithodes Grimaldii A. Milne Edwards and Bouvier, 1894b, p. 62, Pl. 3; Heegaard, 1941, p. 13

Lithodes goodei Benedict, 1894, p. 479

Neolithodes Grimaldii A. Milne Edwards and Bouvier, 1894a, p. 120; A. Milne Edwards and Bouvier, 1894b, p. 92; Bouvier, 1895, p. 177; Bouvier, 1896, p. 22; Hansen, 1908, p. 21; Bouvier, 1922, p. 36

Neolithodes grimaldii Squires, 1970, p. 111; Dawson and Yaldwyn, 1985 (in list); Saint Laurent, 1985 (in list).

1 ♀, R/V Albatross, St. 2682, 16 July 1886, 39°38' N, 70°22' W, 1 837 m

Rijksmuseum van Natuurlijke Historie, Leiden

2 ♂, Tydeman Rockall Cruise, St. 6, 10 June 1977, 53°24' N, 16°25' W

1 ♂, Tydeman Rockall Cruise, St. 87, 31 August 1977, 27°42' N, 15°02' W, 2 500 m

Instituto Español de Oceanografía, Santander

1 ♀, off the Santander coast (no position listed)

Senckenberg Museum, Frankfurt

1 ♂, WH 47/St. 608, 13 October 1981, 56°35.1' N, 09°38.4' W

Muséum National d'Histoire Naturelle, Paris

1 ♂, Biogas IV, CV 37, St. 2, February 1974, 47°33' N, 09°14' W, 3 000 m

1 ♂, CENTOB-INCAL, CP 04, 17 July 1976, 56°33.2' N, 11°11.3' W 2 483 m

3 ♂, 2 ♀, CENTOB-INCAL, CP 03, 17 July 1976, 56°38' N, 11°06.4' W, 2 466 m

2 ♀, Thalassa 73, St. 2454, 48°37.1' N, 10°54.4' W, 1 700 - 1800 m

Material examined

British Museum (Natural History), London

1 ♂, Challenger Exp., St. 78, 10 July 1873, 37°26' N, 25°13' W, 1 853 m

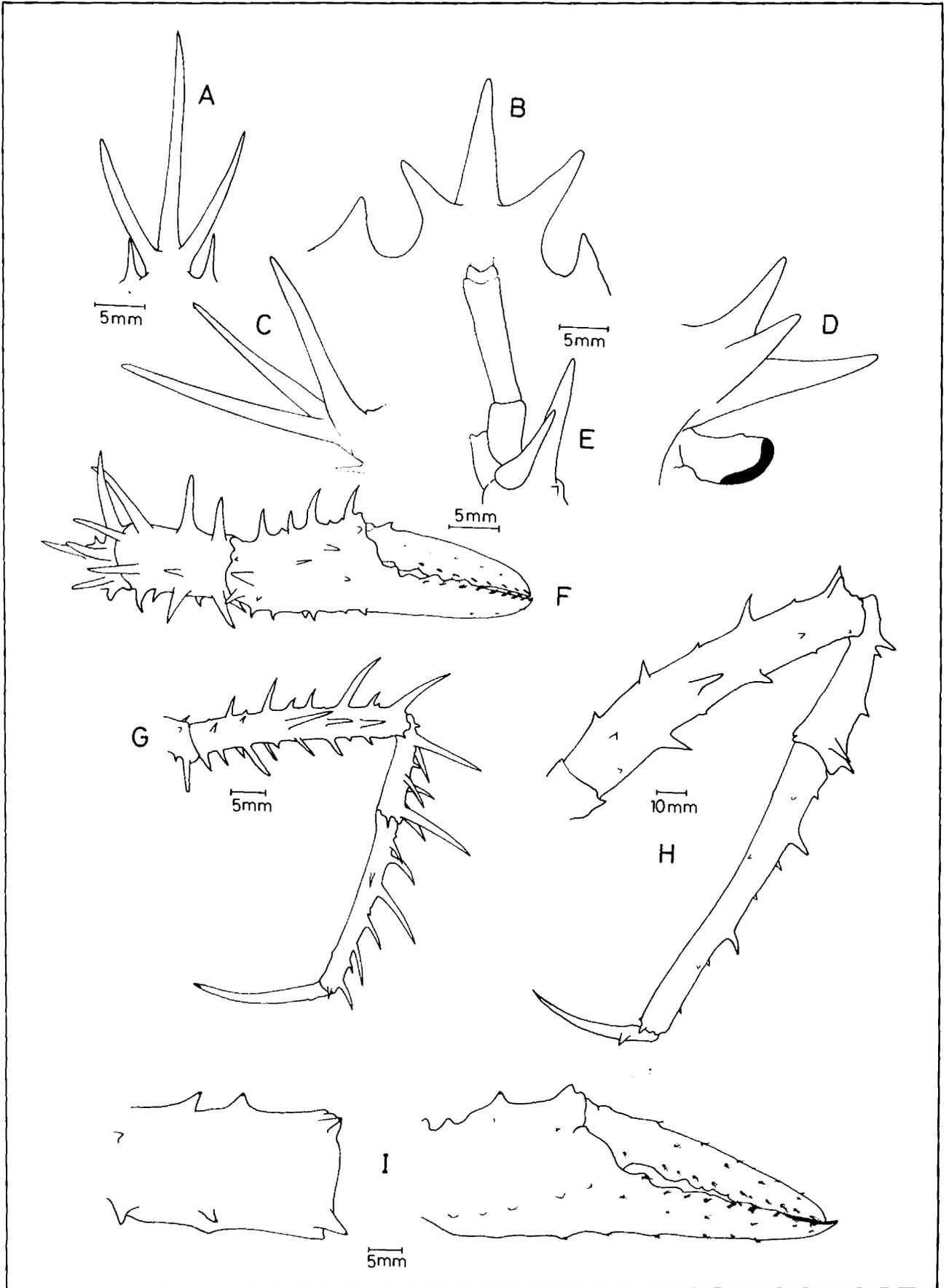


FIG. 18. *Neolithodes grimaldii* (A. Milne Edwards & Bouvier) (A, C, F, G: MP, ♀, CL = 42 mm, CENTOB-INCAL, CP 07; B, D, H, I: USNM, ♂, CL = 152 mm, GI-74-04, St. 105; E: MP, ♂, CL = 30 mm, CENTOB-INCAL, CP 04): A) - B) dorsal view of rostrum; C) - D) lateral view of rostrum; E) right antenna; F) right cheliped; G) - H) right third walking leg; I) right cheliped.

1 ♀, *Thalassa* 73, St. 2662, 21 October 1973, 48°37.1' N, 10°53.4' W
 1 ♂, *Princesse Alice*, St. 1209, 20 August 1901, Cape Verde, 7 miles SW, 1 477 m
 1 ♂, 1 ♀, *Biogas VI*, CP 23, St. 6, 31 October 1974, 44°04.6' N, 04°21.4' W, 1 980 m
 1 ♂, 1 ♀, *Polygas*, DS26, St. 6, 44°08.2' N, 04°15' W, 2 075 m
 1 ♂, *Biogas XI*, CP 37, 38°09.5' N, 29°37.5' W, 2 626 m
 1 ♀, *CENTOB-INCAL*, CP 07, 20 July 1976, 55°03.4' N, 12°46.2' W, 2 895 m
 1 ♀, *Noratlatne*, St. 109, 20 October 1969, 44°07.3' N, 04°09.3' W, 1 900 m
 3 ♂, 6 ♀, *INCAL*, St. CP 05, 55°00.4' N, 12°29.4' W, 2 884 m
 2 ♀, *INCAL*, St. CP 07, 55°03.4' N, 12°46.2' W, 2 895 m
 National Museum of Natural History (Smithsonian Institution), Washington, D.C.
 1 ♀ ov., (type of *Lithodes goodei*), *R/V Albatross*, St. 2196, 6 August 1884, 39°35' N, 69°44' W, 2 250 m
 2 ♂, 1 ♀, *E-6-75*, St. 22, 25 July 1975, 36°48' N, 73°32' W, 2 937 m
 1 ♂, *R/V Albatross*, St. 2715, 18 September 1886, 38°29.3' N, 70°54.3' W, 3 200 m
 3 ♂, *E-6-75*, St. 42, 30 July 1975, 38°34' N, 72°25' W, 2 650 m
 1 ♂, *R/V Albatross*, St. 2077, 9 April 1883, 41°09' N, 66°02' W, 2 296 m
 1 juv., *R/V Albatross*, St. 2530, 14 July 1885, 40°53' N, 66°24' W, 1 750 m
 1 ♂, *R/V Albatross*, St. 2723, 23 October 1885, 36°47' N, 73°09' W, 3 083 m
 1 ♀, *GI-76-01*, St. 28, 24 January 1976, 37°01' N, 74°13' W, 1 916 m
 1 ♀, *R/V Gillis*, *GI-74-04*, St. 95, 23 November 1974, 37°05' N, 74°125' W, 1 980 - 2 250 m
 2 ♂, *R/V Columbus Iselin*, *CI-73-10*, St. 57, 11 June 1973 (no position listed)
 1 ♀, *R/V Gillis*, *GI-74-04*, St. 97, 23 November 1974, 37°00' N, 74°15' W, 1 430 m
 2 ♂, *GI-75-08*, St. 35, 14 September 1975, 36°58' N, 73°21' W, 2 933 m
 1 ♀, *GI-76-01*, St. 41, (no position listed)
 1 ♂, *GI-76-01*, St. 55, 28 January 1976, 36°36' N, 73°58' W, 2 575 m
 3 ♂, *E-2-74*, St. 6, 16 April 1974, 35°23' N, 74°43' W, 2 105 m
 1 ♂, *GI-75-08*, St. 34, 14 September 1975, 36°57' N, 76°39' W, 2 767 m
 1 ♂, 1 ♀, *GI-76-01*, St. 24, 23 January 1976, 36°59' N, 73°43' W, 2 679 m
 1 ♀, *GI-76-01*, St. 58, 29 January 1976, 36°40' N, 74°28' W, 1 578 m
 1 ♂, 1 ♀, *R/V Gillis*, *GI-74-04*, St. 86, 19 November 1974, 36°41.4' N, 73°47' W, 2 620-2 650 m
 1 ♂, *R/V Albatross*, St. 2725, 24 October 1885, 36°34' N, 73°48' W, 2 514 m

1 ♂, *GI-76-01*, St. 56, 29 January 1976, 36°40' N, 73°36' W, 2 920 m
 1 ♀, *R/V Gillis*, *GI-74-04*, St. 96, 22 November 1974, 37°08' N, 73°57' W, 2 710 m
 1 ♂, *R/V Gillis*, *GI-74-04*, St. 106, 24 November 1974, 37°06' N, 74°23' W, 1 375 - 1 425 m
 1 ♀, ov., *E-6-75*, St. 8, 22 July 1975, 36°38' N, 74°33' W, 1 414 m
 1 ♂, *R/V Gillis*, *GI-74-04*, St. 105, 24 November 1974, 37°05' N, 74°23' W, 1 510 - 1 535 m
 1 ♂, 1 juv., *R/V Albatross*, St. 2115, 11 November 1883, 35°49' N, 74°34' W, 1 543 m
 1 ♂, *R/V Albatross*, St. 2734, 26 October 1886, 37°23' N, 73°53' W, 1 540 m
 1 ♀, ov., *R/V Albatross*, St. 2203, 19 August 1884, 39°34' N, 71°41' W, 1 290 m

Description

Carapace, cheliped, and walking leg surfaces armed with thick, well-developed spines in larger (> 100 mm) individuals and with extremely long, slender spines in juvenile and medium-size individuals. In these latter, certain spines sometimes as long as carapace width. Rest of surface smooth, except for some small granules and scattered spinules.

Gastric region armed with four long spines in a pattern describing a square, the anterior pair somewhat larger. A somewhat smaller spine at each side of the region midway between the two pairs of gastric spines. No spine in the centre of the square; sometimes a granule in small specimens. A transverse row of four small spines that disappear in large individuals, between the anterior pair and the base of the rostrum. Cardiac region with four long spines in a pattern describing a square, the anterior pair somewhat larger than the posterior pair. Usually a small spine near the intestinal region in small individuals, normally absent in very large specimens. Sometimes a pair of spicules between the anterior pair and the gastro-cardiac groove in juveniles. Branchial regions with five-seven well-developed spines and some smaller spines disappearing in adults. Intestinal region bearing two long spines near the posterior edge of the carapace and a single, smaller, medial spine also tending to disappear in older individuals. Pterygostomial region with a small spine on the anterior, terminal angle.

Basal spine of rostrum longer than one-half carapace length, shorter in individuals larger than 100 mm. Two well-developed dorsal spines.

Carapace edge armed with numerous spines. External orbital spine overreaching the cornea in juveniles, somewhat shorter in large specimens. Anterolateral spine shorter than the external orbital spine. Hepatic spine long. Branchial edge with

six-seven well-developed spines similar to the hepatic spine in size and five-seven smaller spines, most of which disappear in adults.

Median plate on the second abdominal segment bearing several long, thick, spines. Lateral and marginal plates with some spines on the terminal borders. Plates and nodules on remaining segments with small spines somewhat more developed in juveniles.

Ocular peduncle with one or more granules dorsally, sharper smaller specimens.

Basal antennal segment with a small, terminal, outer spine. Second segment bearing a long, terminal, outer spine reaching (in large individuals) or overreaching (in juveniles) the base of the last segment of the peduncle.

Chelipeds with merus armed with some well-developed spines dorsally on the terminal, outer border. Carpus with four-five spines dorsally and three-four on the outer surface. Some tubercles on the ventral surface. Hand bearing four-five spines dorsally and some small spines in two ragged rows on the outer surface. Some granules on the ventral surface. Fingers less than 1.5 times hand length. Dorsal border of movable finger and ventral border of fixed finger rounded, with some small, spiniform granules on the base. Tufts of yellowish setae in rows.

Second walking leg somewhat larger than the first walking leg, first somewhat longer than the third, which is less than three times carapace length.

On third walking leg, coxa bearing some small spines on the terminal border. Basis-ischium with one-two thick spines on the posterior, terminal border. Merus shorter than carapace length, between five and seven times longer than high, about twice the carpus, and somewhat longer than the propodus. Anterior border bearing six-seven spines, three-four more developed than the rest; four-five spines dorsally, another four-five on the posterior margin. Carpus with two spines on the outer surface and four-five spines on the anterior border, two, the most proximal and the most terminal, thicker and longer than the others. Propodus about seven times longer than high, with six-eight spines, some well-developed, on the anterior border, interspersed with some smaller ones that disappear in large individuals. Several spines on the dorsal surface. Posterior border smooth. Dactylus slightly curved, rounded in juvenile and medium-size specimens, with the terminal third somewhat dorso-ventrally flattened in individuals larger than 100 mm, bearing spines (two anterior spines with one at each side) only on the base. Sometimes a few additional spines dorsally on the anterior border, in large individuals only.

Size

The males examined ranged between 7 and 152 mm in carapace length and 7 and 145 mm in carapace width. The females ranged from 12 to 153 mm in length and from 10 to 138 mm in width. Only three ovigerous females caught, measuring 118, 145, and 153 mm in length.

Distribution

Off the east coast of the United States and Canada north of 35°23' N, Greenland and Iceland, western Ireland, Bay of Biscay, Canary Islands, and Cape Verde, on muddy bottoms at depths between 1 267 and 3 000 m.

Remarks

Neolithodes grimaldii was described from a 45-mm long male caught by the vessel l'Hirondelle off Newfoundland at 46°04' N, 49°02' W, at a depth of 1 267 m in 1887. When describing *Neolithodes agassizii*, Smith (1882) confused the two species, with the juveniles corresponding to the species described by A. Milne Edwards & Bouvier. The two species are readily differentiable on the basis of the generalized spinulation of the carapace and pereopods, with problems in identification arising only when dealing with very young individuals. Even so, there are, as already indicated in the description of *Neolithodes agassizii*, several characters that make identification rather simple (p. 37).

The closest species are *N. vinogradovi* n. sp., from the Southeast Indian Ocean (see p. 46 for the differences between these two species), and *N. capensis* Stebbing, from off southern Africa. The main distinguishing features with respect to this latter species are set out below:

—Spines on carapace, chelipeds, and walking legs much more developed in *N. grimaldii*. Except in large individuals (more than 100 mm long), basal spine of rostrum and several on carapace at least as long as one-half carapace length, in *N. capensis* less than one-fourth carapace length. The spines remaining well-developed in large (more than 100 mm) specimens of *N. grimaldii* but becoming very short in *N. capensis* (Figures 17, 18).

—Dorsal surface and lateral edges of branchial areas armed with more spines on *N. capensis* (Plates 5, 6, 7 Branchial edges in *N. capensis* bearing eight-eleven well-developed spines, dorsal surface eight-nine, with some smaller ones in between, still present in adults. Fewer (six-seven) long spines in *N. grimaldii*, with the small spines disappearing in adults.

Neolithodes vinogradovi n. sp.

(Figure 19; Plate 8)

Material examined

Moscow University Zoological Museum
1 ♂, holotype, St. 21, 29 March 1979, 31°50'43"
S, 87°22'27" E, 1 600 m

Description

Carapace more or less pyriform, slightly wider than long. Dorsal carapace surface armed with thick, of long spines in a pattern describing a square, the rather long spines. Gastric region bearing two pairs

anterior pair slightly more developed. A small spine in the centre of the square. A long spine at each side of the region between the two pairs. Three small spines in a transverse row between the anterior pair and the rostrum. Cardiac region armed with four spines similar to the gastric spines in size, the anterior pair slightly larger than the posterior pair. Two long spines on the intestinal region. Branchial regions with six long spines similar to the gastric and cardiac spines in size, and some smaller spines scattered over the regions. Rest of carapace surface smooth, except for a few scattered granules.

Basal spine of rostrum long and practically

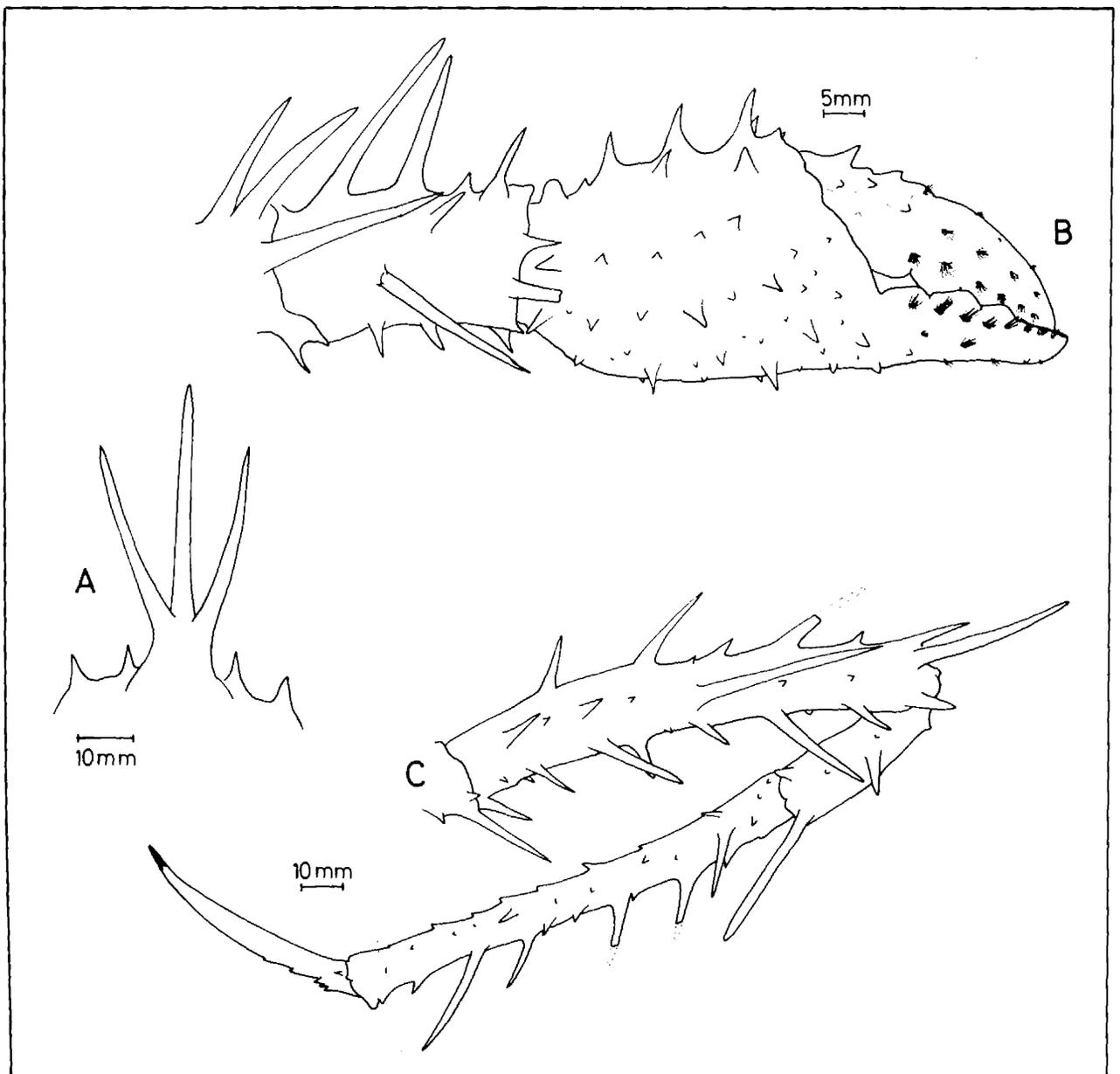


FIG. 19. *Neolithodes vinogradovi* n. sp. (MUZM, ♂, holotype, CL = 109 mm, Indian Ocean): A) dorsal view of rostrum; B) right cheliped; C) right third walking leg.

horizontal, slightly longer than one-half carapace length. Two long, divergent dorsal spines.

External orbital spine extending slightly beyond the cornea. Anterolateral spine smaller than the external orbital spine. One long hepatic spine. Lateral edges of each branchial region armed with 14 spines. Two located on the posterior carapace edge, similar to the hepatic spine in size. Smaller spines similar to the anterolateral spine in size.

Second abdominal segment bearing several long spines on the median plate and on the marginal borders of the other plates. Margins of other segments bearing spines. Small spines on medial nodules.

Chelipeds with merus bearing long spines on the terminal border. Carpus with long spines on the dorsal and outer surfaces. Small spines on ventral border. Hand armed with several poorly defined rows of thick but short spines on the dorsal, outer, and ventral borders. Fingers less than 1.5 times hand length, with numerous tufts of setae.

Walking legs long, the second longer than the first and third. Third walking leg more than three times carapace length.

On third walking leg, basis-ischium with two long spines on the terminal border. Merus 1.2 times carapace length and about seven times longer than high. Several long spines on the anterior, posterior, and dorsal borders, with some smaller spines scattered in between. Carpus one-half merus length, with a long spine on the anterior, terminal border, another in the middle of the anterior border, and another on the dorsal border. Propodus somewhat shorter than the merus, about nine times longer than high, and 1.5 times the dactylus, with several long spines on the anterior border and some smaller ones on the outer surface and ventral border. Dactylus rounded in section, with some spines on the base and several corneous spinules on the anterior border.

Size

The single specimen captured has a carapace

length of 109 mm and a carapace width of 113 mm.

Distribution

Southeast Indian Ocean, 31°50'43" S, 87°22'27" E, 1 600 m.

Remarks

Neolithodes vinogradovi is readily distinguishable from the other species of this genus because of the long spines on the chelipeds and walking legs. It belongs to the group of species without small spines interspersed among the main spines on the carapace and pereopods. The closest species is *N. grimaldii* A. Milne Edwards & Bouvier, from the North Atlantic, but it is readily differentiated by the following characters:

—For specimens the same size, spines on the carapace, chelipeds, and walking legs much longer in this new species (Figures 18, 19; Plates 6, 7, 8).

—Walking legs much more elongate in this new species. Third walking leg nearly 3.5 times carapace length in *N. vinogradovi*, whereas it was never more than 2.7 times carapace length in any of the specimens of *N. grimaldii* examined.

N. vinogradovi also resembles *N. capensis* Stebbing from off South Africa, but the spines in this latter species are proportionally much smaller than in the new species. The basal spine of the rostrum and various spines on the carapace, chelipeds, and walking legs are longer than one-half carapace length in *N. vinogradovi*, smaller in *N. capensis* (Figures 17, 19; Plates 5, 8).

Etymology

This new species is dedicated to Dr. L.G. Vinogradov, in recognition of his important contribution to our knowledge of the family Lithodidae.

Genus *LITHODES* Latreille, 1806

(Masculine gender)

Lithodes: Latreille, 1806, p. 39; Latreille, 1810, p. 97; Leach, 1816, Pl. 24; Samouelle, 1819, p. 90; Desmarest, 1830, p. 278; Cuvier, 1833, p. 172; H. Milne Edwards, 1837, p. 184; Lucas, 1840, p. 452; Bell, 1846, p. 163; Nicolet, 1849, p. 180; de Haan, 1849, p. 214; Dana, 1852, p. 427; White, 1856, p. 133; Henderson, 1888, p.

42; Bouvier, 1896, pp. 10, 20; Ortmann, 1898, p. 1148; Stebbing, 1905, p. 69; Lagerberg, 1908, p. 63; Balss, 1913, p. 73; Stebbing, 1914, p. 274; Schmitt, 1921, pp. 148, 161; Rathbun, 1929, p. 29; Makarov, 1938 (1962), pp. 236, 249; Balss, 1957, p. 1592; Hemming, 1958, p. 175; Yaldwyn and Dawson, 1970, p. 276; Sakai, 1976, p. 692; Sakai, 1978, p. 12; Boschi, 1981, p. 737; Williams, 1984, p. 230

Pseudolithodes: Birstein and Vinogradov, 1972, p. 356

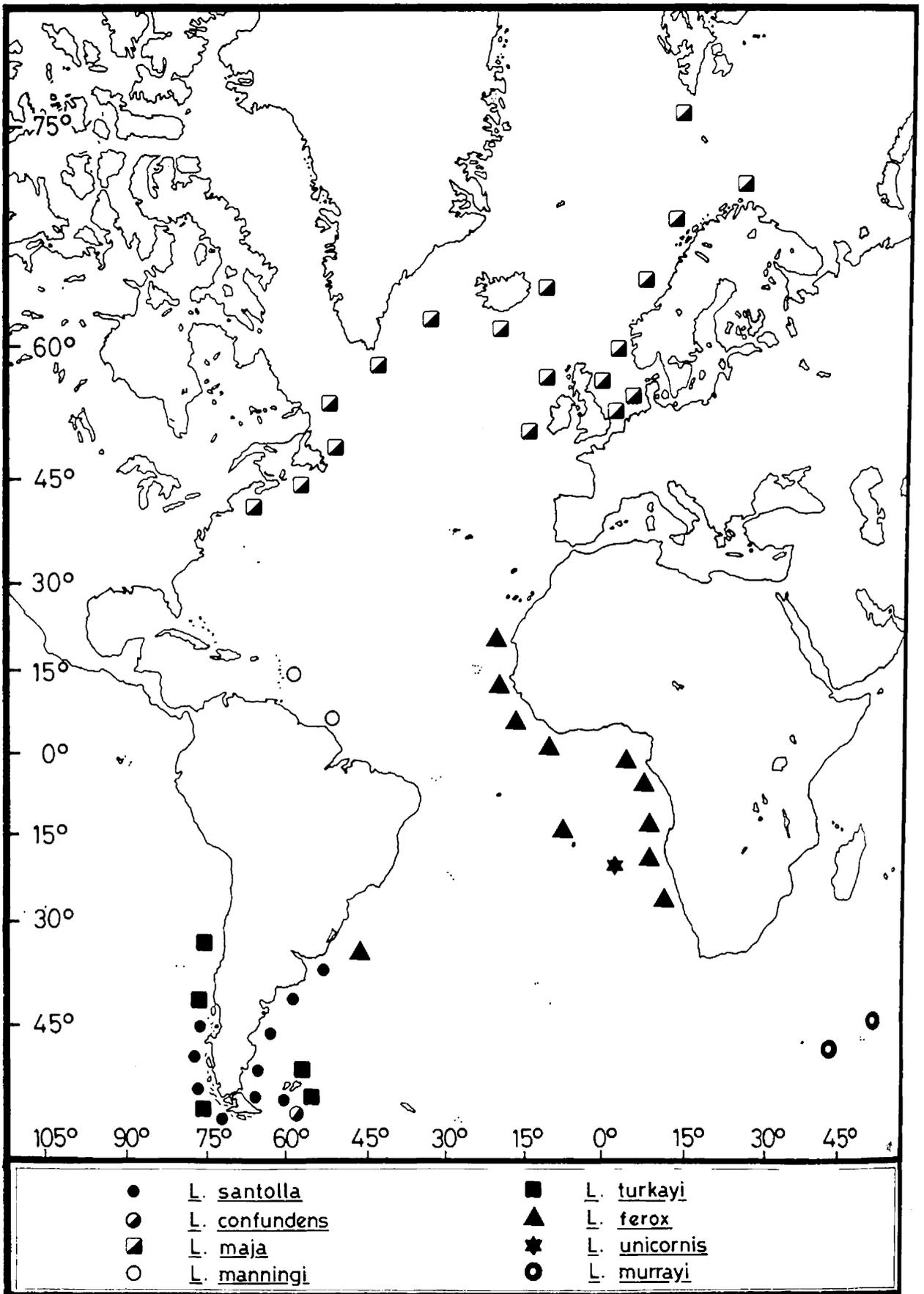


FIG. 20. Species distribution for the genus *Lithodes* Latreille in the Atlantic Ocean.

Type species: *Lithodes maja* (Linnaeus, 1758)

Description

Carapace usually well calcified. Regions well-defined, more or less convex, the gastric region somewhat more prominent than the others. Cardiac region triangular in shape, separated from the gastric region by a deep, transverse groove and from the branchial regions by shallow sutures. Cervical groove poorly defined.

Carapace, chelipeds, and walking legs armed with spines and granules variable in both size and number. Spines proportionally larger in juveniles as compared to adults.

Rostrum formed by a normally bifid, more or less long anterior projection with one or two pairs of spines dorsally. A strong, curved basal spine.

Sternal region with a deep, medial groove between the first pair of walking legs.

Second abdominal segment formed by a median plate fused with the two lateral plates and one pair of marginal plates. All plates fused on some specimens. Median plates on third to fifth segments replaced by a membranous region covered with calcified nodules. Lateral and marginal plates clearly calcified nodules. Lateral and marginal plates clearly differentiated in both males and females. Lateral plates in females more developed on the left side than on the right and fused with the marginal plates, making the abdomen asymmetrical. Marginal plates usually subdivided.

Second article on antennular peduncle thicker than the others and as long as the last segment, bearing a dorsal groove. Last segment twice as long as the

penultimate segment. Flagellum shorter than carapace length. Scaphocerite normally absent, when present very simple, formed by a single spine, sometimes with an accessory spine.

Third maxilliped with a crista dentata with 11-13 corneous denticles and one accessory denticle. Sometimes a pair of spines on the sternal region between the third pair of maxillipeds. Chelipeds subequal in length, the right cheliped more robust. Proximal two-thirds of cutting edges of fingers on right cheliped with several thick, rounded teeth, the terminal third covered with a corneous unguis. Teeth on left cheliped smaller but more numerous; terminal third covered by a corneous unguis. All fingers bearing more or less numerous tufts of setae.

Walking legs elongate, the second longer than the first and third. Third walking leg normally two to three times carapace length.

The genus *Lithodes* Latreille comprises 15 species, seven of which are found in the Atlantic Ocean: *L. maja* (Linnaeus, 1758), *L. santolla* (Molina, 1782), *L. ferox* Filhol, 1885, *L. unicornis* Macpherson, 1984, *L. turkayi* n. sp., *L. confundens* n. sp., and *L. manningi* n. sp.

L. santolla and *L. turkayi* are also present in the Southeast Pacific (Figure 20).

Seven more species are indigenous to the Pacific Ocean: *L. turritus* Ortmann, 1892, *L. panamensis* Faxon, 1893, *L. aequispina* Benedict, 1894, *L. couesi* Benedict, 1894, *L. longispina* Sakai, 1971, *L. wirakocha* Haig, 1974, and *L. nintokuae* Sakai, 1978. An eighth species, *L. murrayi* Henderson, 1888, has been reported near the coast of New Zealand, although it is indigenous to the Southwest Indian Ocean, where it is the only species of this genus reported to date.

KEY TO THE SPECIES OF THE GENUS *LITHODES* IN THE ATLANTIC OCEAN

1. Anterior projection of rostrum short, revealing the basal spine (Figure 22A, F) 2
- Anterior projection of rostrum long, concealing the basal spine (Figure 25A) 3
2. Each branchial region armed with 15-19 well-developed dorsal spines, rest of surface smooth. Walking legs armed with a few thick spines *L. santolla* (p. 50)
- Each branchial region armed dorsally with around 30 small spines or spiniform granules. Walking legs armed with numerous small spines and granules *L. confundens* (p. 55)
3. Anterior projection of rostrum practically horizontal over its entire length (Figure 25B). Lateral edges of carapace armed with very thick spines *L. maja* (p. 58)
- At least the terminal portion of anterior projection of rostrum slanting slightly upwards (Figure 28B). Lateral edges of carapace armed with some well-developed but usually not very thick spines 4
4. Five dorsal spines on each branchial region. Two pairs of well-developed cardiac spines, the anterior pair larger than the posterior pair (Plates 15, 16) *L. ferox* (p. 64)

- Four dorsal spines on each branchial region. One pair of gastric spines and, anterior to these, a pair of more or less acute granules (Plate 17) 5
- 5. Articles on walking legs armed with numerous granules and spines (Figure 30) *L. turkayi* (p. 68)
- Articles on walking legs armed with some scattered spines, rest of surface practically smooth (Figure 31) 6
- 6. Walking legs very long and slender. On third walking leg, merus more than seven times longer than high, propodus more than ten times longer than high *L. manningi* (p. 62)
- Walking legs moderately long. On third walking leg, merus less than seven times longer than high, propodus less than ten times longer than high 7
- 7. Anterior projection of rostrum thick. Ratio of anterior projection thickness: distance between external orbital spines ranging between 0.3 and 0.4 *L. murrayi** (p. 70)
- Anterior projection of rostrum slender. Ratio of anterior projection thickness: distance between external orbital spines around 0.2 *L. unicornis* (p. 73)

* Not cited in the Atlantic Ocean.

Lithodes santolla (Molina, 1782)

(Figures 21, 22, 23; Plates 9, 10)

Cancer santolla Molina, 1782, p. 207; Molina, 1810, p. 106; ? Rathbun, 1910, p. 611

Lithodes santolla Philippi, 1867, p. 777; Bahomonde, 1961, p. 5

Lithodes antarctica Jacquinot, 1844, Pls. 7, 8, Figs. 9-14; H. Milne Edwards and Lucas, 1844, p. 32; Nicolet, 1849, p. 182; de Haan, 1849, p. 217; Dana, 1852, p. 427; White, 1856, p. 133; Jacquinot, 1853, p. 90; Dana, 1855, Pl. 26, Fig. 15; Cunningham, 1871, p. 494; Targioni-Tozzetti, 1872a, p. 398; Targioni-Tozzetti, 1872b, p. 470; Targioni-Tozzetti, 1877, p. 227; Cano, 1888, pp. 164, 177; Cano, 1889, p. 264; Bouvier, 1895, p. 181, Pl. 11, Figs. 17, 19, 20, Pl. 12, Figs. 4, 17, 18, 28, Pl. 13, Figs. 2, 4, 6; Bouvier, 1896, p. 23; Rathbun, 1910, p. 595; Ortmann, 1911, p. 657; Lorenzen *et al.*, 1979, Pl. 69, Fig. 38

Lithodes antarcticus White, 1847, p. 56; Miers, 1881, p. 71; Henderson, 1888 (in list); Ortmann, 1892, p. 321; Lenz, 1902, p. 742; Porter, 1903, p. 259, Pl. 16; Lagerberg, 1905, p. 12; Doflein and Balss, 1912, p. 32; Stebbing, 1914, p. 274; Haig, 1955, p. 13; Garth *et al.*, 1967, p. 175; Zarenkov, 1970, p. 185; Scelzo and Boschi, 1973, p. 204; Retamal, 1973, p. 11; Retamal, 1974, p. 11; Boschi, 1979 (in list); Boschi *et al.*, 1981, p. 243; Retamal, 1981 (in list, Fig. 57); Takeda and Hatanaka, 1984, p. 12; Dawson and Yaldwyn, 1985 (in list and in key); Takeda, 1986, p. 330 (figure, text)

Pseudolithodes zenkevitchi Birstein and Vinogradov, 1972, p. 356, Figs. 5, 6

Material examined

Muséum National d'Histoire Naturelle, Paris

1 ♂, 3 ♀, Expédition de la Zelé, Strait of Magellan

1 ♂, Orange Bay, Mission Cap Horn, shore base (1882 - 1883)

3 ♀, La Romanche, Orange Bay

1 ♂, Orange Bay, Mission Cap Horn

1 ♂, Chile, Mr. Gay Collection

1 ♀, 7 April 1961, 38°22' S, 55°37' W, 135 m

Rijksmuseum van Natuurlijke Historie, Leiden

2 ♂, Strait of Magellan, Punta Arenas, 5 July 1978, 52°47' S, 70°44' W

1 ♀, Strait of Magellan, Punta Arenas, December 1968, 30 m

British Museum (Natural History), London

1 ♀ ov., 2 ♀, 2 ♂, Challenger Coll., Puerto Bueno, Chile

1 ♀, 2 ♂, Borgia Bay, 1 January 1868

1 ♀, 3 ♂, Strait of Magellan, Haslam Collection

Instituto de Ciencias del Mar, Barcelona

1 ♀, 1 ♂, Strait of Magellan, Dr. E.E. Boschi Collection

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, Chilean coast (no location listed)

1 ♀, 3 ♂, R/V Hero, Cruise no. 69-5, St. 51, 20 October 1969, 53°32' S, 7°30' W, intertidal zone, rocky area

2 ♂, Punta Arenas

3 ♀, 4 ♂, Burwood Banks, USARP Cruise no. 11, St. 974, 12 February 1964, 53°32.3' S, 64°55.6' W, 119 - 124 m

13 ♀ ov., 1 ♂, USARP, R/V Eltanin, Cruise no. 5,

St. 214, 22 September 1962, 42°07.8' S, 74°32' W, 145 m

3 ♀, 4 ♂, USARP, R/V Hero, Cruise no. 715, St. 867, 22 October 1971, 54°45.7' S, 64°09.5' W, 1 m

2 ♀, 5 ♂, USARP, St. 69-25 (dive), 18 May 1969, 53°51' S, 70°25.5' W, 2-9 m

1 ♀, R/V Hero, Cruise no. 715, St. 857, 20 October 1971, 54°45.4' S, 64°09.9' W, 14 m

1 ♂, 1 ♀, R/V Hero, Cruise no. 702, St. 475, 26 April 1970, 53°39.4' S, 70°55.1' W, 18 - 27 m

1 ♂, R/V Hero, Cruise no. 702, St. 476, 26 April 1970, 53°39.4' S, 70°55.1' W, 18 - 27 m

3 ♀, 5 ♂, R/V Hero, Cruise no. 712, St. 71-2-39, 20 May 1971, 54°45.4' S, 64°10.1' W, 0 - 1 m

1 ♀, 3 ♂, R/V Hero, Cruise no. 702, St. 488, 20 April 1970, 53°49.3' S, 70°25' W, 13 - 29 m

3 ♂, R/V Eltanin, Cruise no. 21, St. 295, 21 January 1966, purchased

2 ♂, R/V Hero, Cruise no. 702, St. 468, 25 April 1970, 53°39.3' S, 70°55.4' W, 38 - 42 m

1 ♀, R/V Hero, Cruise no. 692, St. 404, 17 May 1969, 53°35' S, 69°45' W, 37 - 46 m

8 ♀ ov., 3 ♀, 5 ♂, R/V Hero, Cruise no. 702, St. 466, 25 August 1970, 53°39' S, 70°55.5' W, 20 m

Moscow University Zoological Museum

1 ♀ ov. (holotype of *Pseudolithodes zenkevitchi*), 11

April 1965, St. 245, 36°29.6' S, 53°46.7' W, 160 m

1 ♀, 1 ♂, (paratypes of *P. zenkevitchi*), St. 1056, 22 April 1967, 36°50.5' S, 53°55' W, 150 - 155 m

1 ♂, (paratype of *P. zenkevitchi*), St. 1010, 7 April 1967, 51°01' S, 56°51' W, 255 - 352 m

Description

Carapace more or less pentagonal. Carapace, chelipeds, and walking legs armed with numerous spines. In contrast to other species, spines mostly similar in size, normally larger in small and medium-size individuals, although some variation in the size, not the number, of spines may be observable between individuals the same length. Rest of surface smooth, except for scattered granules.

Carapace regions convex, prominence of regions similar. Gastric region armed medially with two pairs of spines the same size in a pattern describing a square. One spine outside each of the anterior spines. One or two small spines behind the posterior pair. A transverse row of four small spines between the base of the rostrum and the anterior pair. Some scattered, spiniform granules. Cardiac region with four spines of similar size, also arranged in a square-shaped

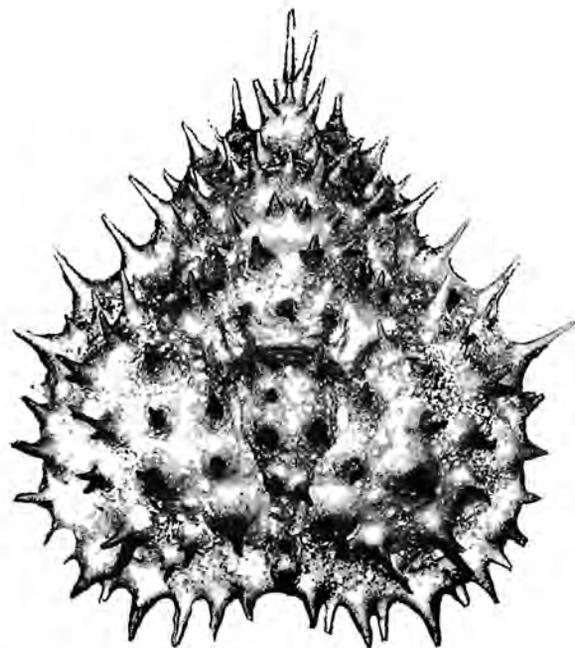
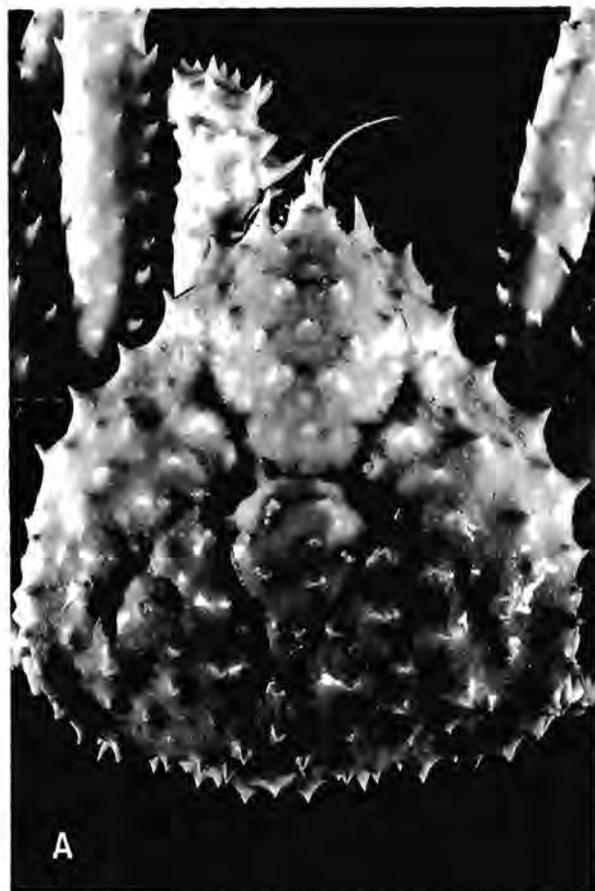


FIG. 21. *Lithodes santolla* (Molina) (A: ICM, ♀, CL = 107 mm, Beagle Channel; B: MP, ♂, CL = 93 mm, Strait of Magellan): dorsal view of carapace.

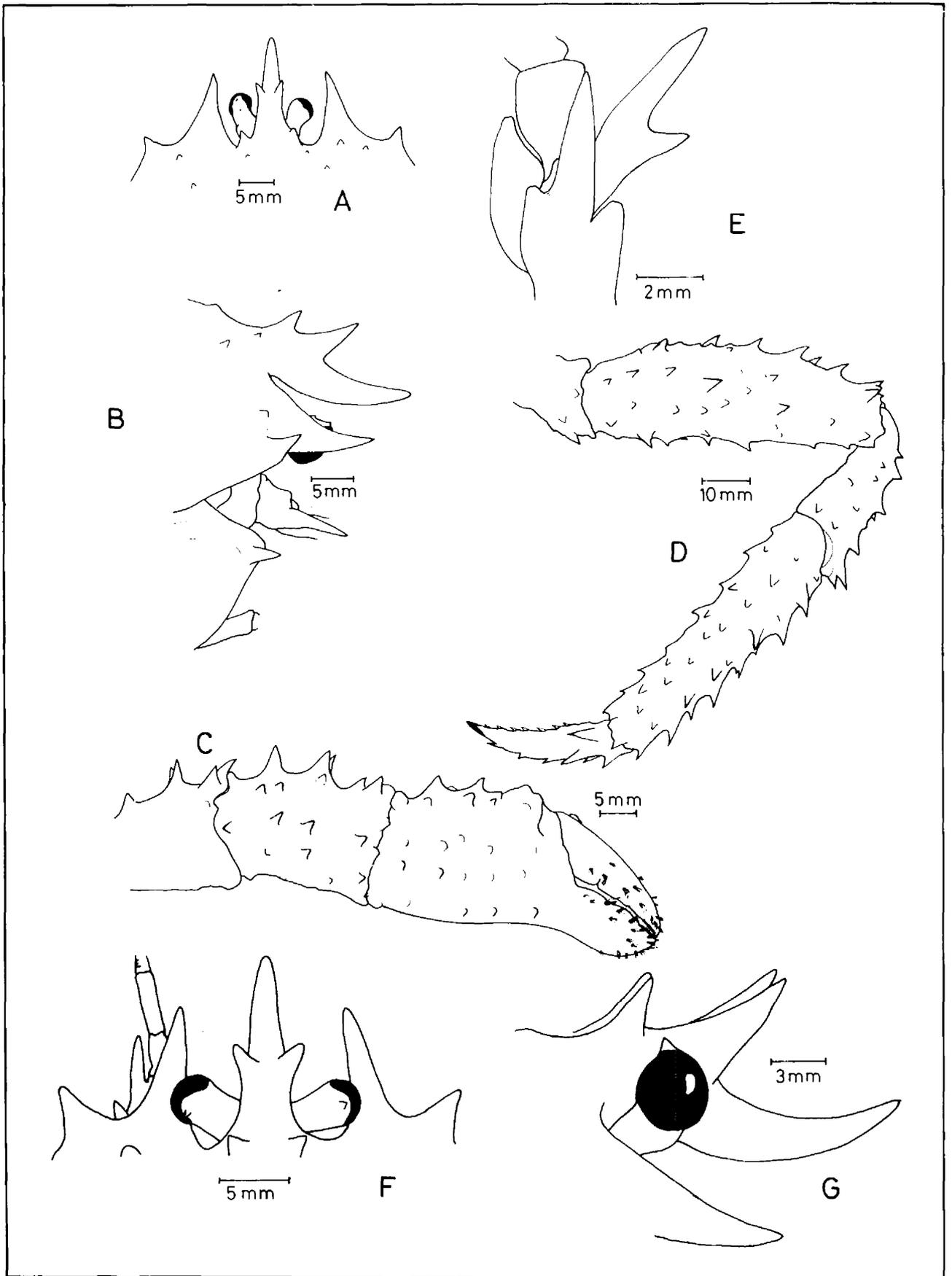


FIG. 22. *Lithodes santolla* (Molina) (A-D: ICM, ♀, CL = 107 mm, Beagle Channel; E: BM, ♀ ov., CL = 103 mm, Puerto Bueno, Chile; F-G: USNM, ♂, CL = 75 mm, USARP, Eltanin, Cruise no. 5, St. 214): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg; E) left antenna; F) anterior part of carapace, dorsal view; G) anterior part of carapace, lateral view.

pattern. A single, smaller, medial spine behind the posterior pair. Sometimes one or two spiniform granules medially, near the intestinal region. Each branchial region armed with 15-20 spines, uniformly distributed, mostly similar in size to the gastric and cardiac spines. Intestinal region bearing two spines near the posterior edge of the carapace, similar to the branchial spines in size. Pterygostomial region with a small spine on the terminal angle.

Rostrum with a short, bifid, somewhat upwardly directed anterior projection that barely overreaches the corneas, without reaching the tip of the antennal peduncle. A pair of dorsal spines on the base. Basal spine well-developed, clearly visible dorsally, overreaching the last antennal segment.

Long, thick, external orbital spine nearly reaching the tip of the antennal peduncle, larger than the other

spines on the carapace. Antero-external spine the same size as the hepatic spine. A small spine between the hepatic and anterolateral spines. Three spines between the cervical groove and the gastro-cardiac groove, the first similar to the hepatic spine in size, the other two slightly larger. Posterior to these, eight-eleven spines, the largest slightly larger than the hepatic spine.

Second abdominal segment consisting of three plates. One pair of medial spines, and several spines on the borders of both the median and lateral plates. Numerous spines or spiniform granules on the lateral plates on the third to fifth segments. Spiniform nodules medially.

Ocular peduncles with some small granules on the dorsal surface. Basal article of the antennal segment armed with a small antero-external spine. Outer

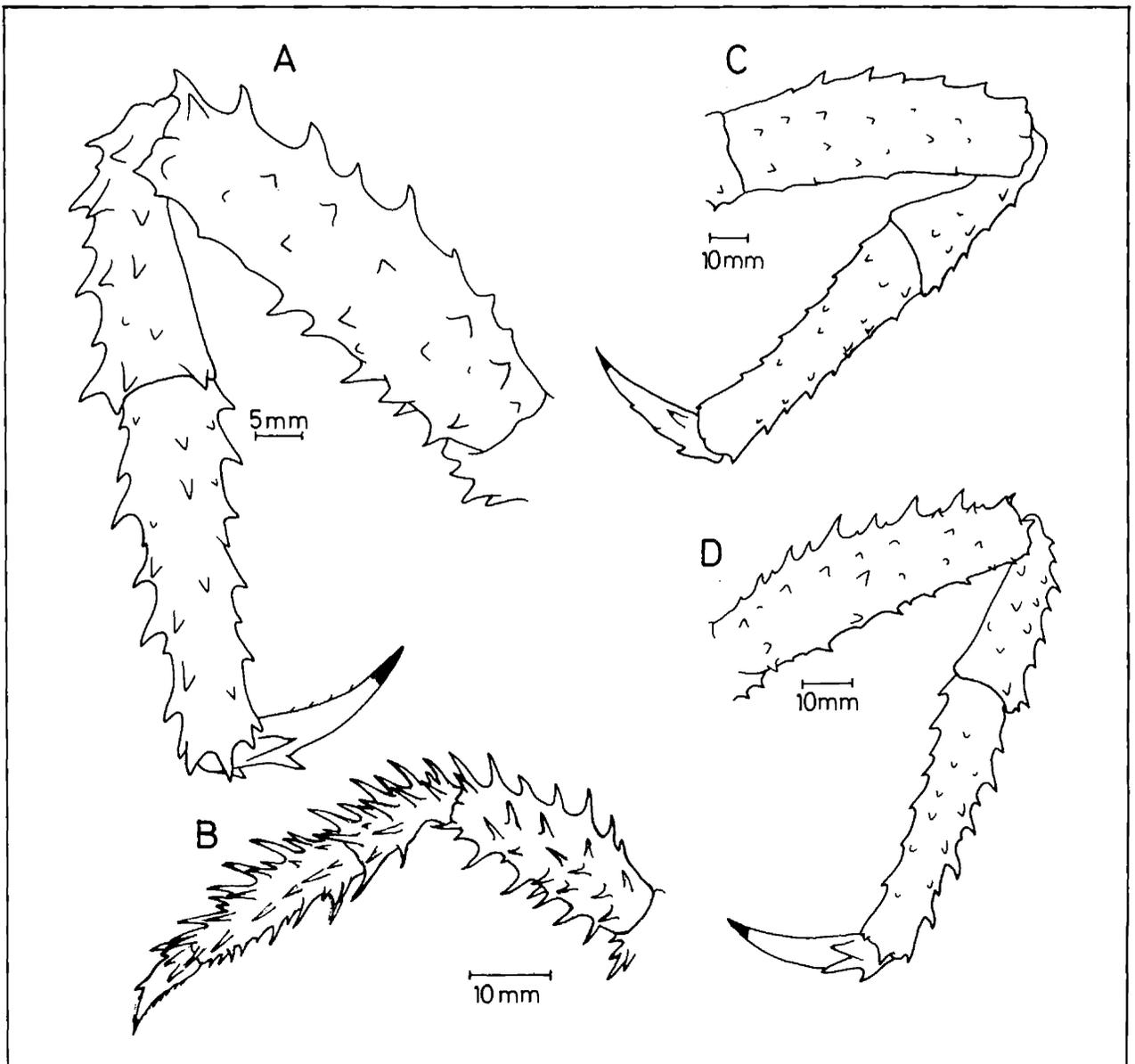


FIG. 23. *Lithodes santolla* (Molina) (A: USNM, ♂, CL = 75 mm, USARP, Eltanin, Cruise no. 5, St. 214; B: MP, ♀ CL = 43 mm, Strait of Magellan; C: MUZM, ♀ ov., CL = 142 mm, St. 245; D: MUZM, ♂, CL = 73 mm, St. 1010): A) - B) left third walking leg; C) - D) right third walking leg.

surface of second segment bearing a terminal spine barely reaching the base of the last antennal segment.

Chelipeds with merus armed with several spines, those on the dorsal and terminal borders more developed. Carpus with four-five spines dorsally, several on the outer and ventral surfaces, and one-two spines on the inner border. Hand with two poorly defined rows of spines dorsally. Two rows of spiniform granules on the outer surface and several granules on the ventral border. Some granules on dorsal surface of movable finger. Tufts of setae on both fingers.

Third pair of walking legs between 2 and 2.5 times carapace length (longer in males than in females). Coxa practically smooth, except for a few scattered granules. Several spines on posterior border of basis-ischium. Merus somewhat shorter than carapace length, between three and four times longer than high, and somewhat more than 1.5 times the carpus, with a row of eight-ten strong spines on the anterior border. Dorsally, two ranged rows of five-seven smaller spines. Several spines on posterior border. Carpus with an anterior row of five-seven spines and several more spines on the dorsal surface. Propodus somewhat shorter than the merus, between three and four times longer than high, and about 1.5 times the dactylus. A row of six-eight spines on the anterior margin and another row of six-seven spines on the posterior margin, the latter somewhat smaller than the former, and several spines on the dorsal surface. Dactylus with three spines on the base of the anterior margin, plus one on each side. One-two corneous spinules on the anterior border and a row of six corneous spinelets on the posterior border, barely visible in large individuals. Dactylus slightly curved. No setae. Ventral surfaces of all articles smooth, sometimes with a few more or less spiniform granules.

Size

The males examined ranged between 12 and 184 mm in carapace length, the females between 14 and 142 mm. Carapace width ranged between 14 and 190 mm in the males and between 14 and 140 mm in the females.

Boschi *et al.* (1984) reported a male specimen taken in the Kackinlay region off Argentina measuring 198 mm in length and 250 mm in width.

Colour

More or less uniformly red in colour on both carapace and pereopods, sometimes with a violet tinge. Boschi *et al.* (1984) noted that oceanic specimens were shades of pink. Takeda (1968) included a colour photograph of an adult specimen.

Distribution

This species is distributed over a wide range off the coast of Chile, from Chiloé to Tierra del Fuego. South Atlantic coast from the Strait of Magellan to Uruguay. In the vicinity of the Falkland Islands (Malvinas). Some reports of *L. santolla* probably refer to *L. confundens* n. sp., given their taxonomic and geographic proximity.

Boschi *et al.* (1984) presented copious information on the habitat of *L. santolla* and reported that it usually inhabits the intertidal zone to more than 700 m. Nevertheless, maximum concentrations are located between 10 and 50 m.

Biology

Lithodes santolla is the most extensively studied Atlantic species of the family Lithodidae. Numerous works dealing with its fecundity and sexual maturity (Guzmán and Campodónico, 1972; Campodónico *et al.*, 1974; Vinuesa, 1984), biometry (Stuardo and Solís 1963), and general and fisheries biology (Boschi *et al.*, 1984; Vinuesa *et al.*, 1985) have been published.

The larvae of *Lithodes santolla* hatch between September and October, sometimes November. Females carry from 5 000 to 30 000 eggs, depending on their size. The larvae attaining 2.4 mm at the end of larval development. Molting in males normally takes place in March and April, whereas females molt after the larvae have hatched (November-December). Sexual maturity has its onset at a length of around 75 mm in males, around 60 mm in females. Growth is slow, a male reaching 68 mm at three years of age and 143 mm at ten years.

Common names

In Spanish, "centolla", "centolla del sur" (Argentina and Chile). FAO names are southern king crab (English), "crabe royal Patagonian" (French), and "centolla patagónica" (Spanish).

Remarks

Lithodes santolla was described briefly but unmistakably by Molina in 1782 from material collected off the coast of Chile. The species was cited earlier, in 1776, in an anonymous work, and Molina himself cited it once again in a later work that appeared in 1810. Molina named it *santolla* in similarity with its Spanish common name, "centolla".

Numerous editions of Molina's works were published: Spanish (1788, 1878), German (1786), French (1799), US (1808), British (1809). It is

therefore surprising that his description has not been acknowledged, particularly since other species he described have been correctly attributed to him. Nicolet (1849) cited Molinas works without acknowledging his description of this species. Rathbun (1910) and Haig (1955) mentioned the likelihood of its being conspecific with *L. antarcticus*. Philippi (1867) Bahamonde (1961) and Baez et al. (1986) are the only authors who have acknowledged Molina's authorship.

As Haig (1955) pointed out, the name *Lithodes antarcticus* should be attributed to Jacquinot. The year of the description is, however, problematical. The results of many of the expeditions were published in several parts. Sherbon and Woodward (1934) cited the date of the text, 1853, but they did not give the date of the figures, which were published separately. Milne Edwards and Lucas (1842 - 1844) cited *Lithodes antarctica* in their "Voyage dans l'Amérique méridionale", volume 6 (part 1), page 32, plate 7 (Expéd. de l'Astrolabe et la Zélée, Crust.). Consequently, since the exact date of publication of the figures is unknown, the correct date, in accordance with the International Code of Nomenclature, is 1844.

As is the case for some other species in this genus, *L. santolla* presents considerable variability in the size of its spines (Figures 21, 23). This variability does not appear to be linked to individual size, sex, or

geographical area. The frequency of such spiny individuals is not inconsiderable (Boschi, personal communication), and they are caught together with individuals with less developed spines, hence it does not seem likely that there are two separate populations.

Birstein and Vinogradov (1972) described a new species in the Southeast Atlantic, *Pseudolithodes zenkevitchi*, which Dawson and Yaldwyn (1985) regarded as synonymous with *L. santolla*. Examination of the holotype and some of the paratypes of *P. zenkevitchi* and the material for *L. santolla* confirmed that they are indeed conspecific. The holotype is a large, ovigerous female (CL = 142 mm) taken on the continental shelf off northern Argentina (Plate 9A); the number of spines on both the carapace and the pereopods was similar to that on the other specimens of *L. santolla* examined. The paratypes examined, which were caught in the same general area as the holotype or near the Falkland Islands (Malvinas), bear a close resemblance.

L. santolla is closely related to *L. confundens* n. sp., from the Southwest Atlantic, in that they are the only two species in this genus with a short anterior projection of the rostrum, revealing the basal spine dorsally. The two species are differentiated by the spines on the carapace, chelipeds, and walking legs (p. 57), which are always smaller and much more numerous in *L. confundens*.

Lithodes confundens n. sp.

(Figure 24; Plates 11, 12)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, holotype, 1 ♀ ov., allotype, 5 ♂, 1 ♀ paratypes, USARP Eltanin, Cruise no. 6, St. 346, 4 December 1962, 54°02.07' S, 58°40.4' W, 101 - 119 m

British Museum (Natural History), London

1 ♂, paratype, St. 1285, 7 December 1985, Falkland Island (Malvinas) area

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♂, paratype, Strait of Magellan, Punta Arenas, December 1968, 50 m

Description

Carapace more or less pentagonal, armed with numerous spinelets and spiniform granules. No substantial variation in spine size observable among the specimens examined.

Regions convex, prominence of regions similar. Gastric region bearing four small spines in a pattern describing a square. A transverse row of four spiniform granules between the anterior pair and the base of the rostrum. A small spiniform granule externally to each anterior spine. Numerous spiniform granules throughout the region. Cardiac region with four small spines in a square-shaped pattern, along with numerous spinelets or spiniform granules distributed over the region. Each branchial region with around 30 small spines, generally similar in size, although some may have turned into small, spiniform granules in large individuals. Intestinal region bearing a pair of small spines. A small spine on the terminal angle of the pterygostomial region. Most of the spines on the different regions rather similar in size.

Rostrum with a short, bifid, somewhat upwardly directed anterior projection extending slightly beyond the corneas without reaching the end of the antennal peduncle. A pair of dorsal spines on the base, and usually another, smaller pair (or granules

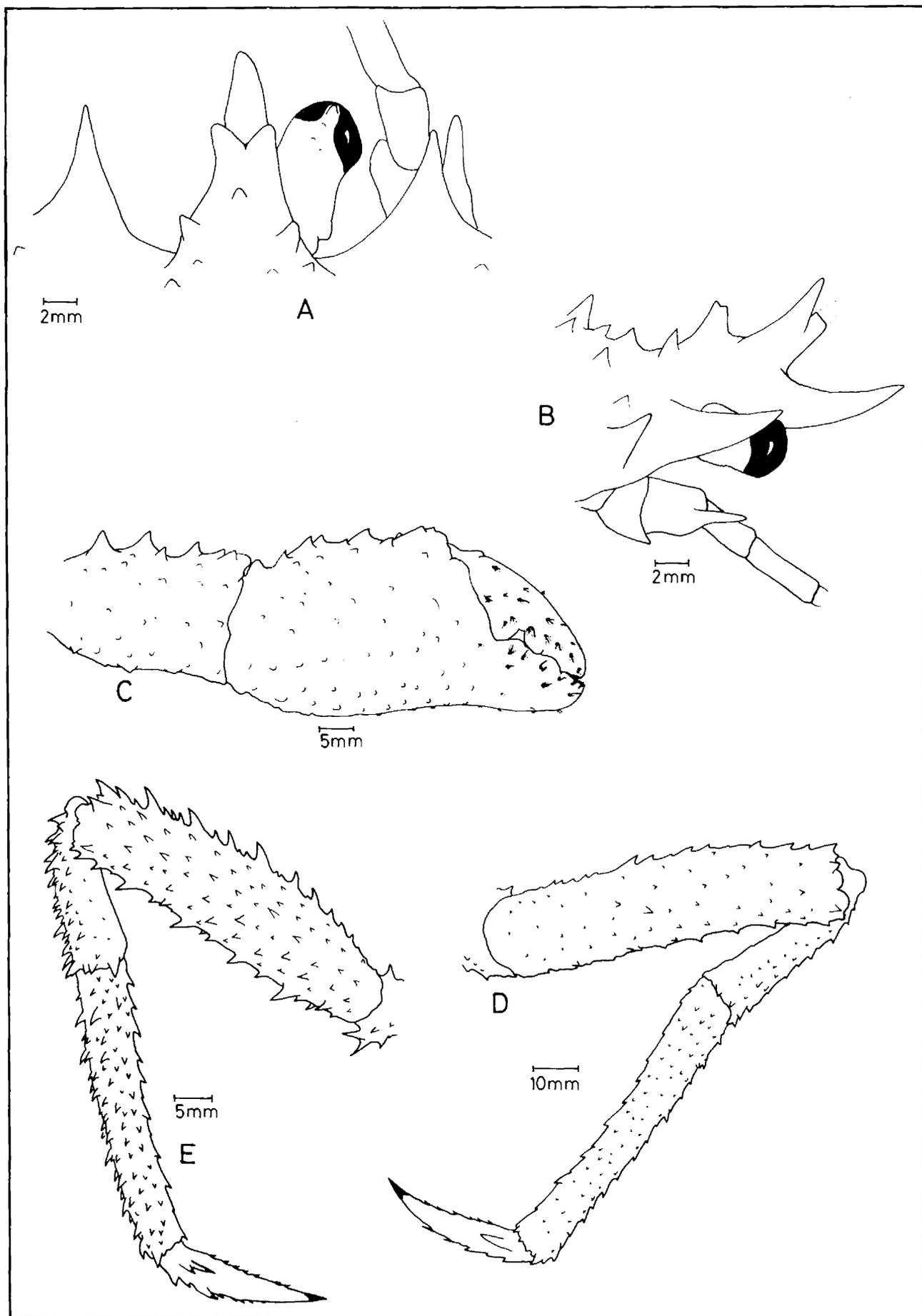


FIG. 24. *Lithodes confundens* n. sp. (A, C, D: USNM, ♂, holotype, CL = 84 mm, USARP, Eltanin, Cruise no. 6, St. 346; B - E: BM, ♂, paratype, CL = 52 mm, St. 1285): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg; E) left third walking leg.

in some specimens) near the orbits. Sometimes a single, small spine on the dorsal surface of the anterior projection and another between the two dorsal pairs. Basal spine well-developed and visible in dorsal view, without overreaching the tip of the antennal peduncle, except in very young individuals. External orbital spine well-developed, larger than the other spines on the carapace, and extending beyond the base of the last antennal segment. Anterolateral spine smaller than the external orbital spine. Hepatic spine similar to the anterolateral spine in size. One-three small spines between these two. From the cervical groove to the level of the gastro-cardiac groove, three spines similar in size to the hepatic spine, with one or two smaller spines interspersed. Posterior to these another 10-12 small spines similar to the more anterior spines in size.

Second abdominal segment bearing a pair of small spines medially and several more on the borders on both the median and lateral plates. Numerous non-spiniform granules on the lateral plates on the third to fifth segments. Calcareous, non-spiniform nodules medially.

Ocular peduncle with some granules on the dorsal surface.

Basal segment of antennal peduncle with a small spine on the antero-external angle. Second segment with a terminal, outer spine.

Chelipeds with merus bearing several spines, more developed on the dorsal and terminal borders. Carpus armed with five-six spines dorsally and several more scattered over the outer, ventral surface. Hand bearing two poorly defined rows of spines dorsally. Two rows of more or less spiniform granules on the outer surface, others on the ventral and inner surfaces. Movable finger with some granules dorsally on the base. Tufts of setae on both fingers.

Third pair of walking legs between 2.3 and 3 times carapace length. Coxa bearing some scattered granules. Basis-ischium with small spines on the posterior, terminal border. Merus equal to or slightly less than carapace length, almost twice carpus length, and between 3.4 and 4.5 times longer than high (the lower values are for females). A row of 12-13 small spines on the anterior border. Two ragged rows of seven-eight small spines each on the posterior margin, smaller than the spines on the anterior border. Numerous small spines spread over the dorsal surface. Carpus armed with an anterior row of six-seven small spines with several smaller spines interspersed or slightly to either side. Various spinules on the outer surface. Propodus somewhat shorter than the merus, between four and five times longer than high, and around 1.5 times the dactylus. A row of 10-13 spines on the anterior border. As on the carpus, this row poorly defined, with numerous small spines to either side. Another row of 11-12 somewhat smaller spines on the posterior margin. Numerous spinules on the dorsal surface. Ventral

surface of propodus bearing two more or less well-defined rows of small spines. Ventral surface practically smooth on merus and carpus. Dactylus with four-five spines on the base of the anterior margin, one-two spines on either side, three-four corneous spines along the anterior border, and seven-eight small, corneous spinelets on the posterior margin. Dactylus slightly curved, without setae.

Size

Carapace length is 84 mm, carapace width 85 mm in the holotype. The allotype is 75 mm long and 73 mm wide. In the rest of the paratypes, carapace length ranges from 52 to 100 mm. The remaining female is 63 mm long and 61 mm wide.

Distribution

South of the Falkland Islands (Malvinas) (54°02.07' S, 58°40.4' W), Strait of Magellan (Punta Arenas), on muddy bottoms between 50 and 119 m in depth.

Because of the resemblance of this species to *Lithodes santolla* (Molina), it is likely that some reports of *L. santolla* in fact refer to this new species. Nevertheless, further study is required in order to determine its exact range.

Remarks

Lithodes confundens n. sp. is closely related to *L. santolla* (Molina), from the southern coasts of South America, in the shape of the rostrum, which is quite distinct from the rest of the species in this genus. Several characters readily distinguish these two species:

—Spinulation of the carapace, chelipeds, and walking legs considerably different. Fewer spines on the dorsal carapace surface in *L. santolla*, but the spines all much larger than those on *L. confundens*. Each branchial region in *L. santolla* bearing some 15-20 spines, whereas in the new species there are about 30 small spines (Plates 9-12).

—Fewer but much larger spines on the articles of the walking legs and chelipeds in *L. santolla*. Articles covered with many small spinelets in *L. confundens* (Figures 23, 24).

The presence of two more or less proximate species, in the Southwest Atlantic raises the possibility that we are dealing with a variant or subspecies. However, no intermediate characters that would support such a possibility were observed in any of the specimens examined. For this reason, and in view of the fact that the most important

specific characters (number of spines on the carapace and walking legs) are constant in all the *Lithodes* species examined (see p. 49), they have been considered separate species. Clearly, additional research into the distribution ranges of both species could shed more light on the matter.

Etymology

The name *confundens* is derived from the Latin "confundo", referring to the resemblance between this species and *L. santolla* and the confusion that could therefore arise between the two.

Lithodes maja (Linnaeus, 1758)

(Figures 25, 26; Plate 13)

Cancer Maja Linnaeus, 1758, p. 269 (in part); Herbst, 1782, p. 219, Pl. XV, Fig. 87; Olivier, 1791, p. 175; Fabricius, 1793 p. 465

Cancer spinosus Amboinensis Seba, 1759, p. 45, Pl. 18, Fig. 10

Cancer spinosus maximus Seba, 1759, p. 56, Pl. 22, Fig. 1

Cancer horridus Pennant, 1777, p. 7, Pl. 8, Fig. 14 (non Linnaeus, 1758)

Parthenope Maja Fabricius, 1798, p. 354

Inachus Maja Fabricius, 1798, p. 358

Maja eriocheles Lammark, 1801, p. 154

Lithodes arctica Latreille, 1806, p. 40; Lammarck, 1818, p. 240; Desmarest, 1830, p. 278, Pl. 5 bis, Fig. 2; Cuvier, 1833 Pl. 1, Fig. 1; Cuvier, 1837, Pl. 37; H. Milne Edwards, 1837, p. 186; Lucas, 1840, p. 153; Guerin Meneville, 1829-1844, Pl. 12, Fig. 1; de Haan, 1849, p. 216; Boas, 1880, p. 192, Pl. VI, Fig. 200; Bouvier, 1895, p. 181, Pl. 11, Fig. 7, Pl. 12, Fig. 5; Boas, 1924, Figs. 7, 8, 11, 12, 15, 16, 20, 21, 27

Lithodes arcticus Brandt, 1848, p. 171

Lithodes Maia Samouelle 1819, p. 90; Bell, 1846, p. 165, text, fig.; White, 1856, p. 132

Lithodes maia Smith, 1879, p. 45; Smith, 1883a p. 25; Smith, 1884a, p. 351; Bouvier, 1896, pp. 10, 24; Lagerberg, 1908, p. 63, Pl. 5, Fig. 5; Selbie, 1921, p. 56, Pl. 9, Figs. 1-4; Bouvier, 1922, p. 41; Rathbun, 1929, p. 29, Fig. 39; Bouvier, 1940 p. 153, Fig. 109

Lithodes Maja Latreille, 1810, p. 67; Leach, 1814, p. 395; Leach, 1815, p. 332; Leach, 1816, Pl. XXIV; Hansen, 1908, p. 22

Lithodes maja Ortmann, 1892, p. 320; Ortmann, 1898, pl. 52; Stephensen, 1935, p. 8; Heegaard, 1941, p. 13; Holthuis, 1950, p. 141, Figs. 51-53; Balss, 1957, p. 1592, Fig. 1170; Squires, 1965, p. 110; O'Riordan, 1968, p. 106; Williams, 1984, p. 230, Fig. 166

Material examined

British Museum (Natural History), London

1 ♀ ov., Moray Firth, St. E 82/98, 9 June 1982, 57°57' N, 02°51' W, 82 m

1 ♂, December 1971, between Mine Head (Eire) and Smalls Light (Pembrokeshire), 60 m

1 ♀ ov., July 1971, Loch Torridon, Ross and Crom

1 ♂, Kibbrennand Sound, 240 m

1 ♂, Hardanger Fiord, Norway

1 ♂, Mouth of Kibbrennand Sound

1 ♀, July 1973, Outer Skerries, Shetland, Harbour Mouth

1 ♀, West of Fair Isle, 63 m

1 ♂, 44°50.2' N, 57°25' W (no depth listed)

1 ♂, 12 June 1937, Barents Sea, 60 miles north of North Cape, 203 - 240 m

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♂, 2 ♀ ov., Den Helder (no depth listed)

1 ♀ ov., 63°43' N, 09°52' E (no depth listed)

1 ♂, 63°37' N, 09°46' E (no depth listed)

2 ♂, 63°39' N, 09°49' E (no depth listed)

2 ♂, 1 ♀, Dogger Bank (no depth listed)

1 ♀, 58°19' N, 11°33' E (no depth listed)

1 ♀, 60°34' N, 04°57' E (no depth listed)

Senckenberg Museum, Frankfurt

1 ♂, 30 June 1977, Viking Bank, St. 28, 59°45' N, 03°11' E, 138 m

1 ♂, 1 July 1977, Viking Bank, St. 30, 59°40' N, 03°11' E, 140 m

2 ♀ ov., 18/20 May 1977, Dogger Bank, 55°46' N, 02°40' E, 70 m

1 ♂ 18 June 1977, St. Fs. 19, 58°39' N, 02°47' E, 111 m

1 ♂ 7 August 1984, NR 16, 59°07.5' N, 03°04.5' E, 154 m

1 ♀ 16 June 1977, FS-10, 56°41' N, 00°44' E, 4 m

Instituto de Ciencias del Mar, Barcelona

2 ♂, 1 ♀, Terranova Bank (no position listed)

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀, 43°15' N, 60°20' W (no depth listed)

1 ♂, 1 ♀ ov., Bergen

1 ♂, Gul of Maine

1 ♂, Massachusetts Bay

1 ♂, Gloucester, Massachusetts

1 ♂, off New England

1 ♀, Gulf of Maine, 93 - 166 m

Muséum National d'Histoire Naturelle, Paris

1 ♂, North Sea (no position listed)

1 ♂, Erhaps 851, 15 February 1985, 46°54' N, 57°02' W, 158 - 161 m

1 ♀ ov., Main 2, 10 August 1964, 63°04' N, 23°45' W (no depth listed)

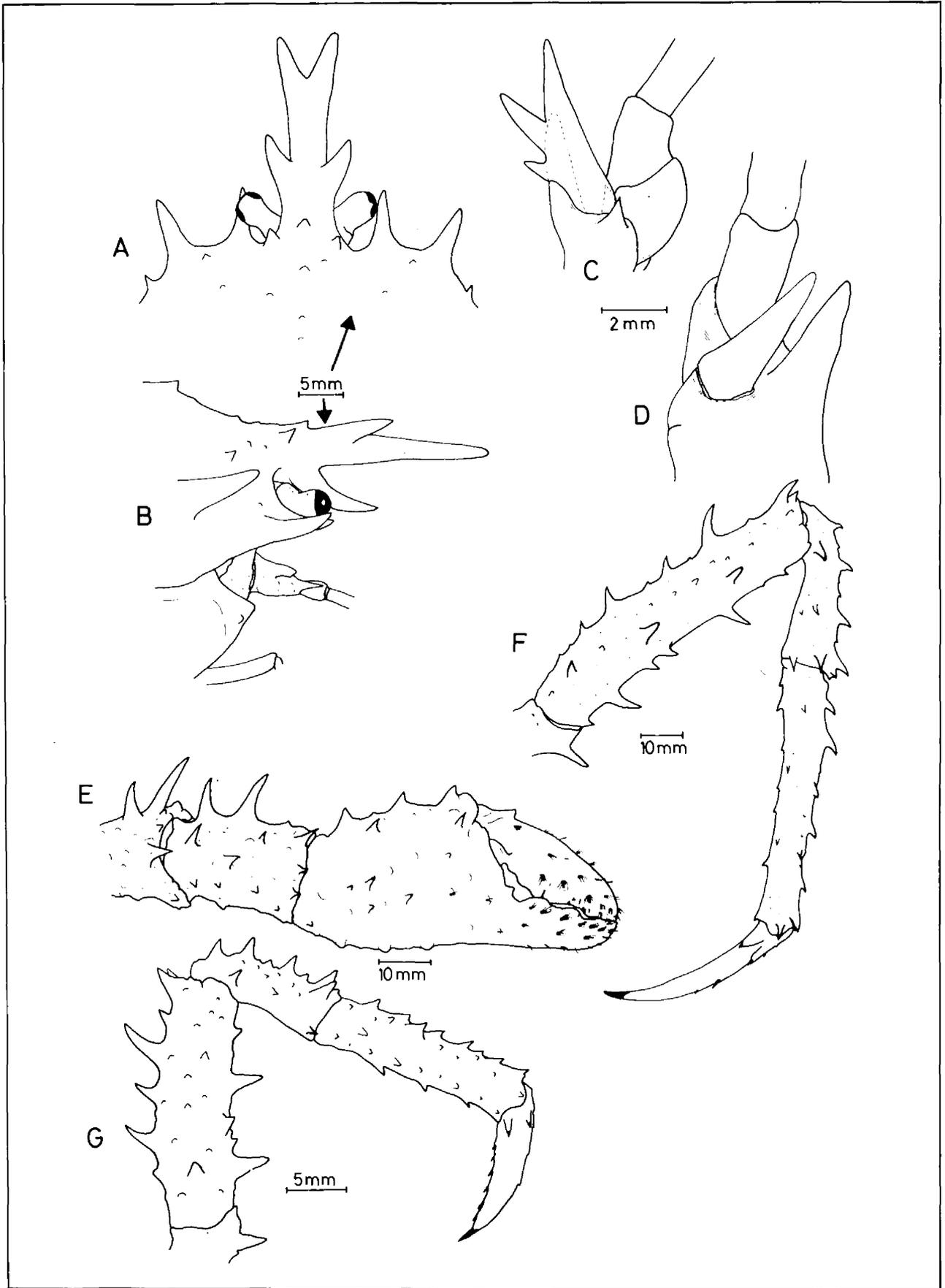


FIG. 25. *Lithodes maja* (Linnaeus) (A, B, E, F: ICM, ♂, CL = 85 mm, Canada; C: RMNH, ♂, CL = 52 mm, North Atlantic; D: RMNH, ♀ ov., CL = 76 mm, North Atlantic; G: ICM, ♂, CL = 36 mm, North Sea): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) left antenna; D) right antenna; E) right cheliped; F) - G) right third walking leg.

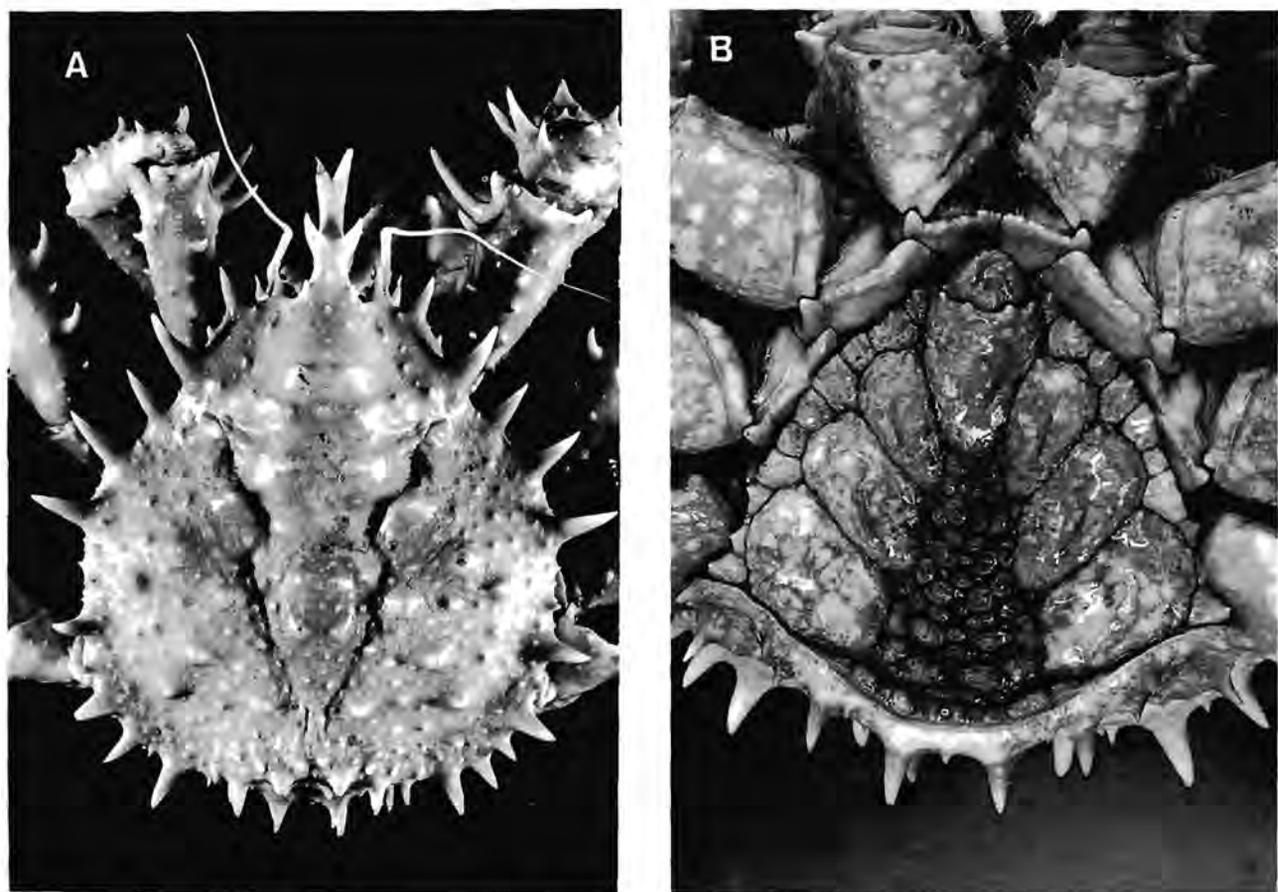


FIG. 26. *Lithodes maja* (Linnaeus) (ICM, ♂, CL = 85 mm, Canada): A) dorsal view of carapace. B) abdomen.

Description

Carapace more or less pentagonal in shape. Dorsal carapace surface armed with some spines and numerous, more or less spiniform granules of different sizes. Regions well-defined, only slightly convex, prominence of regions similar. Gastric region with two longitudinal rows of three spines each, the spines similar in size, with a small spine at the centre. Several additional small spines on the sides of the region. Cardiac region bearing four small spines of similar size in a square-shaped pattern. Branchial regions with seven spines somewhat larger than the cardiac and gastric spines and with numerous, scattered granules. Intestinal region bearing two thick spines practically at the posterior edge of the carapace. A small spine on the terminal angle of the pterygostomial region.

Rostrum with a long, bifid anterior projection whose thickness is about 0.4 times the distance between the external orbital spines. Two pairs of dorsal spines, a terminal pair located approximately halfway along the central spine, a proximal pair located at the base, the terminal pair more developed than the proximal pair. A single, small, dorsal spine at the base of the anterior projection. A thick,

curved, basal spine. Anterior projection horizontal, with the dorsal spines slanting slightly upwards.

External orbital spine smaller than the anterolateral spine, sometimes overreaching the cornea. One thick hepatic spine, and usually another, small spine between it and the anterolateral spine.

Edge of each of the branchial regions bearing 11-12 spines, the three spines on the anterior half (between the hepatic spine and the level of the gastro-cardiac groove) the thickest, similar to the hepatic spine in size.

All the plates on the second abdominal segment fused, although the marginal pair may be clearly visible in some specimens. Second segment with a pair of strong spines in the centre, and several spines on the terminal border. Numerous, more or less spiniform tubercles or granules on the lateral and marginal plates of the third to fifth segments and on the medial nodes.

Ocular peduncles bearing small, dorsal tubercles slightly larger at the apical end.

Basal antennal article with a small, anterolateral spine. Second article bearing a small tooth on the base and a spine on the terminal, outer angle, usually reaching the base of the last antennal article. Scaphocerite generally absent or, when present, very

simple, formed by a single spine, sometimes with a few spinelets on the outer border.

Chelipeds with merus armed with some spines on the outer border, the terminal spines most developed. Carpus with four dorsal spines, the two middle ones quite long. Some spines and more or less spiniform granules on the outer and ventral surfaces. Hand with several dorsal spines as well as some spines and granules on the outer and ventral surfaces. Some thick granules dorsally on the base of the movable finger.

Walking legs long. Second walking leg somewhat longer than the first and the third.

Third walking leg about twice carapace length in adult females, more than 2.5 times carapace length in adult males, and less than twice carapace length in juveniles (CL = 25 mm). Basis-ischium bearing a strong posterior spine and another, less developed spine on the ventral surface. Merus somewhat shorter than carapace length, more than four times longer than high in males, somewhat less in females, between 1.5 and 2 times the propodus. A row of four-five thick spines on the anterior border, with two-three smaller spines interspersed. Two poorly defined rows of four-five spines each on the posterior border, these a little smaller than those on the anterior border. Dorsal surface bearing various spines. Ventral side smooth. Carpus with four well-developed spines on the anterior border, the terminal of these the largest, with two-three smaller spines interspersed. Various spines on the dorsal surface; ventral and posterior surfaces unarmed. Propodus four-five times longer than high, armed on the anterior surface with six-seven spines somewhat smaller than the spines on the merus and the carpus. Some spines on the dorsal surface and six-seven on the posterior surface. Dactylus slightly curved, with two spines on the anterior base and one on each side, and two-four corneous spinules along the anterior margin which may extend down past the midpoint of the article. A row of small corneous spines on the posterior border in juveniles, disappearing in adults.

Size

The males examined measured between 13 and 110 mm in carapace length and between 12 and 113 mm in width. The females were between 17 and 97 mm long and between 15 and 95 mm wide. The smallest ovigerous females specimen measured 59 mm in length and 57 mm in width.

Colour

More or less dark brown, spines darker.

Distribution

North Sea to the coasts of Belgium, west coasts of Ireland and Scotland, Barents Sea, Iceland and Spitzbergen, Greenland, east coast of North America to the Gulf of Maine. The specimens examined were caught at depths ranging from 4 to 200 m though Williams (1984) stated that they are usually found between 65 and 790 m.

Biology

The species is little known, even though a considerable amount of data is available on its habitat and larval development. Williams (1984 and other references cited) provided abundant information on these aspects. The species is not normally found at temperatures below 0 °C and seldom below 2.5 °C. Females ovigerous between December and April.

Remarks

In the original description of the species, Linnaeus (1758, p. 629) cited works by Matthioli (1560, p. 185; *Maia vulgo cancevola*; though Linnaeus cited page 229, he was referring to a different edition) and by Johnston (1650, pp. 5, 20, Fig. 5, *Cancer Majas dictus*). In both these works the species represented and described was in fact *Maja squinado*, hence the material on *Lithodes maja* actually corresponded to the reference in Linnaeus's own work, «Skanska Resa» (1751). Since only *Lithodes maja*, not *Maja squinado*, occurs in Sweden, the lectotype was the specimen that Linnaeus himself collected at Skalkar Viken, or the largest specimen, if there was more than one, and which is cited in his work (p. 327). He referred to it again in 1759 (see also Holthuis, 1958).

L. maja (Linnaeus) is differentiated from the other species of the genus by the thick spines along the carapace edge and by the horizontal anterior projection of the rostrum. In the other species the anterior projection points more or less upwards, and the spines along the carapace edge are smaller.

Lithodes manningi n. sp.

(Figures 27, 28, Plate 14)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, holotype, R/V Oregon II, St. 10829, 2 December 1969, 15°34' N, 61°10' W, 640 m

1 ♀ ov., allotype, R/V Oregon II, St. 10611, 12 May 1969, 07°13' N, 52°52' W, 777 m

Description

Carapace more or less pentagonal, somewhat longer than wide. Four gastric spines in a pattern describing a square, the anterior pair much longer than the posterior pair. Two thick granules near the base of the rostrum. Cardiac region with a pair of anterior granules and a pair of posterior spines. Convexity of cardiac region similar to that of the branchial regions. Branchial regions bearing four spines each, the most anterior the most developed, at a level anterior to the pair of cardiac spines. Another spine located behind the level of the cardiac

pair, and two more small, not very sharp, spines near the posterior edge. Two well-developed intestinal spines located near the carapace edge. Pterygostomian region with a thick granule on the terminal angle. Some small granules scattered over all the regions.

Anterior projection of rostrum long and bifid, with two long dorsal spines and one ventral spine. Thickness of anterior projection in the holotype 0.2 times the distance between external orbital spines. Proximal portion slanting slightly upwards, becoming nearly horizontal after the point of insertion of the two dorsal spines. Basal spine curved.

External orbital spine more developed than the anterolateral spine, tip even with the level of the cornea but without reaching the end of the penultimate antennal article. Very long hepatic spine. Along the edge, behind the cervical groove, twelve more or less pointed granules and some (two-three) small spines, the most developed (similar in size to the anterolateral spine) at the level of the gastro-cardiac groove.

Plates on abdominal segments with some granules.



FIG. 27. *Lithodes manningi* n. sp. (A: USNM, ♂, holotype, CL = 103 mm, Oregon II, St. 10829; B: USNM, ♀ ov., allotype, CL = 120 mm, Oregon II, St. 10611): A) - B) carapace, dorsal view.

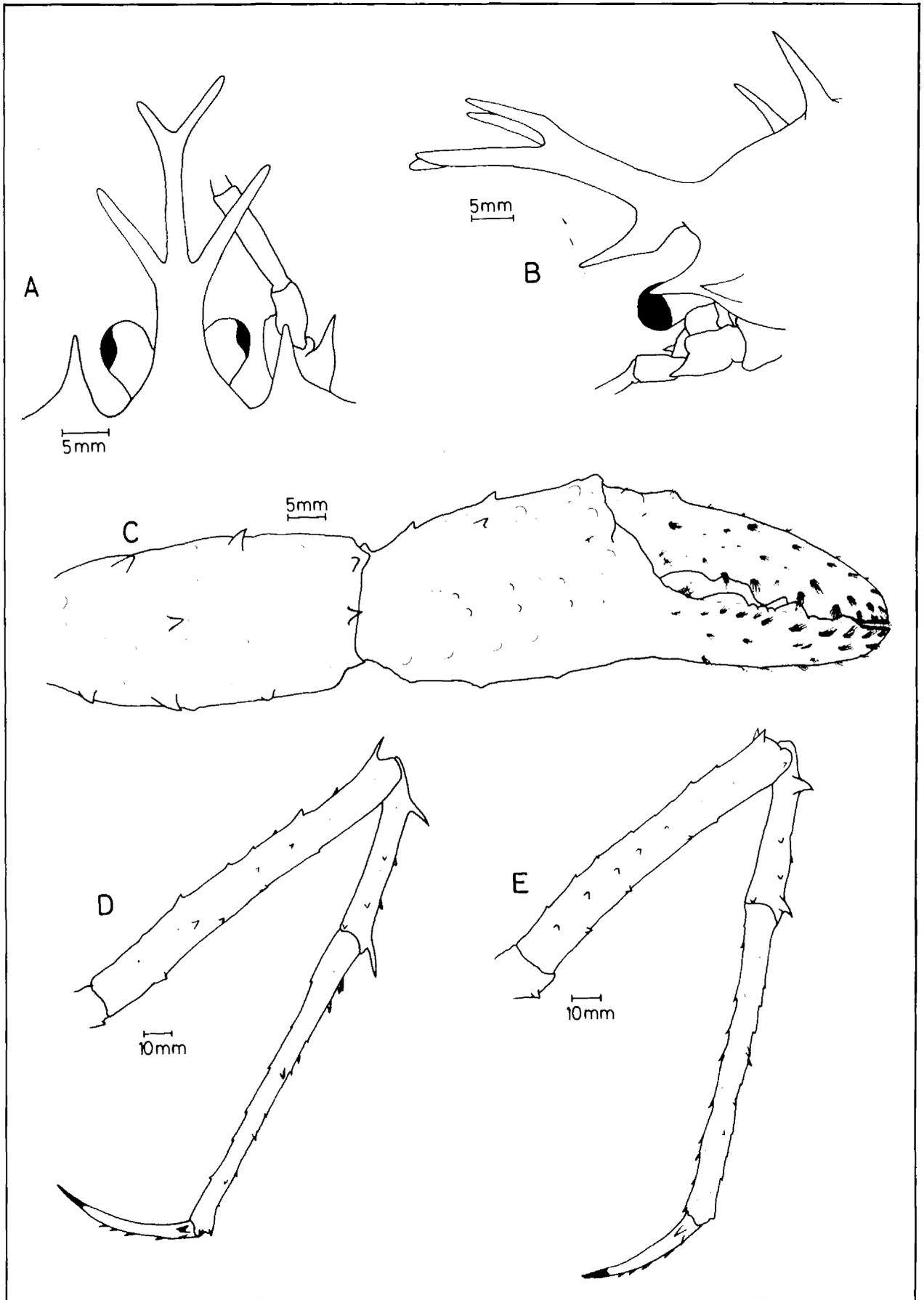


FIG. 28. *Lithodes manningi* n. sp. (A-D: USNM, ♂, holotype, CL = 103 mm, Oregon II, St. 10829; E: USNM, ♀ ov., allotype, CL = 120 mm, Oregon II, St. 10611): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) - E) right third walking leg.

A pair of spines in the centre of the median plate on the second segment, and some spiniform granules on the borders.

Ocular peduncles smooth.

Basal antennal article bearing a small, terminal, outer granule. Second segment with a terminal, outer spine extending to the midpoint of the penultimate antennal segment.

Chelipeds with merus armed with some small spines on the dorsal border and one well-developed spine practically on the terminal border. Carpus with three small spines dorsally, the most proximal also the longest, and another spine on the outer surface. One-two small spines on the terminal border. Hand armed with some small dorsal spines and some spiniform granules on the outer and ventral surfaces.

Walking legs very long. Third walking leg 3.6 times carapace length in male, only 2.8 times in female. Coxa on third walking leg smooth. Basis-ischium bearing one-two small spines. Merus with eight-nine small spines in a row on the anterior margin, the most terminal of these the most developed. Some small spines on the dorsal surface and ventral border. Merus as long as or longer than the carapace, more than seven times longer than high, and almost twice the length of the carpus. Carpus with five small spines on the dorsal surface and two very long spines, one proximal and one terminal (the latter slightly longer than the former), on the outer surface, together with some additional small spines. Propodus slightly shorter than the merus and more than ten times longer than high. Anterior border armed with 11-12 small spines, some other small spines on the outer surface, and eight more on the posterior border. Dactylus cylindrical and slightly curved, one-half propodus length, with two proximal spines on the dorsal border and one on each side. A series of corneous spines dorsally extending down beyond the midpoint of the article. Ventral border smooth. Inner borders of the articles also smooth.

Size

The holotype is 103 mm long and 94 mm wide. The ovigerous female (allotype) is 120 mm long and 106 mm wide.

Distribution

Dominica, French Guiana, at depths between 640 and 777 m.

Remarks

Lithodes manningi belongs to the group of species in the Atlantic and adjoining waters with four spines on the dorsal surface of each branchial region (*L. turkayi* n. sp., *L. unicornis* Macpherson, and *L. murrayi* Henderson). It is differentiated from these by the extreme length and thinness of its walking legs. In addition, *L. turkayi* n. sp. (p. 68), from the Southwest Atlantic, which also has long, slender walking legs, is differentiated by the many small spines and granules on the articles of the walking legs (Figure 38D), which are much less numerous in *L. manningi*.

The anterior projection of the rostrum is much thicker in *L. murrayi* Henderson (the ratio of projection thickness: distance between external orbital spines is greater than 0.3). In addition, the most developed spines on the carapace, chelipeds, and walking legs are longer and more slender in *L. manningi* (Figures 34D, 34E, 39E, 39F).

The anterior projection of *L. unicornis* Macpherson is as slender as that of this new species, but the spines on the carapace, chelipeds, and walking legs are shorter and more numerous than in *L. manningi*.

Of the other species in this genus, the closest is *L. longispina* Sakai, from the Pacific Ocean (Midway Islands, Japan). The illustrations provided by Sakai (1971, 1976) and Takeda (1974) show that the spines on the rostrum and carapace are much longer in *L. longispina* than in this new species.

Etymology

This species is dedicated to Dr. R. B. Manning of the National Museum of Natural History (Smithsonian Institution), in recognition of his important contribution to our knowledge of decapods and in appreciation of his invaluable assistance during the completion of this work.

Lithodes ferox Filhol, 1885

(Figures 4A, 29; Plates 15, 16)

Lithodes tropicalis A. Milne Edwards, 1883, p. 13; (nomen nudum); Bouvier, 1895, p. 182, Pl. XII, Fig. 7; Bouvier, 1896, p. 24; A. Milne Edwards and Bouvier, 1900, p. 266, Pl. VII, XXVII, Figs. 18-20; Dawson and Yaldwyn, 1985, (in list and in key)

Lithodes ferox Filhol, 1885 a, pp. 55, 57, fig. 2; Filhol 1885b, p. 128, Pl. I, Fig. 37; Perrier, 1886, p. 296, Fig. 215; Bouvier, 1895, pp. 182, 189, Pl. XII, Fig. 6; Bouvier, 1896, p. 24; A. Milne Edwards and Bouvier, 1900, p. 264, Pl. VI, Figs. 3-6

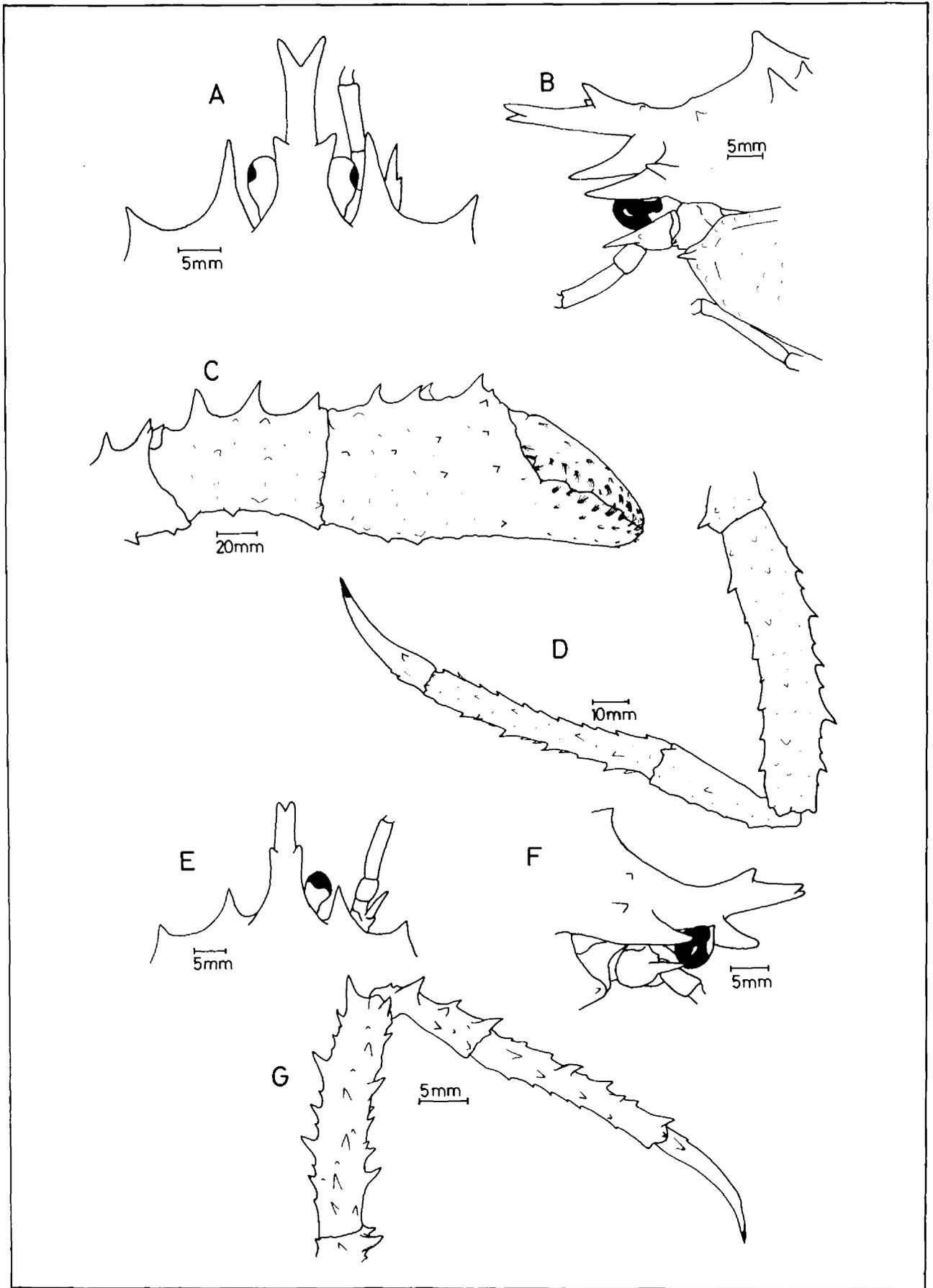


FIG. 29. *Lithodes ferox* Filhol (A-D: ICM, ♂, CL = 92 mm, Benguela VIII, P-61; E - F: ICM, ♀, CL = 85 mm, Guinea Bissau, P-88; G: ICM, ♂, CL = 36 mm, Benguela IV, P-107): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg; E) anterior part of carapace, dorsal view; F) anterior part of carapace, lateral view; G) right third walking leg.

Lithodes murrayi Kensley, 1980, p. 22; Macpherson, 1983, p. 9, Fig. 3; Dawson and Yaldwyn 1985 (in part, in list and in Key) (no Henderson, 1888)
Pseudolithodes pyriformis Birstein and Vinogradov, 1972, p. 358, Figs. 7, 8 (1-4)

Material examined

Muséum National d'Histoire Naturelle, Paris

1 ♂, Exp. Talisman, 1883, Sahara, 860 m
1 ♂, paralectotype Exp. Talisman, St. 90, 13 July 1883, 22°03' N, 17°33' W, 1 013 m
1 ♀, lectotype, Exp. Talisman, St. 86, 12 July 1883, 22°57'N, 17°31'W, 930 m
1 ♀ ov., N.O. Laurent Amaro, 15 May 1982, St. 6, 14°13.3' N, 17°36.2' W
1 ♂ 23 January 1976, 05°00' S (no depth listed)
1 ♀, Arguin Bank
1 ♂, Camp, l'Amaro, St. 13, 24 October 1981, 15°50.3' N, 17°01.3' W, 600 m
3 ♂, N'Diago-Mauritania, St. 17, 27 March 1982, 800 m

South African Museum, Cape Town

2 ♂, off Lüderitz, 800 m
3 ♀, off Namibia (no position listed)

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♂, Pillsbury Exp., St. 41, 3 May 1964, 04°47.1' N, 03°35' W, 350 - 460 m

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀ ov., St. Helena Island
1 ♂, Guinea Trawling Survey, Cruise no. 1, St. 6/8, 28 November 1963, 09°10' N, 15°39' W, 600 m

Instituto de Ciencias del Mar, Barcelona

1 ♂, 1 ♀, Benguela I, P-13, 16 November 1979, 23°03' S, 13°19' E, 340 m
1 ♂, Benguela II, P-62, 9 September 1980, 21°18' S, 12°33' E, 360 - 370 m
1 ♂, Benguela IV, P-80, 16 April 1981, 18°11' S, 11°24' E, 607 m
1 ♂, Benguela IV, P-107, 21 April 1981, 22°50' S, 12°52' E, 607 m
2 ♂, Benguela IV, P-110, 21 April 1981, 23°03' S, 12°55' E, 607 - 615 m
3 ♂, Benguela IV, P-113, 22 April 1981, 23°34' S, 13°05' E, 607 - 615 m
2 ♀, Benguela IV, P-116, 22 April 1981, 24°03' S, 13°11' E, 622 m
1 ♂, 1 ♀, Benguela IV, P-140, 26 April 1981, 28°14' S, 14°26' E, 534 - 542 m
1 ♂, Benguela V, P-17, 16 July 1983, 24°42.5' S, 13°43.8' E, 348 - 362 m
1 ♂, Benguela VI, P-91, 30 January 1984, 25°08.2' S, 13°38.1' E, 428 m
1 ♂, Benguela VII, P-63, 5 August 1984, 25°08.9' S, 13°39.4' E, 421 m

1 ♀ ov., 4 ♂ Benguela VIII, P-61, 21 July 1985, 24°37.9' S, 13°31.5' E, 428 m
2 ♀, 6 ♂ Benguela IX, P-63, 10 February 1986, 24°36.3' S, 13°30.7' E, 412 m
1 ♀, Guinea Bissau, P-88, 13 January 1985, 11°27' S, 17°19' E, 266 - 430 m

Moscow University Zoological Museum

1 ♀ ov., 1 ♂, R/S Akadiemik Knipovich, St. 245, 11 April 1965, 36°29.6' S, 53°46.7' W, 160 m (types of *Pseudolithodes pyriformis*)
2 ♀ ov., R/S Akadiemik Knipovich, St. 360, 25 May 1965, 26°16' S, 13°49' E, 470 - 438 m (types of *P. pyriformis*)

Description

Carapace more or less pentagonal, somewhat longer than wide, somewhat more pyriform in juveniles. Surface bearing many granules and various spines distributed in each region. All regions convex, the gastric and cardiac regions slightly more prominent than the branchial regions. Gastric region armed with four spines in a pattern describing a square, the anterior pair somewhat larger than the posterior pair. A small spine on the outer side of each of the two anterior spines. A few small spines between the anterior pair and the base of the rostrum. Cardiac region with two pairs of spines arranged in a square-shaped pattern, the anterior pair larger than the posterior pair. Two thick granules between the anterior pair and the gastro-cardiac groove. Branchial regions bearing five spines each, the largest at the level of the gastro-cardiac groove, with a smaller spine adjacent to it. Another two well-developed spines located near the posterolateral angle, and another, smaller spine near the intestinal region. Intestinal region armed with two strong spines near the posterior edge of the carapace.

Rostrum well-developed, with a bifid anterior projection (rarely, just a single spine) slightly upwardly inclined over its entire length. Thickness of the central spine 0.3 - 0.4 times the distance between external orbital spines. A pair of dorsal spines inserted approximately at the level of the end of the cornea. A strong, curved, downward-and-forward-pointing ventral spine overreaching the cornea.

External orbital spine on carapace edge well-developed, usually extending beyond the cornea to the base of the last antennal segment. Spine on the antero-external angle smaller than the external orbital spine. Hepatic spine similar in size to the anterolateral spine, in juveniles similar to the external orbital spine. Edges of the branchial regions with six-seven well-developed spines and three-four smaller ones interspersed, these latter turning into granules in large individuals. Intestinal edge smooth.

Pterygostomian region bearing a spine on the terminal angle.

Second abdominal segment formed by three plates, occasionally fusing to form a single plate. Median plate with a pair of spines in the centre, two-four pairs on the terminal border.

Some spines on the outer borders of the marginal plates. Medial nodules on third to fifth segments more or less spiniform. Lateral and marginal plates bearing some spines and granules.

Ocular peduncles practically smooth, sometimes with a few terminal granules dorsally.

Basal segment of antenna with a small, terminal, outer spine. Second segment bearing a well-developed, terminal, outer spine and one-two small teeth on the base, the terminal spine extending beyond the base of the last segment in juveniles but not in adults.

Chelipeds with merus armed with some thick spines on the terminal portion of the dorsal and outer borders and with other, smaller spines scattered over the entire article, except for the inner border. Carpus and palm bearing several thick spines on the dorsal border and some spines or spiniform granules on the outer and ventral surfaces. Movable finger with a thick granule dorsally on the base. Numerous tufts of yellow setae on both fingers.

Third walking leg between 2.5 and 3 times carapace length. Coxa with some granules on the ventral surface, more spiniform on the terminal border. Basis-ischium bearing two terminal spines and some spiniform granules on the posterior surface. Merus slightly shorter than the carapace, about 4.5 to 5.5 times longer than high, and almost twice the carpus. A row of 11-12 spines on the anterior margin, another row dorsally, and two more or less well-defined rows on the posterior border, with somewhat smaller spines than those in the row on the anterior margin. Carpus with a row of six-seven spines on the anterior border and several more scattered on the dorsal surface. Propodus somewhat shorter than the merus, 5.3 to 6.7 times longer than high, and about 1.5 times dactylus length. A row of 10-11 spines on the anterior border, another with 10-11 smaller spines on the posterior border. Several spines on the dorsal surface. Dactylus cylindrical and slightly curved, with several spines on the base and some small spines on the anterior margin that do not usually extend beyond the proximal third. Ventral surfaces of all articles normally without spines or granules.

Size

The lectotype, illustrated by Filhol, measures 25 mm in length and 22 mm in breadth. The paralectotype is 21 mm long and 20 mm wide. The length of the other specimens examined ranged from

28 to 140 mm for the males and from 20 to 110 mm for the females. Ovigerous females from 69 mm in length.

Colour

Carapace, chelipeds, and walking legs all a darker red than the spines. Some specimens may exhibit orange or pink tones.

Distribution

Off western Africa between 22°03' N and 28°16' S, Saint Helena, Brazil (36°29.6' S - 53°46.7' W) on muddy bottoms between 160 and 1 013 m in depth.

Biology

Lithodes ferox is a species with a certain commercial importance off Namibia (Melville-Smith, 1982).

Abelló and Macpherson (1986) studied this species in the Namibian region and found the highest densities to be between 400 and 500 m. They also reported bathymetric differences in the size and sex distributions, perhaps, as in *L. murrayi* (Miquel *et al.*, 1985), associated with migrational behaviour.

Remarks

The first reference to this species corresponds to A. Milne Edwards (1884, p. 13), although he just reported ("cette espèce, distincte de toutes celles déjà connues, a été désignée sous le nom de *Lithodes tropicalis*"), without any description or figure and must be considered a nomen nudum.

Later, Filhol (1885a, b) described and illustrated *L. ferox* from the same area.

The species *L. tropicalis*, attributed to A. Milne Edwards, was not described until Bouvier (1895), since A. Milne Edwards only named and labelled the samples (as was also the case for other species, see Crosnier and Forest, 1973, p. 125). In view of the fact that the specimens described as *L. ferox* are the juveniles of *L. tropicalis*, the latter name should be considered a junior synonym of *L. ferox*.

The closest Atlantic species to *Lithodes ferox* are *L. turkayi* n. sp., from the Southwest Atlantic, and *L. unicornis* Macpherson, from the Valdivia Bank. *L. ferox* is also closely related to *L. murrayi* Henderson, from the Indian Ocean.

The most evident character for differentiating *L. ferox* from these species is the number of branchial spines, five on each side in *L. ferox* as opposed to four in the other species. There are other distinguishing characters as well:

—Four well-developed cardiac spines in *L. ferox*, the anterior pair larger. In the other species, a single pair of spines, with a pair of more or less spiniform granules anterior to the spines.

—A pair of intestinal spines practically at the carapace edge in *L. murrayi*, *L. unicornis*, and *L. turkayi*, somewhat further from the edge in *L. ferox*.

—External orbital spine usually extending beyond the end of the cornea in *L. ferox*, in the other species usually not reaching the end.

—Anterior border of dactylus on walking legs generally smooth (except for the basal spine) in *L. ferox*, some corneous spines along the anterior border in *L. murrayi* and *L. unicornis*.

—Plates and nodules on the abdominal segments more spiniform in *L. ferox*.

—Third walking leg more than three times carapace length in *L. turkayi*, less than three times in *L. ferox*; also, articles more elongate in *L. turkayi*.

—Articles on walking legs in *L. turkayi* armed with numerous spines and spiniform granules, in *L. ferox* with less numerous but larger spines.

In 1972 Birstein and Vinogradov described a new species, *Pseudolithodes pyriformis*. The holotype and allotype of this species were caught off Brazil, and the two paratypes were taken off Namibia. A comparative study of these specimens and *L. ferox* demonstrated all the diagnostic characters to be similar, and they have, for this reason, been considered conspecific.

Lithodes turkayi n. sp.

(Figure 30; Plate 17A)

Lithodes murrayi Campodonico and Guzmán, 1972, p. 222, Pls 1 - 5; Revuelta and Andrade, 1978, p. 3; Retamal, 1981 (in list, Fig. 58); Takeda and Hatanaka, 1984, p. 14; Dawson and Yaldwyn, 1985, in list and in key (in part); Takeda, 1986, p. 332 (text, figure) (no Henderson, 1888)

Material examined

Zoologisches Museum, Hamburg
1 ♀ ov., holotype, 54°19.2' S, 56°22' W, 300 m

Description

Carapace more or less pyriform, slightly longer than wide. Carapace surface bearing some spines and granules, more numerous on the branchial regions. Regions well-defined, prominence of regions similar. Gastric region armed with four spines in a pattern describing a square, the anterior pair somewhat larger than the posterior pair. Cardiac region bearing a pair of spines smaller than the gastric spines and two thick granules between the gastric spines and the gastro-cardiac groove. Branchial region with four spines, the two posterior spines smaller than the anterior pair. Intestinal region with two well-developed spines on the carapace edge.

Rostrum with a long, bifid anterior projection. Two divergent, dorsal spines inserted at the level of the end of the cornea.

Thickness of the anterior projection a little more than 0.3 times the distance between external orbital spines. Proximal portion of anterior projection upwardly inclined, the anterior projection becoming

practically horizontal after the point of insertion of the dorsal spines. External orbital spine well-developed, reaching the end of the cornea, somewhat larger than the spine on the anterolateral angle. Hepatic spine long. Branchial edge bearing seven spines, the one nearest the cervical groove and the three on the posterior edge rather small. Pterygostomial region with a small spine on the terminal angle.

Second abdominal segment bearing two spines in the centre of the median plate and several blunt spines on the borders. Lateral and marginal plates on subsequent segments with some scattered granules.

Ocular peduncles with some granules dorsally.

Basal articles of antenna with a small, terminal, outer spine. Second segment with a terminal, outer spine that does not reach to penultimate segment with a terminal, outer spine that does not reach the penultimate segment of the peduncle.

Chelipeds with merus bearing some small dorsal spines and some well-developed spines on the terminal border. Carpus armed with four dorsal spines and several more on the outer surface. Various granules on the ventral border. Hand armed with more or less well-defined rows of small, spiniform granules on the dorsal, outer, and ventral borders. Granules on the base of the fingers.

Third walking leg in the holotype more than three times carapace length. Basis-ischium with a ventral spine near the terminal border. Merus longer than the carapace, about seven times longer than high, and twice as long as the carpus. A row of small spines on the anterior border, three-four of these spines slightly larger than the rest. Posterior and dorsal surfaces bearing numerous, spiniform granules.

Carpus one-half merus length, armed with many small spines on the anterior and dorsal borders. Propodus about 8.5 times longer than high, 1.5 times longer than the dactylus, and somewhat shorter than the merus, with many small spines on the anterior, dorsal, and posterior borders. Dactylus longer than the carpus, with two spines at the base of the anterior border and one on each side. Four small spicules

along the anterior margin. Ventral borders of articles smooth, except for a few very small spinelets sometimes present on the propodus.

Size

The holotype has a carapace length of 58 mm and

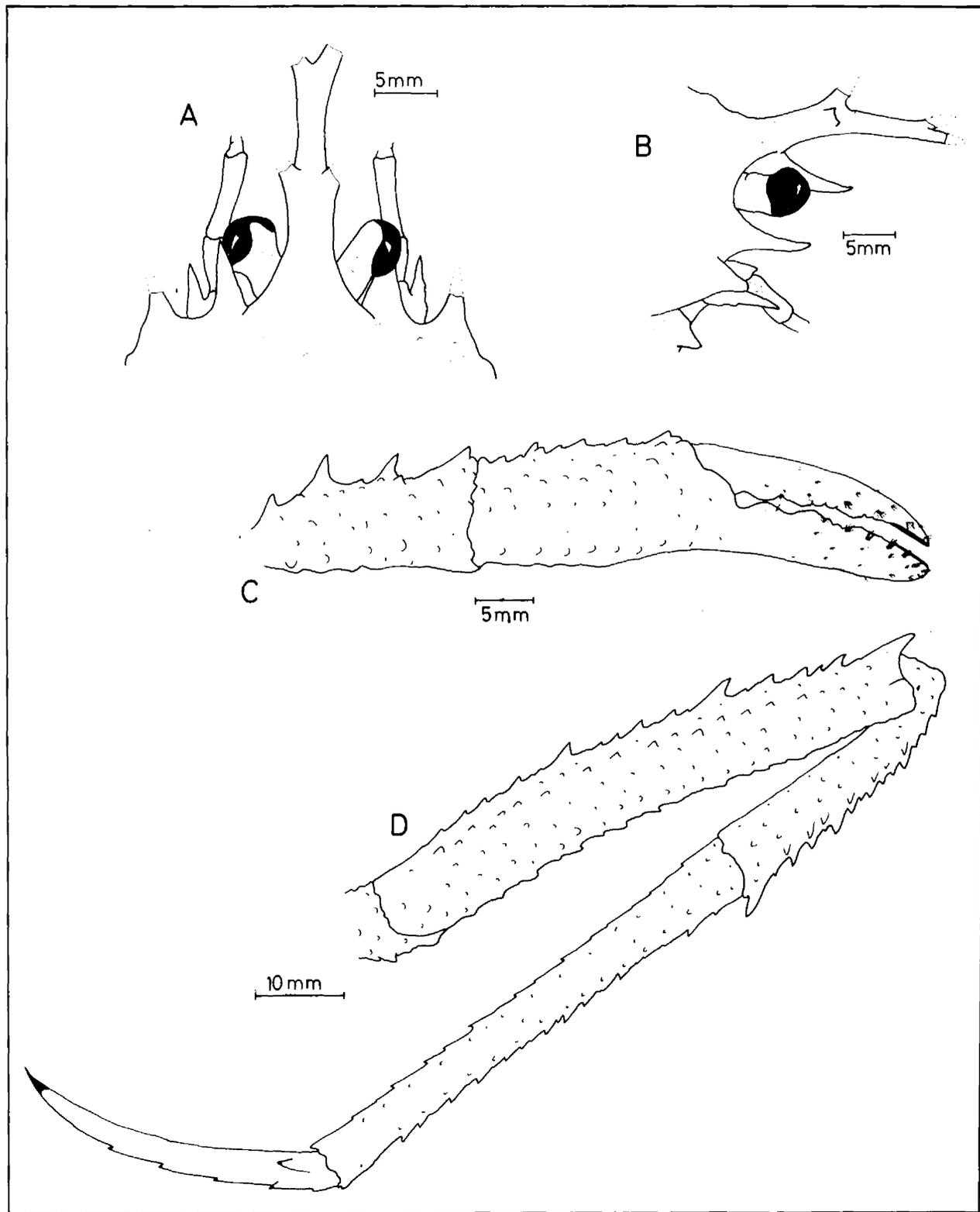


FIG. 30. *Lithodes turkayi* n. sp. (ZMH, ♀ ov., holotype, CL = 58 mm, Southwest Atlantic): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg.

a carapace width of 55 mm. The males described by Campodónico and Guzmán (1972) ranged in length from 90 to 109 mm and in width from 90 to 110 mm, while the females ranged from 57 to 66 mm in length and from 54 to 65 mm in width. Takeda and Hatanaka (1984) reported two males, 50 and 60 mm wide.

Colour

Takeda (1986) included a colour photograph of this species. The chelipeds and walking legs are more or less dark red. The carapace spines are red, the rest reddish or brownish.

Distribution

Southeast of the Falkland Islands (Malvinas) at 300 m. Takeda and Hatanaka (1984) reported it north of the Falkland Islands (Malvinas) at 554 - 581 m. Off the coast of Chile from 31°56' S, 71°38' W to Tierra del Fuego, between 70 and 400 m (Campodónico and Guzmán, 1972; Revuelta and Andrade, 1978).

Remarks

Lithodes turkayi is closely related to *L. murrayi* Henderson, from the Indian Ocean. The two species are readily distinguished by the shape and spinulation of the walking legs.

In this new species the articles of the walking legs are covered with numerous spines and granules, whereas in *L. murrayi* the spines are less numerous but larger, the rest of the surface practically smooth (Figures 30, 31).

Moreover, the legs in this new species are more elongate. The third walking leg is more than three times carapace length in *L. turkayi*, less than three times in *L. murrayi*.

Etymology

This species is dedicated to Dr. M. Türkay of the Senckenberg Museum in Frankfurt, in appreciation of his important contribution to the field of carcinology.

Lithodes murrayi Henderson, 1888

(Figure 31; Plate 17 B, C)

Lithodes murrayi Henderson, 1888, p. 43, Pl. IV; Hale, 1941, p. 272, Pl. 3, Figs. 3, 4; Yaldwyn and Dawson, 1970, p. 275, Figs. 1-3; Arnaud, 1971, p. 167; Dawson and Yaldwyn, 1985 (in list and in key, in part)

Lithodes Murrayi Bouvier, 1895, p. 182; Bouvier, 1896, p. 26

no *Lithodes murrayi* Kensley, 1980, p. 22; Macpherson, 1983, p. 9, Fig. 3 (= *Lithodes ferox* Filhol, 1885).

no *Lithodes murrayi* Campodónico and Guzmán, 1972, p. 222, Pls. 1-5; Revuelta and Andrade, 1978, p. 3; Retamal, 1981 (in list, Fig. 58); Takeda and Hatanaka, 1984, p. 14; Takeda, 1986, p. 332, text, figure (= *Lithodes turkayi* n. sp.)

1 ♂, 1 ♀, Campagne MD30, Crozet Islands, February 1982

1 ♀, Austral 83, St. 7, 46°11' S, 49°40' E, 250 m

Description

Carapace pyriform. Prominence of gastric region generally more pronounced than that of the branchial regions, somewhat greater than or equal to that of the cardiac region. Gastric region armed with four spines arranged in a square-shaped pattern, the two anterior spines larger than the posterior pair. Cardiac region with two spines and, anterior to these, a pair of more or less acute granules. Branchial regions bearing a strong, medial spine at the level between the gastro-cardiac groove and the pair of cardiac spines. Another, well-developed though somewhat smaller spine behind the level of the cardiac pair. Another, smaller spine adjacent to this one, towards the posterolateral angle. A fourth spine, as small as the preceding spine, near the intestinal region. Intestinal region bearing two long, medial spines practically at the edge of the carapace. A small spine on the terminal angle of the pterygostomial region.

Carapace surface bearing some granules of

Material examined

British Museum (Natural History), London

1 ♂, lectotype, 1 ♀ ov., paralectotype, Challenger Exp., St. 145 A, 27 December 1876, 46°41' S, 38°10' E, 157 - 570 m

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♀, 2 ♂, 23 February 1982, 46°40.3' S, 51°48' E (no depth listed)

Muséum National d'Histoire Naturelle, Paris

1 ♂, 1 ♀, Campagne MD03, St. 70, 20 April 1974, 46°22.6' S, 51°51' E 105 m

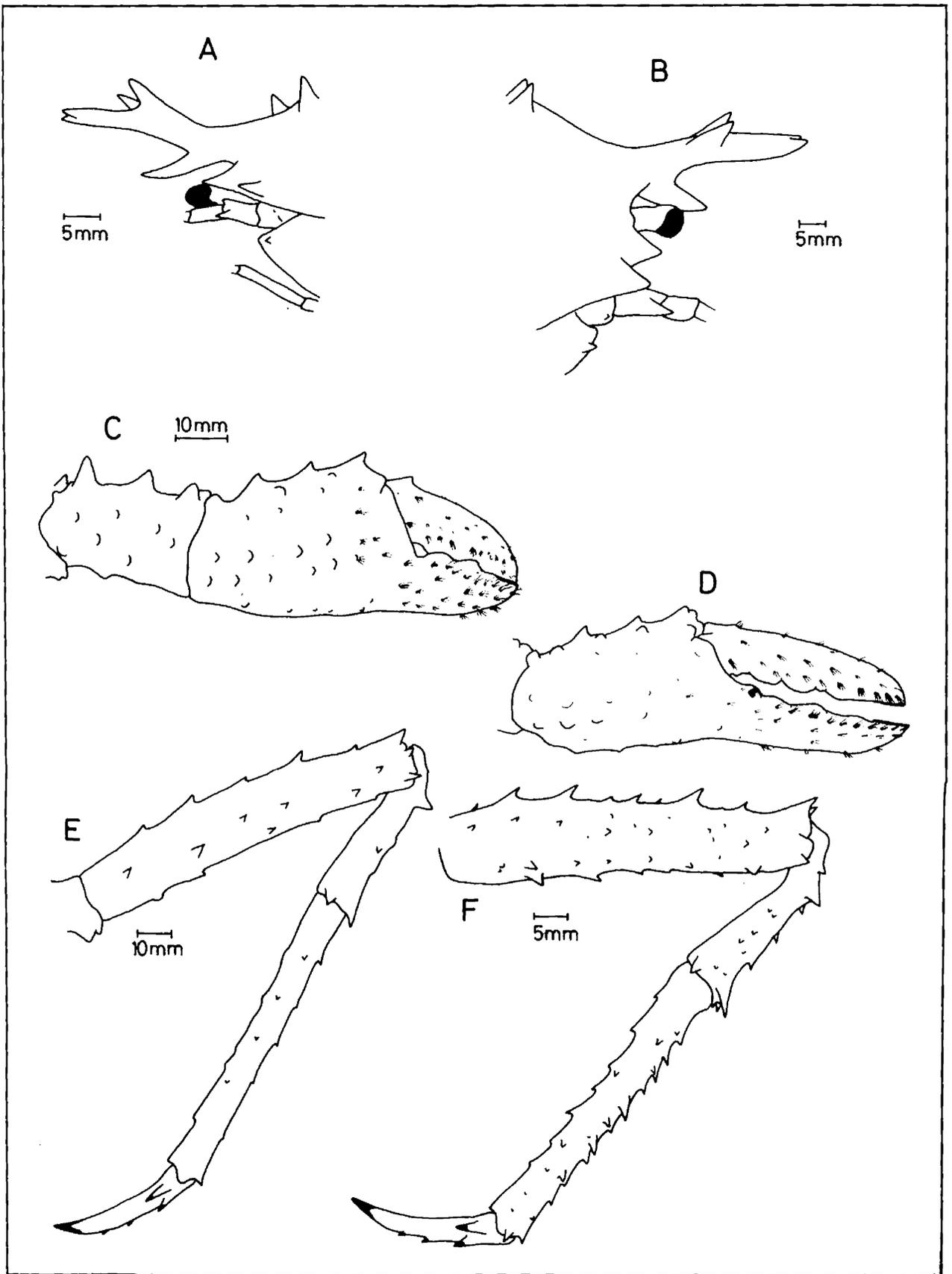


FIG. 31. *Lithodes murrayi* Henderson (A, D, F: BM, ♂, lectotype, CL = 64 mm, Challenger Exp., St. 145A; B, C, E: MP, ♀, CL = 100 mm, Cruise MD03): A) - B) anterior part of carapace, lateral view; C) - D) right cheliped; E) - F) right third walking leg.

different sizes, more numerous on the branchial regions.

Anterior projection of rostrum with a bifid tip and two dorsal spines more or less at the middle. Thickness of anterior projection between 0.3 and 0.4 times the distance between external orbital spines. Proximal portion directed slightly upwards, becoming practically horizontal after the point of insertion of the pair of dorsal spines. Basal spine curved.

Carapace edge with several spines of different lengths. External orbital spine almost never extending past the cornea and rarely reaching the end of the penultimate antennal segment. Another spine similar in size to the external orbital spine on the antero-external angle. A strong hepatic spine. Branchial edges bearing a spine, a little smaller than the hepatic spine, at the level of the gastro-cardiac groove. Ten-eleven spines, all similar in size (in juveniles the spine on the posterolateral angle may be larger), all much smaller than the most anterior branchial spine, between this spine and the intestinal spine.

Second abdominal segment with three clearly differentiated plates. A pair of well-developed spines medially and a series of smaller spines on the lateral and terminal borders. Third to fifth segments bearing calcareous, rather non-spiniform nodules. A lateral plate and three-four small, marginal plates on each segment. Marginal plates on each segment sometimes subdivided or fused. Some scattered granules on the various plates.

Ocular peduncles with some granules on the dorsal surface.

First antennal segment with no apparent spine. Second segment bearing an antero-external spine (occasionally a very small antero-internal spine as well) that does not normally reach the end of the penultimate segment.

Chelipeds with merus bearing several spines on the dorsal and lateral borders and some spiniform granules on the ventral border. Terminal part of these borders with the strongest spines. Carpus with dorsal spines and some other spines on the outer surface. Palm with some more or less well-defined rows of spines and spiniform granules, except on the inner surface, where it is practically smooth. Fingers unarmed, except for a few spines dorsally on the base of the movable finger, but bearing numerous tufts of setae.

Third walking leg between 2.5 and 3 times carapace length. More or less spiniform granules on the posterior margin of the coxa. Basis-ischium with two-three large spines on the posterior border. Merus equal to or a little shorter than carapace length, equal to or a little less than twice the carpus, and between 4.5 and 6 times longer than high. A row of eight-ten spines on the anterior border, three-four more developed than the rest, especially the terminal

spine. Two more or less well-defined rows of spines on the posterior border. Several spines on the dorsal surface, rest of surface practically smooth. Merus more or less cylindrical in section. Carpus with a row of six-nine spines on the anterior margin and a few spines on the dorsal surface, including a thick spine in the proximal region and another on the terminal border. Propodus somewhat shorter than the merus, between 6 and 9.5 times longer than high. A row of nine-eleven spines on the anterior margin and another of eight-nine spines on the posterior margin, both rows poorly defined. Some spines on the dorsal surface, with hardly any granules among them. All the spines more or less the same size. Dactylus equal to or a little less than one-half propodus length, with a series of corneous spines on the anterior border, sometimes extending nearly to the end of the article, other times few in number and located only near the base; these spines generally more numerous in large individuals. A basal spine on the dorsal surface and another on the ventral surface. Some tufts of small setae on the posterior border. Ventral borders of articles smooth.

Size

The paralectotype is 72 mm long and 65 mm wide, the lectotype 64 mm long and 60 mm wide. The length of the rest of the males examined ranged from 42 to 125 mm, the width from 43 to 120 mm. In the females, the length ranged between 17 and 78 mm and the width between 16 and 75 mm. Arnaud and Do-Chi (1977) found males measuring up to 103 mm in width and 108 mm in length, females of up to 77 mm in width and 84 mm in length. The smallest specimens, both males and females, caught were 38 mm long. According to Arnaud and Do-Chi (1977), ovigerous females from 64 mm in length.

Distribution

Southern Indian Ocean, Prince Edward, Crozet, and Possession Islands, on muddy bottoms at depths between 35 and 200 m. *Lithodes murrayi* has been reported in other areas: Mozambique Channel (Kensley, 1977), Macquarie Islands (Hale, 1941), and southern New Zealand (Yaldwyn and Dawson, 1970). The illustrations in all these cases appear to confirm that it is indeed the same species. However, in view of the variability often observable in individuals of this genus and the fact that the species from off South America is not *L. murrayi*, which at least in part invalidates the circumpolar distribution that has been claimed for it, a thorough examination of the specimens from the different areas is called for in order to confirm that they are in fact all conspecific.

Biology

Arnaud (1976) and Arnaud and Do-Chi (1977) provided copious information on the biology of this species and the fisheries for it, based on the population around Crozet and Possession Islands, where it is taken mainly between 35 and 200 m. Bathymetric stratification is the rule, with the largest individuals being found in deeper waters, where there is also a larger proportion of males. Miquel *et al.* (1985) reported that the males preceded the females and juveniles in their summer migration to shallower waters. The largest females may carry up to 2 500 eggs. Prey include polychaetes, sponges, gastropods, and small crustaceans, as well as other small benthic organisms. Many individuals have been observed to carry parasites and epibionts.

Remarks

Lithodes murrayi is closely related to *L. unicornis* Macpherson, from the Valdivia Bank. However, it is differentiated by the shape and thickness of the anterior projection of the rostrum and by the more spinulate walking legs (p. 75). It is also close to *L. ferox* Filhol, from off western Africa, from which it is readily distinguished by the spinulation of the carapace (p. 67). Off South America, *L. turkayi* n. sp. has been confused with *L. murrayi*, even though the shape and spinulation of the legs in these two species is quite different (p. 70).

Lithodes unicornis Macpherson, 1984

(Figure 32; Plate 17D)

Lithodes unicornis Macpherson, 1984, p. 76, Figs. 20-23
Lithodes murrayi Dawson and Yaldwyn, 1985, p. 72 (in list, in part) (no Henderson, 1888)

Material examined

Rijksmuseum van Natuurlijke Historie, Leiden
1 ♀ ov., holotype, Valdivia I, P-12, 2 May 1982,
24°43.7' S, 06°24.3' E, 934 - 936 m

Instituto de Ciencias del Mar, Barcelona
1 ♂, allotype, Valdivia I, P-12, 2 May 1982, 24°43.7'
S, 06°24.3' E, 934 - 936 m

Description

Carapace more or less pentagonal, as long as wide. Gastric region more prominent than the cardiac region, in turn somewhat more prominent than the branchial regions. Four spines on the gastric region in a pattern describing a square, the anterior pair thicker. Granules scattered over the entire surface. Cardiac region bearing two spines similar to the gastric spines in size, with a pair of thick granules between them and the gastro-cardiac groove. Branchial regions armed with four spines each, the largest approximately in the middle of the anterior half of the region at the level midway between the gastro-cardiac groove and the cardiac spines. The three remaining spines, located on the posterior half, smaller than the preceding spine, especially the two spines nearest the posterior edge. Many granules uniformly distributed throughout the region.

Intestinal region bearing two spines near the posterior edge.

Rostrum formed by a slender anterior projection overreaching the tip of the antennal peduncle, ending in a single spine in the holotype, in the process of regeneration in the allotype. Two lateral spines dorsally on the terminal half. Basal spine curved. Proximal portion of anterior projection slanting more or less upwards, becoming nearly horizontal after the point of insertion of the dorsal spines. Anterior projection thickness equal or a little more than 0.2 times the distance between external orbital spines. External orbital spines on carapace edge shorter than the ocular peduncles. Spine on the anterolateral angle a little smaller than the external orbital spine. Hepatic spine thicker than these spines and thicker than the rest of the spines along the carapace edge. Three spines similar to the external orbital spine in size between the hepatic spine to the level of the gastro-cardiac groove, then nine-ten spines more or less the same size, less developed than the rest of the spines along the carapace edge.

Second abdominal segment formed by a single plate in the holotype, by three plates in the allotype. Two well-developed spines in the centre and several more on the terminal border of the segment. Nodules on third to fifth segments bearing some more or less spiniform granules. Surface of plates rough but with neither spines nor granules, except for small spines along the borders of the marginal plates.

Ocular peduncles with no apparent granules. End of cornea not overreaching the end of the penultimate segment of the antennal peduncle.

First segment of antennal peduncle bearing a small, terminal, outer spine. Second segment with a

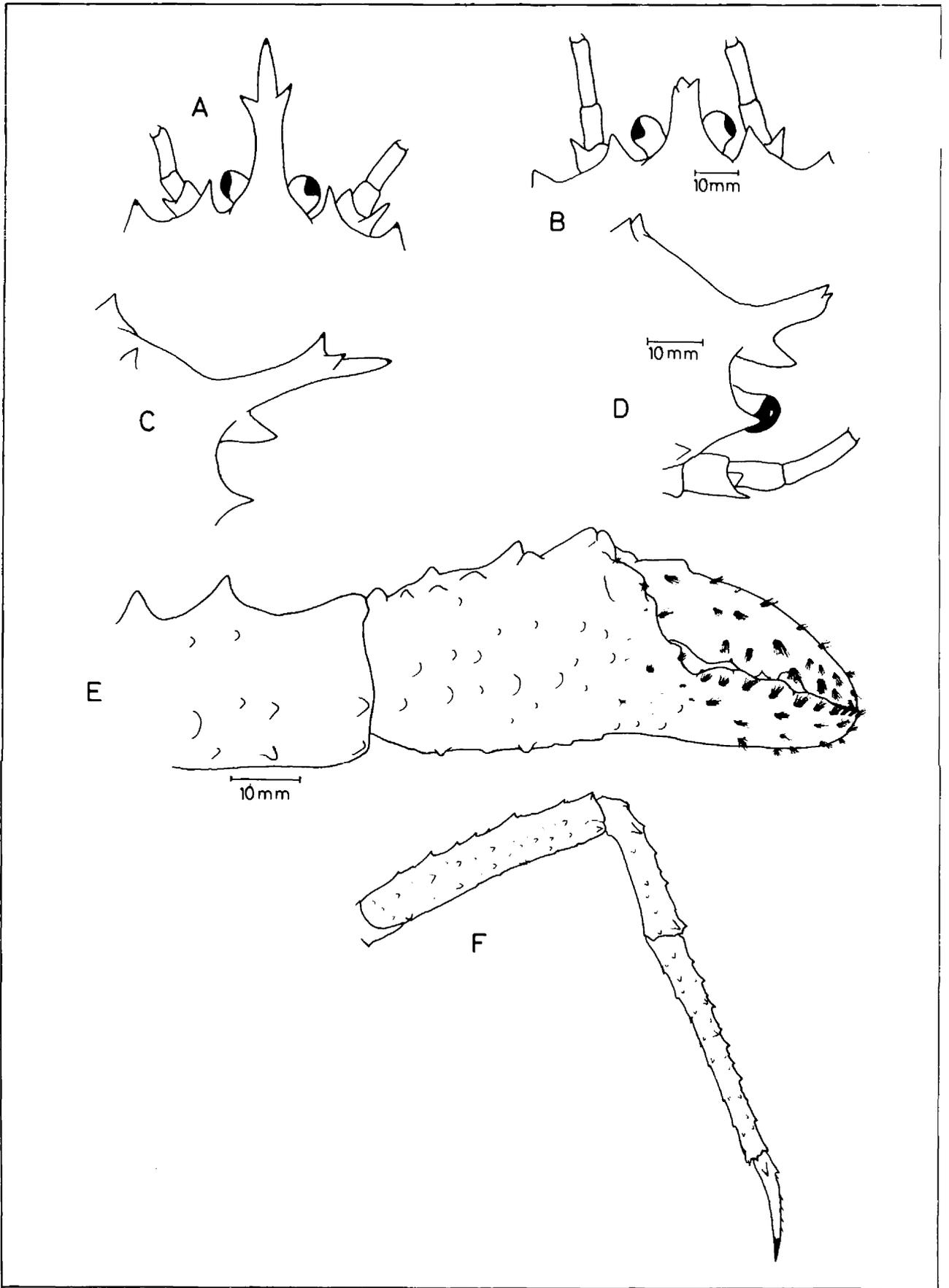


FIG. 32. *Lithodes unicornis* Macpherson (A, C: RMNH, ♀ ov., holotype, CL = 118 mm; B, D, E, F: ICM, ♂, allotype, CL = 129 mm, Valdivia I, P-12): A) - B) anterior part of carapace, dorsal view; C) - D) anterior part of carapace, lateral view; E) right cheliped; F) right third walking leg.

well-developed spine on the antero-external angle that does not reach the midpoint of the penultimate segment.

Chelipeds with merus armed with several thick spines on the dorsal and outer borders, the spines on the posterior half of the article more developed. Carpus with several thick spines on the dorsal and outer surfaces. Hand bearing two poorly defined rows of spines, less developed than those on the merus and the carpus, on the dorsal and outer borders. Fingers with many tufts of yellow setae. Some granules scattered over the various articles.

First walking leg shorter than the second and third walking legs, which are subequal.

Third walking leg somewhat less than three times carapace length. Coxa bearing some granules. Basis-ischium with a spine near the terminal border and some granules. Merus more than six times longer than high, almost twice carpus length, and a little shorter than the propodus, with a row of nine-ten spines on the anterior border, three-four of which are very small. A few spines on the dorsal surface and some scattered, spiniform granules. Some spines on the posterior border. Several spines on the anterior dorsal border of the carpus. Propodus 7.5-9 times longer than high, armed with more or less clearly defined rows of spines on the anterior, dorsal, and posterior borders. Ventral borders of all articles smooth. Dactylus rounded, slightly curved, one-half the length of the propodus, with several spines on the base and a row of corneous spines on the anterior border, extending beyond the midpoint of the article. Posterior border smooth.

Size

Carapace length is 118 mm, width 115 mm in the holotype. The allotype is 129 mm long and 124 mm wide.

Colour

Cream with pinkish tinges on the carapace and

pereiopods, darker on the spines and dactyli. Setae yellowish.

Distribution

Valdivia Bank, 24°43.7' S, 06°24.3' E, on muddy bottoms at 934 and 936 m.

Remarks

Lithodes unicornis is closely related to *L. murrayi* Henderson, from the Indian Ocean, with very similar spinulation of the carapace.

As Dawson and Yaldwyn (1985) pointed out, in some specimens of *Lithodes murrayi* the anterior projection of the rostrum may, because of malformation during regeneration, not be bifid, as is normal in this species, being formed instead by a single spine. This is also found to occur, though infrequently, in other species, such as *L. ferox* Filhol from off western Africa. Unfortunately, only two specimens of *L. unicornis* have been caught, and in one of these the rostrum was in the process of regeneration, hence there is some likelihood that the most definite specific character (non-bifid anterior projection) may be erroneous. Even so, comparative examination of *L. unicornis* and *L. murrayi* confirmed certain differences not included in the original description:

—Central spine of rostrum in *L. murrayi* visibly thicker than that in *L. unicornis*. Ratio anterior projection thickness — distance between external orbital spines, 0.3-0.4 in the former and around 0.2 in the latter (Plates 17 B-D).

—Walking legs spinier in *L. unicornis* (Figures 31E, F, 32F).

These two characters are rather constant in the other *Lithodes* species and would appear to confirm its validity as a separate species. Nevertheless, comparative analysis of a larger number of specimens of both these species is called for in order to verify whether or not these differences are in fact specific.

GENUS *PARALOMIS* White, 1856

(Feminine gender)

Paralomis White, 1856, p. 134; Stimpson, 1858, p. 231; Henderson, 1888, p. 44; Faxon, 1895, p. 44; Bouvier, 1895, p. 185; Bouvier, 1896, pp. 12, 21; Ortmann, 1898, p. 1148; Stebbing, 1900, p. 531; Balss, 1913, p. 76; Stebbing, 1914, p. 275; Schmitt, 1921, p. 158; Makarov, (1938) 1962, p. 257; Sakai, 1971, pp. 14, 36; Haig, 1974,

p. 155; Takeda, 1974 (in list); Sakai, 1976, p. 699; Sakai, 1978, p. 14; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in key, in list)

Acantholithus Stimpson, 1858, p. 231; Bouvier, 1895, p. 182; Bouvier, 1896, pp. 11, 21; Ortmann, 1898, p. 1148; Balss, 1913, p. 75

Leptolithodes Benedict, 1894, p. 484; Faxon, 1895, p. 47
Pristopus Benedict, 1894, p. 486

Echinocerus Benedict, 1894, p. 484 (in part)
Echidnocerus Bouvier, 1895, p. 184 (in part); Bouvier, 1896, pp. 12, 21 (in part)
Lopholithodes Haig, 1974, p. 160 (in part)

Type species: *Paralomis granulosa* (Jacquinot, 1847)

Description

Carapace well-calcified, more or less pentagonal or pyriform. Regions well-defined and convex. Gastric region more prominent than the others. Cardiac region triangular in shape, separated from the gastric region by a deep furrow. Cervical groove poorly marked and even less apparent between the branchial areas and the cardiac region.

Rostrum formed by a basal spine and at least one pair of more or less divergent, upwardly inclined, dorsal spines.

Second abdominal segment formed by a single plate. Third to fifth abdominal segments exhibiting clearly differentiated, well-calcified plates without nodules or membranous areas. A median plate, a pair of lateral plates, and a pair of marginal plates on each segment. Marginal and lateral plates on third segment (and very rarely on fourth segment) sometimes fused. Marginal plates on any segment sometimes subdivided.

Sternal region between the first pair of walking legs without a longitudinal, medial groove.

Eyes with pigmented corneas. Scaphocerite more or less spinulated, always present.

Third maxilliped with a crista dentata bearing more than ten corneous denticles and an accessory denticle.

Chelipeds subequal in length, right cheliped stouter. Cutting edges on right cheliped bearing thick, rounded teeth on the proximal two-thirds. Terminal third covered by a corneous unguis. Left cheliped bearing small, rounded teeth on the proximal region and a more or less denticulate, corneous unguis on the terminal region. Fingers curved slightly inwards, with numerous tufts of setae.

Walking legs more or less elongate. Second walking leg somewhat longer than the first and third.

Third walking leg always longer than carapace length.

Remarks

The genus *Paralomis* was established by White in 1856 for *P. granulosa* (Jacquinot) and currently comprises 44 species (see also Takeda *et al.*, 1984; Dawson and Yaldwyn, 1985). Sixteen species are found in the Atlantic Ocean (Figure 33): *P. granulosa* (Jacquinot, 1847) off southern South America, *P. formosa* Henderson, 1888, *P. longidactyla* Birstein & Vinogradov, 1972, *P. spinosissima* Birstein & Vinogradov, 1972, and *P. anameræ* n. sp. in the Southwest Atlantic, *P. bouvieri* Hansen, 1908, *P. spectabilis* Hansen, 1908, and *P. microps* Filhol, 1884, in the North Atlantic, *P. cubensis* Chace, 1939, *P. grossmani* n. sp., *P. pectinata* n. sp., and *P. serrata* n. sp. in the Caribbean and central western Atlantic, *P. shrinkaimaruae* Takeda, 1984 off southern Brazil, *P. erinacea* n. sp. and *P. cristulata* n. sp. off northern and central Africa, and *P. africana* Macpherson, 1982 off Namibia.

Four species have been reported from the Indian Ocean: *P. aculeata* Henderson, 1888, *P. indica* Alcock & Anderson, 1899, *P. investigatoris* Alcock & Anderson, 1899 and *P. roeveltdae* Kensley, 1980.

The largest number of species, 24, is found in the Pacific Ocean, Antarctic waters included: *P. hystrix* (de Haan, 1849), *P. aspera* Faxon, 1893, *P. longipes* Faxon, 1893, *P. diomedæae* (Faxon, 1893), *P. multispina* (Benedict, 1894), *P. verrilli* (Benedict, 1894), *P. dofleini* Balss, 1911, *P. japonica* Balss, 1911, *P. zelandica* Dawson & Yaldwyn, 1971, *P. medipacifica* Takeda, 1974, *P. inca* Haig, 1974, *P. seagranti* Eldredge, 1976, *P. haigae* Eldredge, 1976, *P. pacifica* Sakai, 1978, *P. cristata* Takeda & Ohta, 1979, *P. truncatispinosa* Takeda & Miyake, 1980, *P. hystrixoides* Sakai, 1980, *P. odawari* (Sakai, 1980), *P. chilensis* Andrade, 1980, *P. heterotuberculata* Tung Yumao *et al.*, 1984, *P. kyushupalauensis* Takeda, 1985, *P. ochithodes* Macpherson, 1988, *P. birsteini* Macpherson, 1988, *P. tuberipes* Macpherson, 1988 (*P. granulosa* also occurs in the Pacific, off southern Chile).

KEY TO THE SPECIES OF THE GENUS *PARALOMIS* IN THE ATLANTIC OCEAN

1. Dorsal carapace surface armed with well-developed spines, more (Plate 18) or less (Plate 20) numerous 2
 - Dorsal carapace surface bearing more (Plate 23B) or less (Plate 25) acute granules not forming true spines 7
2. Entire dorsal carapace surface covered with numerous spines (Plate 18) 3
 - Dorsal carapace surface bearing a few scattered spines (Plate 20) 6

3. One spine more developed than the rest in the centre of the gastric and branchial regions (Figure 34) *P. spinosissima* (p. 78)
- No clearly more developed medial spine in the gastric and branchial regions (Plate 19) 4
4. Dorsal surfaces of walking legs bearing some scattered spines (Figure 37E). Dorsal surface of scaphocerite with several spines and tubercles (Figure 37C) *P. erinacea* (p. 82)
- Dorsal surfaces of walking legs covered with many, well-developed spines. Dorsal surface of scaphocerite with neither spines nor tubercles 5
5. Rostrum slightly pedunculate, without spines between the pairs of dorsal spines (Figure 38A). Scaphocerite having a spine on either side of the medial spine (Figure 38C) *P. bouvieri* (p. 85)
- Rostrum only slightly pedunculate, with spines between the pairs of dorsal spines (Plate 19B). Scaphocerite having two-three spines on either side of the medial spine (Figure 39A) *P. shinkaimaruae* (p. 87)
6. A very well-developed, medial gastric spine (Plate 20). Scaphocerite bearing two-three spines on either side of the central spine (Figure 40 A) *P. formosa* (p. 88)
- A moderately developed, medial gastric spine (Plate 21). Scaphocerite bearing only one-two spines on the outer surface (Figure 42C) *P. spectabilis* (p. 91)
7. Carapace, cheliped, and walking leg surfaces densely covered with clusters of granules (Plate 22A) *P. granulosa* (p. 94)
- Carapace, cheliped, and walking leg surfaces densely covered with single granules of different sizes, never in clusters 8
8. Dorsal carapace surface bearing many large, flattened granules (Plates 22B, 23A) *P. cubensis* (p. 97)
- Dorsal carapace surface bearing numerous granules of varying size, but never flattened 9
9. Dorsal carapace surface bearing thick, rather pointed granules that do not form true spines (Plate 23B) 10
- Dorsal carapace surface bearing small, rounded granules (Plate 25) 11
10. Posterior carapace edge bearing several protuberances (Plate 23B, C). Distance between the two anterolateral spines equal to one-third carapace width *P. grossmani* (p. 99)
- No protuberances on the carapace edge or branchial regions (Plate 24). Distance between the two anterolateral spines equal to one-half carapace width *P. longidactyla* (p. 102)
11. Anterior and posterior borders of walking legs bearing well-defined rows of long, curved spines. Clearly visible crests on terminal borders of cheliped merus and carpus (Figure 47) *P. pectinata* (p. 103)
- Anterior and posterior borders of walking legs bearing poorly or well-defined rows of moderately long, curved spines. No crests on terminal borders of cheliped merus and carpus 12
12. Lateral edges of carapace practically smooth, except for some small spines on the anterior half (Figure 48) *P. serrata* (p. 105)
- Lateral edges of carapace bearing numerous spines or denticulate crests (Plate 26) 13
13. Lateral edges of carapace and anterior and posterior borders of walking leg articles bearing a more or less denticulate crest (Plate 26A) *P. cristulata* (p. 108)
- Lateral edges of carapace and anterior and posterior borders of walking leg articles bearing well-developed spines but no clearly visible crests (Plate 26B) 14

14. No thick spines on posterior border of propodus on walking legs (Figure 50I). Anterior border of merus on walking legs with a slight ridge. Central spine of scaphocerite bearing four-five spines on the inner margin (Figure 50C) *P. africana* (p. 110)
- Posterior border of propodus on walking legs with more or less thick spines. No ridge on anterior border of merus on walking legs (Figures 51H, 52D). Central spine of scaphocerite with one-two small spines on the inner margin 15
15. Spines on dorsal border of cheliped carpus forming a crest (Figure 51E). No concavity on lateral carapace edges just behind the level of the gastro-cardiac groove (Figure 51A) *P. microps* (p. 113)
- Spines on dorsal border of cheliped carpus not forming a crest (Figure 52C). Concavity on lateral carapace edges just behind the level of the gastro-cardiac groove (Plate 27) *P. anamerae* (p. 115)

Paralomis spinosissima Birstein & Vinogradov, 1972

(Figures 34, 35; Plate 18)

Paralomis spinosissimus Birstein and Vinogradov, 1972, p. 352, Figs. 1, 2

Paralomis spinosissima Takeda and Ohta, 1979, p. 197; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

1 ♂, R/V Eltanin, Cruise no, 9, St. 732, 11 September 1963, 53°36' S, 36°51' W, 220 - 265 m
1 ♂, 1 ♀, USARP, Cruise no. 575, St. 34, 19 May 1975, 54°41.6' S, 34°51' W, 563 - 598 m

Material examined

Moscow University Zoological Museum

1 ♂, holotype, 1 ♀, allotype, 1 ♀ ov., paratype, R/V Akadiemik Knipovich, St. 171, 28 February 1965, 53°37' S, 36°13' W, 640 - 650 m

4 ♂, paratype, R/V Akadiemik Knipovich, St. 855, 21 February 1967, 54°40.7' S, 35°11.5' W, 290 - 318 m

1 ♀, paratype, R/V Akadiemik Knipovich, St. 867, 27 February 1967, 54°39' S, 35°11.6' W, 260 - 325 m

1 ♀, paratype, R/V Akadiemik Knipovich, St. 881, 28 February 1967, 54°50.1' S, 34°48.2' W, 240 - 300 m

1 ♀, paratype, R/V Akadiemik Knipovich, St. 912, 8 March 1967, 53°55.8' S, 39°25.9' W, 215 - 220 m

1 ♀, paratype, R/V Akadiemik Knipovich, St. 176, 5 March 1965, 53°38' S, 36°47.2' W, 400 - 600 m

1 ♀, ov., R/V Akadiemik Knipovich, 26 March 1972, 46°01' S, 60°40.3' W, 132 - 135 m

3 ♀, R/V Akadiemik Knipovich, Cruise no. 19, northwest of South Georgia Island

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, 1 ♀, R/V Eltanin, Cruise no 9, St. 740, 18 September 1963, 56°06' S, 66°19.3' W, 384 - 494 m

1 ♀, R/V Eltain, Cruise no. 6, St. 339, 3 December 1962, 53°05.1' S, 59°24.3' W, 512 - 586 m.

4 ♂, 5 ♀ ov., 5 ♀, 54°48' S, 37°53' W, 671 m

1 ♂, R/V Eltanin, Cruise no, 9, St. 731, 12 September 1963, 53°34' S, 36°28' W, 796 - 824 m

Description

Carapace more or less pyriform, covered with more or less developed spines and spiniform tubercles. Tips of many spines sometimes bearing long, thin setae in juveniles.

Gastric region more convex and prominent than the cardiac and branchial regions, with a medial spine much more robust than the rest. Prominence of cardiac region same as or slightly more than that of the branchial regions, each of which has, at the level of the gastro-cardiac groove, a medial spine thicker than the spine in the gastric region. Branchial regions, like other regions, entirely covered by spines evenly distributed over the whole surface, except for a few spines clustered around the three large spines (one gastric spines and two branchial spines) and some spines grouped closer together near the posterior edge. Pterygostomian region bearing a spine on the terminal angle.

Rostrum with a straight, slightly upwardly inclined basal spine. Ventral border with several spines, usually absent in large individuals. A pair of divergent slightly upward-slanting, dorsal spines with a single spine between them. Two pairs of smaller dorsal spines at the base of the rostrum, with several still smaller spines between them.

Carapace edges armed with numerous spines. External orbital spine well-developed, without overreaching the end of the cornea. Antero-external

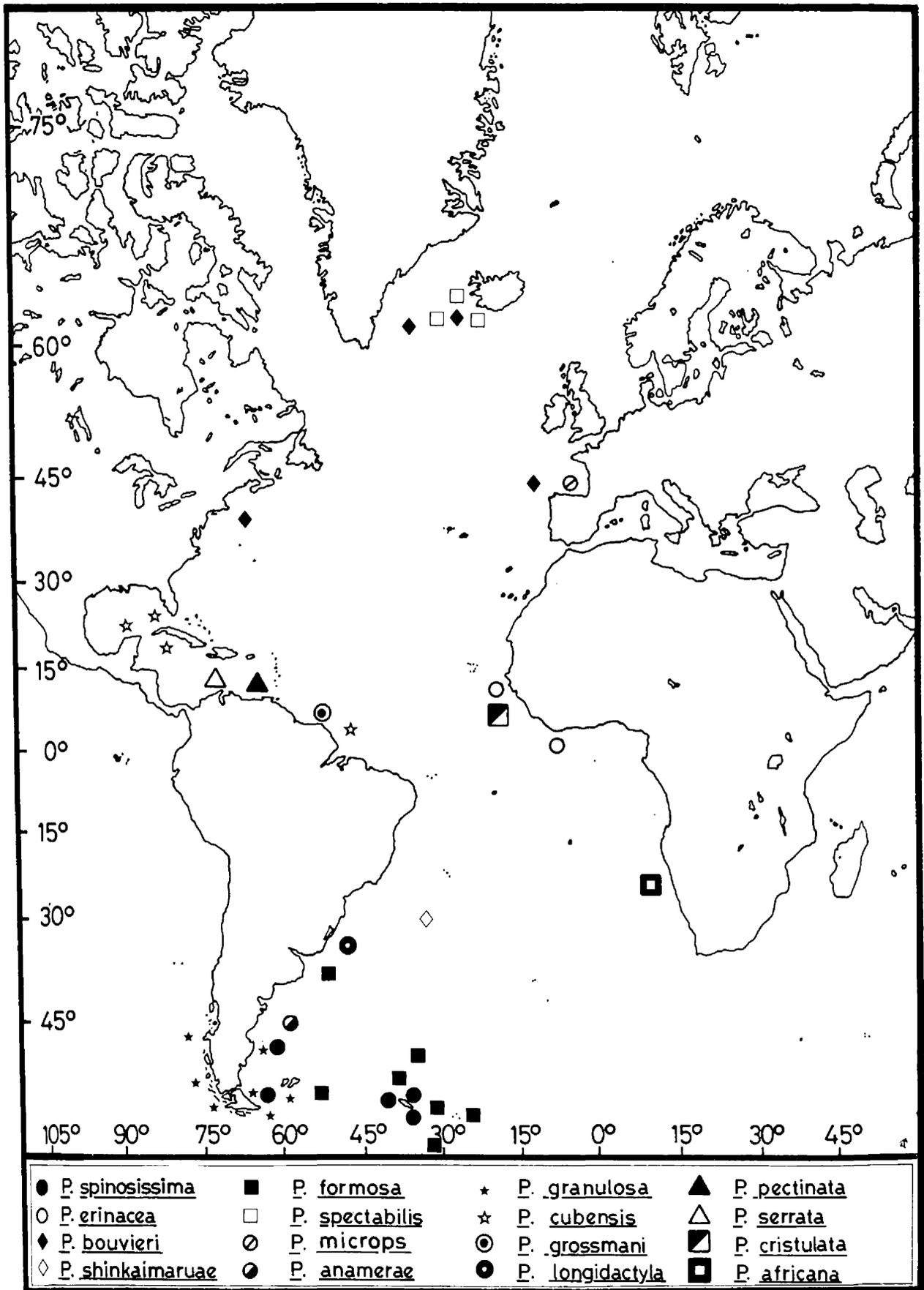
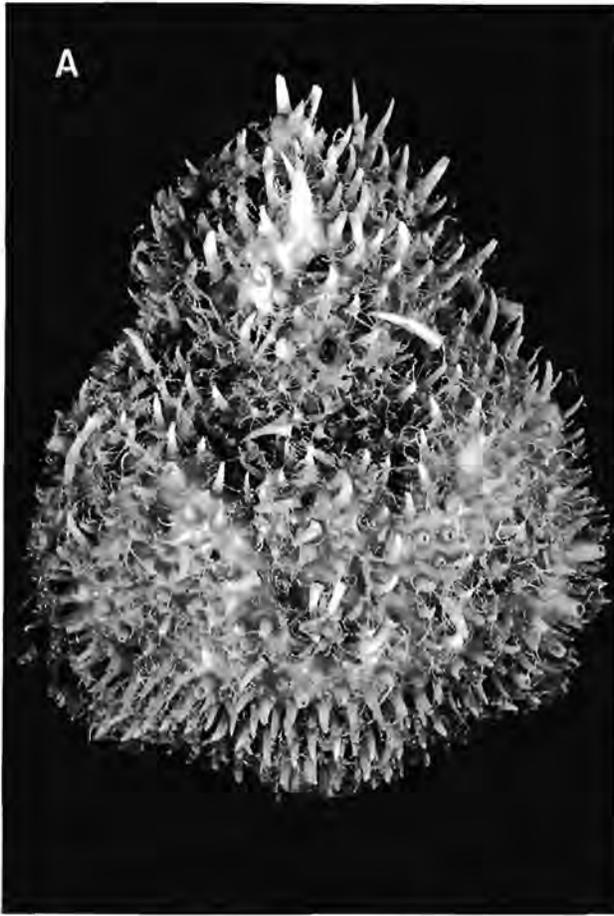


Fig. 33. Species distribution for the genus *Paralomis* White in the Atlantic Ocean.



spine long and outward-pointing, a little larger than the external orbital spine. Hepatic spine similar to the external orbital spine in size. Two spines somewhat smaller than the anterolateral spine on each branchial edge at the level of the gastro-cardiac groove, two-three more near the posterolateral angle. Posterior edge armed with numerous spines.

Abdominal segments covered with numerous spines. Marginal plates and lateral plates sometimes fused on third segment. Marginal plates on fourth and fifth segments subdivided.

Ocular peduncles bearing small dorsal spines, the terminal of these being the most developed, sometimes extending well beyond the end of the cornea in juveniles.

Basal article of antennal peduncle bearing a terminal, outer spine with one-three spinules at the base. Second article with five spines, the terminal spine on the outer surface longest, overreaching the base of the last segment of the antennal peduncle.

Scaphocerite rather compressed, with a long central spine reaching the tip of the antennal peduncle, two-three long spines on the outer surface.

FIG. 34. *Paralomis spinosissima* Birstein & Vinogradov (A - B: USNM, ♀, CL = 37 mm, Eltanin, Cruise 6, Sta. 339; C: USNM, ♂, CL = 101 mm, Southwest Atlantic): A) dorsal view of carapace. B) - C) lateral view of carapace.



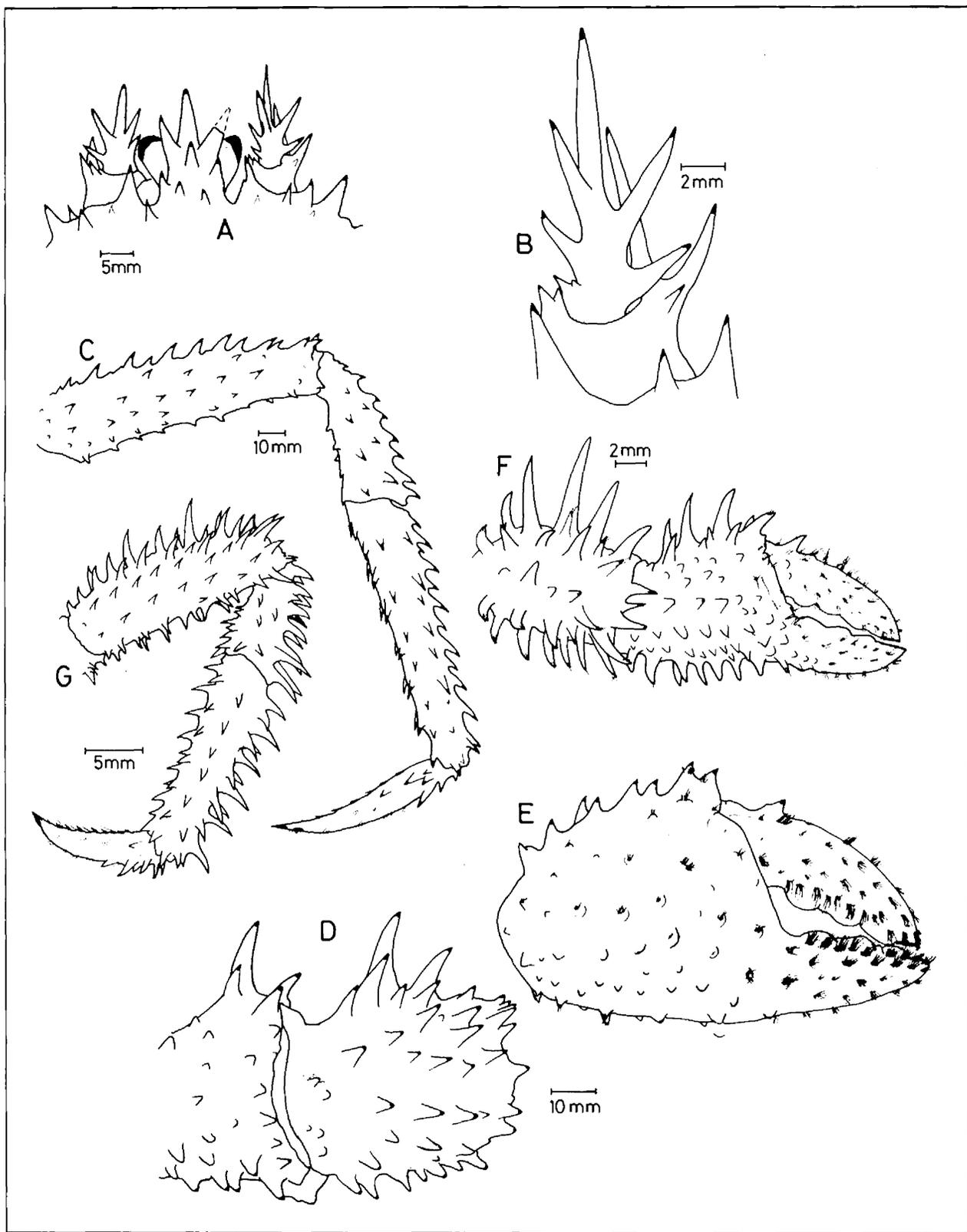


FIG. 35. *Paralomis spinosissima* Birstein & Vinogradov (A-E: MUZM, ♂, holotype, CL = 113 mm, Akademiik Knipovich, St. 171; F: USNM, ♀, CL = 30 mm, USARP, Cruise no. 9, St. 740; G: MUZM, ♀, CL = 34 mm, Cruise no. XIX): A) anterior part of carapace, dorsal view; B) right scaphocerite; C) right third walking leg; D) merus and carpus, right cheliped; E) claw, right cheliped; F) right cheliped; G) right third walking leg.

and two-three somewhat shorter spines on the inner surface.

All borders, except the inner borders, of cheliped articles armed with numerous, well-developed spines. Merus bearing some larger spines dorsally on the terminal border. Carpus with four-five dorsal spines longer than the rest, particularly the medial spine. Dorsal surface of hand bearing a pair of rows with four-five spines each. Movable finger with some dorsal spines proximally. Many tufts of setae on both fingers.

Third walking leg 2 to 2.5 times longer than carapace length in females and 2.5 to 3 times longer in males. Coxa with some small spines on the terminal border. Basis-ischium bearing many small spines. Merus between three and five times longer than high and a little more than 1.5 times carpus length. Anterior border with one row of 13-15 spines and two more rather poorly defined rows of about ten spines each on dorsal surface. Posterior border with a row of eight-ten spines smaller than the dorsal spines. Ventral surface bearing a row of 13-15 small spines very close to the anterior border plus two rows of very small spines. Carpus with a row of seven-eight spines on the anterior margin, around nine spines on the dorsal surface not arranged in any recognizable rows, and several spines on the posterior border. About six ventral spines near the anterior border, and several smaller spines scattered over the ventral surface. Propodus slightly shorter than the merus, four-five times longer than high, and a little longer than the dactylus. A row of 11-12 spines on the anterior margin. Dorsally, three rows of six-nine spines each, the spines in the most anterior row larger than the others. On the posterior margin, a row of eight-ten spines smaller than those on the anterior

border. On the ventral surface, one row of seven-nine spines near the posterior border. Dactylus slightly curved, with six spines on the proximal half of the anterior margin and two-three on each side on the base. Eleven-twelve corneous spicules on the posterior border. Tufts of setae in two rows along the anterior and posterior margins.

Size

The holotype measures 113 mm in length and 125 mm in width. Allotype length is 88 mm, width 84 mm. The other males examined ranged from 25 to 112 mm in length and from 24 to 114 mm in width. The females ranged between 30 and 100 mm in length and between 31 and 103 mm in width. Ovigerous females from 77 mm long.

Distribution

Southeast Atlantic, Scotia Sea, South Georgia Island, and between the Burwood Bank and the Falkland Islands (Malvinas) at depths between 132 and 650 m.

Remarks

Paralomis spinosissima resembles *P. erinacea* n. sp., from off northwestern Africa, and *P. shinkaimaruae* Takeda, from off southern Brazil, but it is differentiated by thick spines in the centre of the gastric and branchial regions (pp. 85, 88), as well as by other characters.

Paralomis erinacea n. sp.

(Figures 36A, 37; Plate 19A)

Material examined

Muséum National d'Histoire Naturelle, Paris
1 ♀ ov., holotype, 7 ♀ ov., paratypes, Ivory Coast,
900 m, Le Loeuff and Intes Coll.

Instituto de Ciencias del Mar, Barcelona
1 ♀, paratype, Guinea Bissau, P-89, 13 January
1985, 11°22' N, 17°21' W, 251 - 398 m

Description

Carapace more or less pentagonal, covered with numerous spines bearing small setae. Gastric region convex, more prominent than the cardiac and

branchial regions. Branchial regions less protuberant than the cardiac and gastric regions. Size of spines rather uniform, except for somewhat thicker spines in the centre of the gastric and branchial regions and on the posterior edges of the branchial regions.

Basal spine of rostrum curved, pointing slightly upwards. Rostrum bearing three-four small, ventral spines and a pair of dorsal spines. A single on the dorsal surface of the basal spine. Two pairs of smaller spines at the base of the rostrum. A few small spines between the dorsal pairs.

Carapace edges bearing numerous spines, most thicker than the spines on the dorsal carapace surface. External orbital spine reaching the base of the last segment of the antennal peduncle, without overreaching the end of the cornea. Anterolateral

spine larger than the external orbital spine. Spines on the posterior half of the branchial edge and posterior carapace edge somewhat smaller than the rest.

Abdominal segments covered with spines bearing numerous setae around the base. Spines on the outer borders more developed. Marginal plates on third to fifth segments subdivided but not fused with the lateral plates.

Ocular peduncles bearing several spicules dorsally, the terminal spicule largest.

First segment of antennal peduncle with a thick spine on the terminal, outer angle that sometimes has a smaller spine at the base. Three spines on the outer margin of the second segment, one on the inner margin. Scaphocerite with a long, terminal spine, two-three well-developed spines on the outer border, and three somewhat smaller spines on the inner surface. One-two spines and several tubercles on the dorsal surface.

Chelipeds with merus bearing numerous spines on the dorsal, ventral, and outer surfaces, the thickest near the terminal, dorsal border. Carpus with three thick spines and several smaller spines on the dorsal surface, without forming any clearly recognizable crest. Some small spines and granules on the outer

surface and ventral border. Dorsal surface of hand bearing seven strong spines. Many small spines and granules on the outer and ventral borders. Some small spines on the base of each finger. Many tufts of setae.

Walking legs elongate. Third pair of walking legs somewhat less than twice carapace length. On third walking leg, merus one half carapace length, almost twice carpus length, and between three and four times longer than high, with a row of 12-14 spines on the anterior border and a few smaller spines on the posterior margin. Some spines on the dorsal surface, without forming any clearly defined rows. Carpus bearing a row of spines on the anterior border and some more, scattered spines on the dorsal surface and terminal margin. Propodus a little shorter than the merus, about four times longer than high, and slightly longer than the dactylus, with spines along the anterior margin and some more, fewer and smaller, spines on the posterior surface. Three-four small spines on the dorsal surface. Dactylus slightly curved, with some small spines on the base of the anterior border and one on each side. Several corneous spicules along the posterior margin. Many tufts of setae in rows along the anterior border and on the dorsal surface.

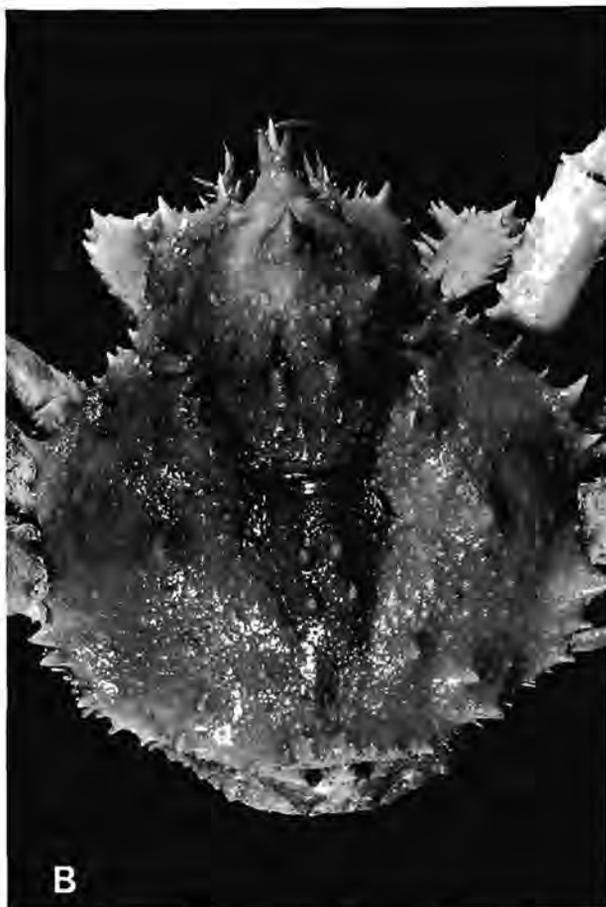
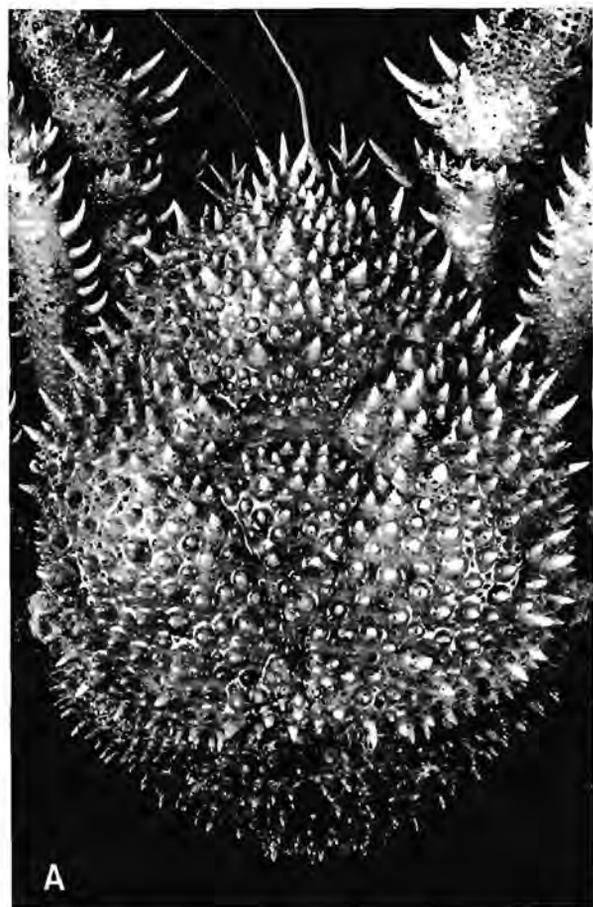


FIG. 36. A) *Paralomis erinacea* n. sp. (MP, ♀ ov., holotype, CL = 69 mm, Ivory Coast): dorsal view of carapace. B) *Paralomis formosa* Henderson (USNM, ♀ ov., CL = 86 mm, Cruise 9, Sta. 731): dorsal view of carapace.

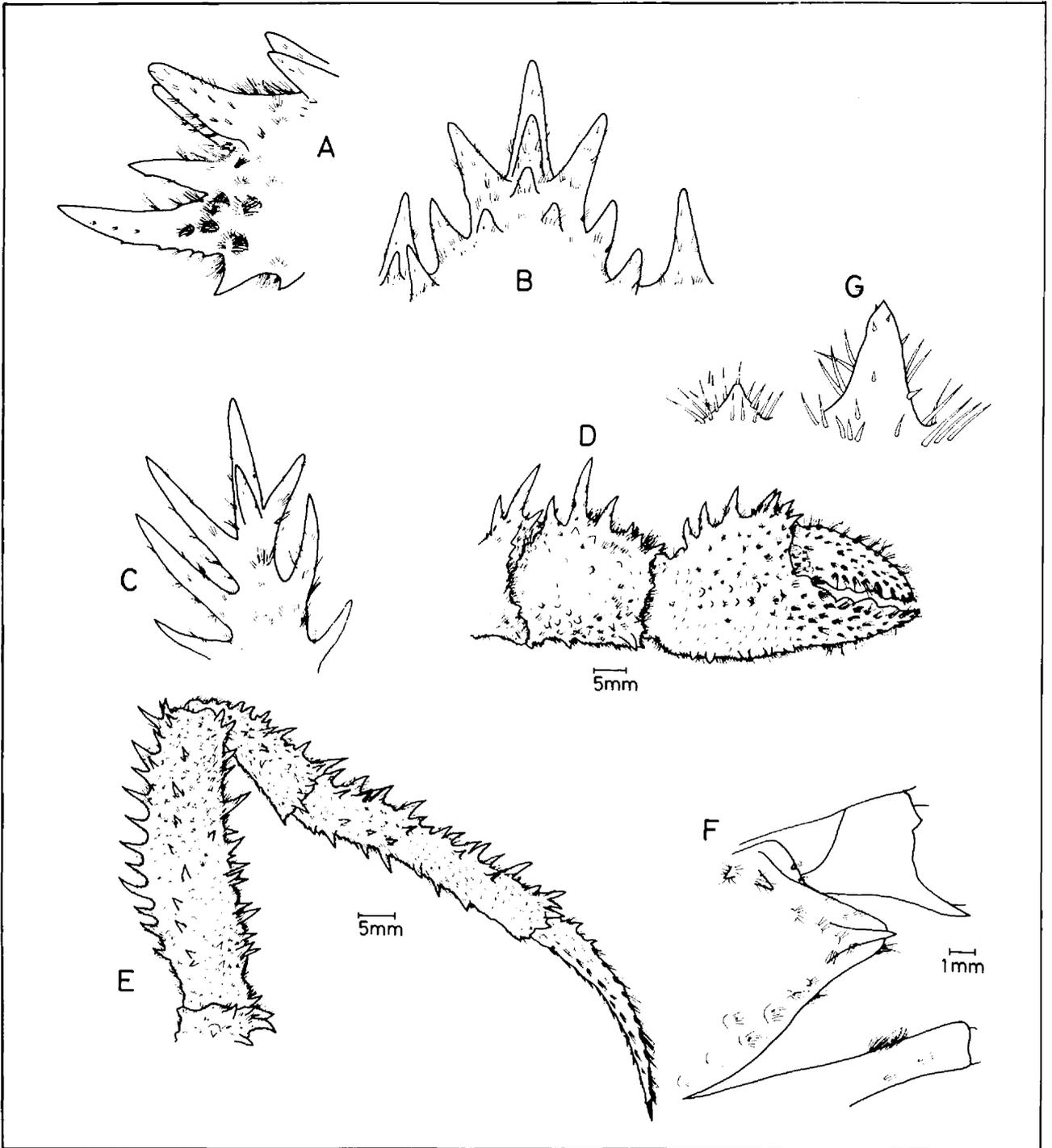


FIG. 37. *Paralomis erinacea* n. sp. (MP, ♀ ov., holotype, CL = 69 mm, Ivory Coast): A) lateral view of rostrum; B) dorsal view of rostrum; C) left scaphocerite; D) right cheliped; E) right third walking leg; F) pterygostomian region; G) dorsal carapace spines.

Size

Holotype length 69 mm, width 68 mm, the other ovigerous females ranging between 58 and 78 mm long and between 57 and 76 mm wide. The only non-ovigerous female measured 46 mm in length and 44 mm in width.

Distribution

Off Guinea Bissau and the Ivory Coast on muddy bottoms at depths between 251 and 900 m.

Remarks

Paralomis erinacea is closely related to *P. spinosissima* Birstein & Vinogradov, from the Southeast Atlantic, and *P. shinkaimaruae* Takeda, from off Brazil. The carapaces of all three species are covered with spines, but they are differentiated by the characters set out below:

—*P. spinosissima* bearing several thick spines clearly larger than the others in the centre of the gastric and branchial regions. In *P. erinacea* a few spines appearing slightly more developed than the others, but in general all spines small in size and similar to the rest.

—Walking legs bearing more spines in *P. spinosissima*, particularly the propodus (Figures 35C, G, 37E).

—Chelipeds less spinulated in the new species.

—Scaphocerite more spinulated in *P. erinacea* than in *P. spinosissima*. In the former, two-three spines on the outer border, three on the inner border, and several spines and tubercles on the dorsal surface. In the latter, two-three spines on the outer border and

two on the inner border, dorsal surface smooth (Figures 35B, 37C).

—No spines thicker than the rest on the gastric and branchial regions in *P. shinkaimaruae*, yet the spines on the carapace, chelipeds, and walking legs are larger in *P. shinkaimaruae* than in *P. erinacea* (Plate 19). Various spines and tubercles on the dorsal surface of the scaphocerite in *P. erinacea*, absent in *P. shinkaimaruae*.

P. bouvieri Hansen, from the North Atlantic, also resembles *P. erinacea*, but the two are readily distinguished by the spinulation of the rostrum and scaphocerite, spinier in the new species. Additionally, there are fewer spines on both the chelipeds and walking legs in *P. bouvieri* (Figures 35, 38).

Etymology

The name *erinacea* is derived from the Latin "ericus", urchin or hedgehog, in reference to the spiny appearance of this species.

Paralomis bouvieri Hansen, 1908

(Figure 38)

Paralomis bouvieri Hansen, 1908, p. 24, Pl. II, Figs. 2a-2f; Stephensen, 1912, p. 578; Birstein and Vinogradov, 1967 (in list); Takeda, 1974 (in list); Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

Material examined

Muséum National d'Histoire Naturelle, Paris
1 ♂, 1 ♀, Geomanche, St. D1 13 (CH60), 47°46' N,
12°19.6' W, 4 152 m

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, R/V Gillis, GI-74-04, St. 97, 23 November
1974, 36°59' N, 74°24' W, 1 460 m

Description

Carapace more or less pentagonal, somewhat longer than wide. Dorsal surface covered with many long spines, but without granules among them. Normally no setae on spines. Size of spines variable, some clearly larger than others. Gastric region more prominent than the branchial regions and somewhat more prominent than the cardiac region. One spine

more developed than the rest in the centre of the gastric region. A spine on the terminal angle of the pterygostomial region.

Basal spine of rostrum practically horizontal, smooth ventrally. Two pairs of dorsal spines. Another pair of small spines at the base of each of the dorsal spines. No spines between the dorsal pairs.

Carapace armed with numerous small spines on all surfaces. External orbital spine smaller than the anterolateral spine, reaching neither beyond the end of the cornea nor to the end of the penultimate antennal segment. Hepatic spine similar to the anterolateral spine in size.

Spines and spiniform granules on all plates of the abdominal segments. Marginal plates on third to fifth segments very small.

Ocular peduncles bearing dorsal spines, the terminal spine extending well past the end of the cornea.

Basal segment of antenna bearing an antero-external spine. Second antennal segment with a long, antero-external spine overreaching the base of the last segment and a smaller spine on the base. Inner border smooth. Scaphocerite with a long, central spine reaching nearly to the end of the last segment of the antennal peduncle and another, less developed spine on the outer border. A small spine on the inner border.

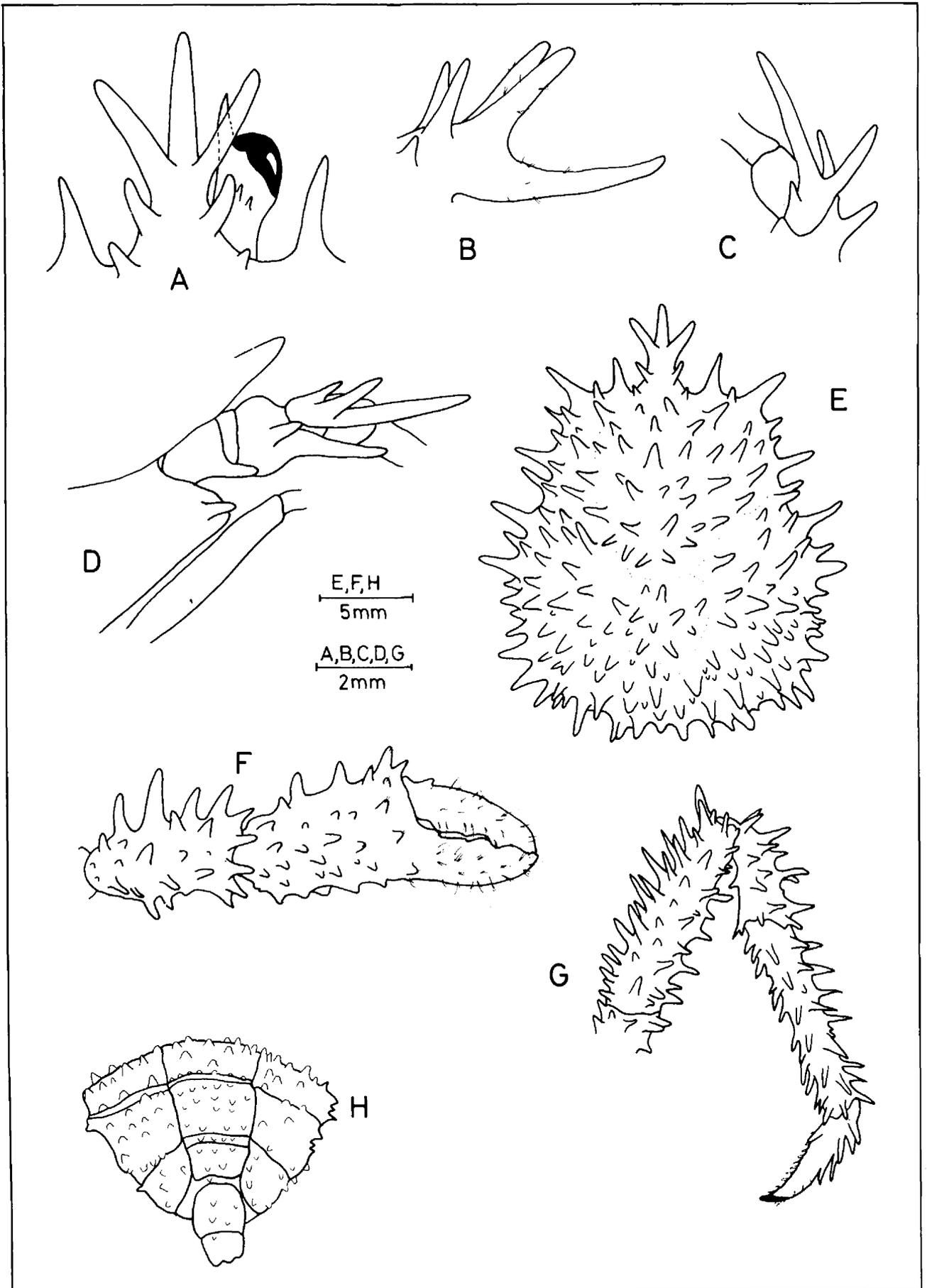


FIG. 38. *Paralomis bouvieri* Hansen (MP, ♂, CL = 18,5 mm, Geomanche, St. D1 13 (CH60)): A) dorsal view of rostrum; B) lateral view of rostrum; C) right scaphocerite; D) right antenna and pterygostomial region; E) dorsal view of carapace; F) right cheliped; G) right third walking leg; H) abdomen.

Chelipeds with merus and carpus armed with many spines, well-developed on the dorsal, outer, and terminal borders. Some small spines on the inner surface. Carpus with four-five thick spines dorsally without forming a crest. Many small spines on the dorsal, ventral, and outer borders of the hand, the longest of these on the dorsal surface, and a few tubercles on the inner surface. A small, basal spine dorsally on the movable finger. Rest of finger surfaces smooth except for tufts of yellow setae.

Walking legs elongate. Third walking leg equal to or a little less than twice carapace length. Various spines on basis-ischium. Merus four times longer than high and a little more than twice carpus length, with two more or less clearly defined rows of spines on the anterior border and two more on the posterior margin. Numerous spines on the dorsal surface. Two longitudinal rows of small spines on the ventral surface. Carpus with ragged rows of spines on the anterior border and dorsal surface, spiniform tubercles on the posterior border, and several well-developed spines on the ventral surface. Propodus somewhat shorter than the merus, 1.5 times the dactylus, about four times longer than high, well-armed with numerous spines more or less in rows on the anterior, posterior, and dorsal margins. Many spines on the ventral surface. Dactylus with spines on the proximal portion of the anterior border, a basal spine on each side, and a row of nine corneous spines on the posterior border. Terminal unguis curved.

Size

All the specimens of *Paralomis bouvieri* caught to date are small. The males examined were 13 and 18.5

mm long and 12 and 16 mm wide. The female (damaged) was 13 mm long.

The specimens described by Hansen were 34.8 mm in length and 34 mm in width (female) and 23 mm in length and 21 mm in width (male).

Distribution

South of Iceland, east of Greenland, off the northeastern United States, and off southwestern Ireland at depths of from 1 460 to 4 152 m.

Remarks

Paralomis bouvieri belongs to the group of Atlantic species in which the dorsal carapace surface is covered with spines, also including *P. spinosissima* Birstein & Vinogradov, from the Southwest Atlantic, *P. shinkaimaruae* Takeda, from off southern Brazil and *P. erinacea* n. sp., from off northwest Africa.

The size difference between the specimens of *P. bouvieri* (CL = 13 to 35 mm) and those of the other species examined makes comparison difficult, particularly with *P. shinkaimaruae* and *P. erinacea*, in which the specimens examined were all larger than 46 mm. However, *P. bouvieri* has no thick, medial spines on the gastric or branchial regions, which clearly differentiates it from *P. spinosissima*. The rostrum and scaphocerite are more spinulate and less pedunculate in *P. shinkaimaruae* and *P. erinacea*. Moreover, in *P. erinacea* there are fewer spines on the legs and chelipeds, and the curvature of the dactyli is less pronounced.

Paralomis shinkaimaruae Takeda, 1984

(Figure 39; Plate 19B)

Paralomis shinkaimaruae Takeda and Hatanaka, 1984, p. 14, Figs. 3-5; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

Description (after Takeda and Hatanaka, 1984)

Carapace more or less pentagonal, covered with well-developed spines. Some small tubercles scattered among the spines. Gastric region slightly more prominent than the cardiac and branchial regions. Branchial regions not markedly convex. None of the spines on any of the regions clearly larger than the others.

Basal spine of rostrum (tip broken off) slightly recurved. A spine and several spinules on the ventral margin. A pair of divergent, dorsal spines slanting upwards. Another pair of spines on the base of the rostrum, and a spine midway between the two dorsal pairs. External orbital spine larger than the anterolateral spine, extending beyond the end of the cornea, probably terminating at the level of the central rostral spine. Lateral carapace edges bearing numerous, well-developed spines. Spines on the posterior edge smaller than those on the lateral edges.

Ocular peduncles with three long spines longitudinally on the dorsal surface.

A long spine and two or three smaller spines on the terminal, outer angle of the basal segment of the antennal peduncle. Three spines on the outer border and one on the terminal, inner angle of the second segment. Scaphocerite rather compressed, with a long, central spine overreaching the tip of the

peduncle, two long spines on the outer surface, and three smaller ones on the inner surface.

Chelipeds with merus, carpus, and claw armed with numerous spines, more developed on the dorsal margin. Dorsal spines on carpus not forming crests.

Numerous, well-developed spines on walking legs, which are not particularly elongate.

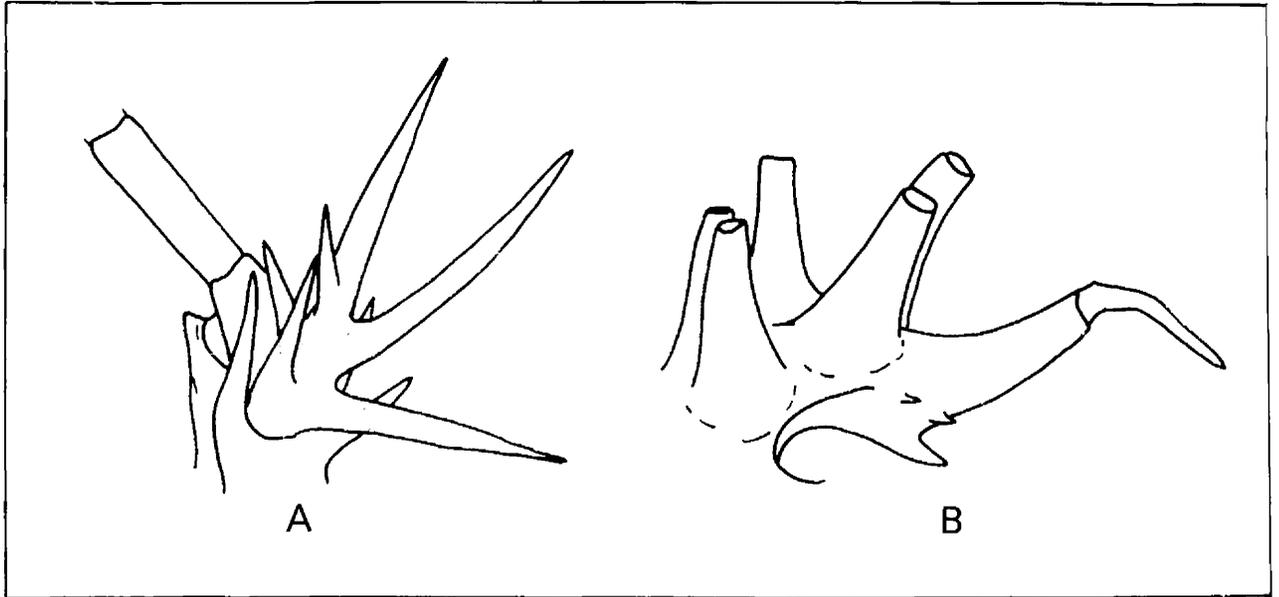


FIG. 39. *Paralomis shinkaimaruae* Takeda (NSMT, ♀, holotype, CL = 75 mm): A) left antenna; B) lateral view of rostrum (from Takeda and Hatanaka, 1984).

Size

The only specimen (female) caught to date has a carapace length of 75 mm and a width of 78 mm.

Distribution

Bromley Plateau, 31°13' S, 34°49' W, at a depth of 698 m.

Remarks

This species resembles *Paralomis spinosissima* Birstein & Vinogradov, from the Southwest

Atlantic, but it is readily distinguishable by the following characters:

—In *P. spinosissima*, a very large, medial gastric spine and another, clearly more developed spine on each of the branchial regions. In *P. shinkaimaruae*, all spines similar in size.

—Several long spines on the branchial edge in *P. spinosissima*, smaller in *P. shinkaimaruae*.

—Walking legs shorter in *P. shinkaimaruae*.

—External orbital spine smaller than the anterolateral spine in *P. shinkaimaruae* and longer in the other species.

P. shinkaimaruae is also close to *P. erinacea* n. sp., from off northwest Africa, but the two species are differentiable by the spinulation of the carapace, chelipeds, walking legs, and scaphocerite (p. 85).

Paralomis formosa Henderson, 1888

(Figures 36B, 40; Plate 20)

Paralomis formosus Henderson, 1888, p. 46, Pl. V. Fig. 2

Paralomis formosa Bouvier, 1896, p. 26; Birstein and Vinogradov, 1967 (in list); Takeda, 1974 (in list);

Boschi, 1979 (in list); Boschi *et al.*, 1981, p. 244; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list) *Paralomis spectabilis* Birstein and Vinogradov, 1972, p. 352 (no Hansen, 1908)

Material examined

British Museum (Natural History), London

1 ♂, lectotype, 2 ♂, 1 ♀, paralectotypes, Challenger Exp., St. 320, 14 February 1876, 37°17' S, 53°52' W, 1 110 m

Instituto de Ciencias del Mar, Barcelona

1 ♂, 37°28' S, 54°27' (no depth listed), Dr. Boschi bequest

Senckenberg Museum, Frankfurt

2 ♂, R/S Walter Herwig, St. 692/78, 40°34.8' S, 55°38.6' W, 1 500 - 1 560 m

1 ♂, 1 ♀, R/S Walter Herwig, St. 693/78, 40°23.9' S, 56°07.2' W, 940 - 1 040 m

Muséum National d'Histoire Naturelle, Paris

1 ♂, R/S Akadiemik Knipovich, St. 176, 5 March 1965, 53°34.9' S, 36°45.2' W, 660 - 860 m

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀ ov., 1 ♂, USARP, Cruise no. 9, St. 734, 52°23' S, 37°11.2' W, 1 299 - 1 400 m

9 ♀ ov., 1 ♀, 4 ♂, USARP, Cruise no. 9, St. 731, 12 September 1963, 53°34.3' S, 36°38.5' W, 796 - 824 m

2 ♀, 2 ♂, USARP, Cruise 575, 11 May 1975, 53°31.2' S, 37°50.9' W, 1 267 - 1 599 m

5 ♀ ov., 1 ♂, USARP, R/V Eltanin, St. 678, 24 August 1963 54°48' S, 37°53' W, 732 - 814 m

1 ♂, USARP, Cruise no. 575, St. 34, 19 May 1975, 54°41.6' S, 34°51.7' W, 563 - 598 m

3 ♀ ov., USARP, Cruise no. 575, St. 35, 20 May 1975, 54°46.8' S, 34°21.7' W, 960 - 991 m

1 ♀, USARP, Cruise no. 575, St. 69, 2 June 1975, 56°23.7' S, 27°19' W, 861 - 1 042 m

7 ♀ ov., 4 ♂, USARP, Cruise no. 575, St. 27, 17 May 1975, 53°34.9' S, 36°47.8' W, 448 - 872 m

1 ♂, USARP, Cruise no. 876, St. 130, 25 February 1976, 59°53.1' S, 32°19.5' W, 523 - 671 m

1 ♀, USARP, Cruise no. 575, St. 5, 50° 51.2' S, 43° 03.2' W, 1350-1361 m.

Moscow University Zoological Museum

2 ♀ ov., R/S Akadiemik Knipovich, St. 176, 5 March 1976, 53°38' S, 36°47.2' W, 400 - 600 m

2 ♂ R/S Akadiemik Knipovich, St. 931, 14 March 1967, 59°58.6' S, 32°24.6' W, 563 - 605 m

2 ♂ R/S Akadiemik Knipovich, St. 918, 9 March 1967, 54°48.8' S, 34°52.5' W, 560 - 593 m

Description

Carapace more or less pentagonal, as long as wide. Entire carapace surface covered with small granules and a few spines. Gastric region convex, much more prominent than the cardiac and branchial regions. A thick, medial spine slanting slightly upwards on the

anterior half of the gastric region. Two small spines in the centre of the posterior half. One small spine on each side of the gastric region, a little behind the large, medial spine. Four small spines rather close together in a square-shaped pattern on the cardiac region. A strong, medial spine on each branchial region at the level of the first pair of cardiac spines. A row of two-three oblique spines near the intestinal region. A small spine near the cervical groove at the level between the posterior pair of gastric spines and the gastro-cardiac groove. Some more or less spiniform granules on the intestinal region. A spine on the terminal angle of the pterygostomian region.

Rostrum slightly pedunculate, with the basal spine slightly recurved and bearing a small tubercle on the ventral border. Two divergent, upwardly inclined, dorsal spines. Spines on the branchial borders most developed. External orbital spine well-developed, not usually extending beyond the end of the cornea, though it may reach the base of the last antennal article. Anterolateral spine well-developed, similar to the external orbital spine in size, recurved and directed upwards and outwards. Hepatic spine similar to the anterolateral spine in size. Five-six spines thicker than the hepatic spine on the branchial edges, with a number of smaller spines interspersed.

Abdominal segments bearing small granules. Two spines in the centre of the second segment. Marginal and lateral plates on third segment usually fused in both males and females, though in some specimens they may be clearly separate and in others only partially fused. Marginal plates on fourth and fifth segments fused or subdivided.

Ocular peduncles with granules on the dorsal surface along with a small, terminal spine.

Terminal, outer spine on the basal segment of the antennal peduncle. Long, terminal, outer spine on the second segment, overreaching the base of the last segment. Two-five smaller spines on the base of the second segment, and one-two small spines on the inner border. Scaphocerite with a long, central spine, normally extending a little beyond the end of the antennal peduncle. Two-three spines on either side, more developed than those on the outer surface. Spines on the inner surface of the scaphocerite rudimentary in the type material.

Chelipeds with merus bearing several spines, the most developed spine located on the terminal, dorsal border. Carpus armed with small spines on the outer surface (some on the inner surface) and a row of five-six thick spines on the dorsal border, with the medial spine very well-developed. Hand with well-developed spines on the dorsal border and two poorly defined rows of four small spines or granules on the outer and ventral borders. Some spines on the inner surface. Two longitudinal rows of tubercles on the inner surface, more evident on the right cheliped. Tufts of setae on fingers.

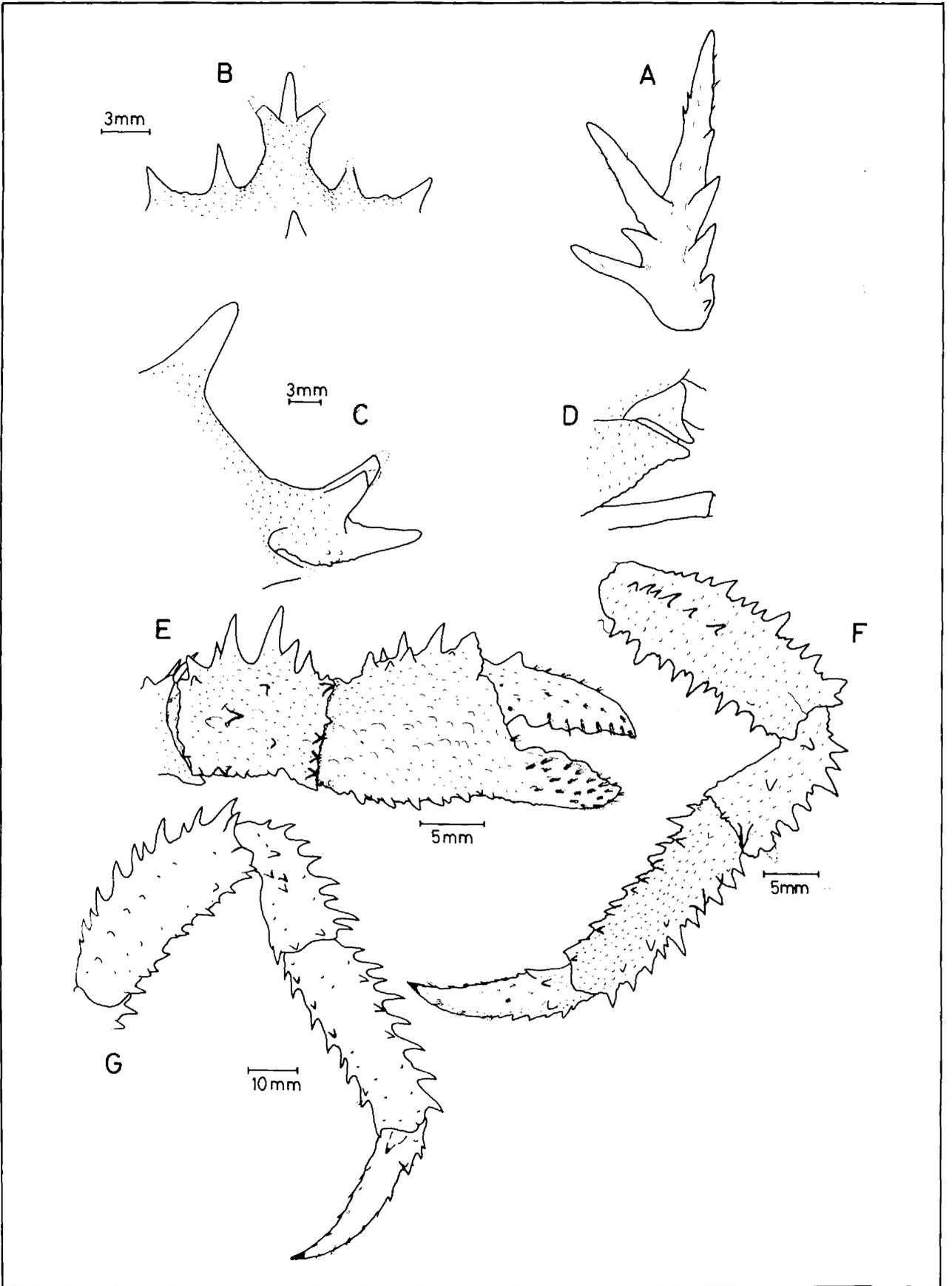


FIG. 40. *Paralomis formosa* Henderson (A: BM, ♂, lectotype, CL = 14.5 mm, Challenger Exp., St. 320; B-F: ICM, ♂, CL = 39 mm, Argentina; G: USNM, ♀ ov., CL = 86 mm, Cruise no. 9, St. 731): A) left scaphocerite; B) anterior part of carapace, dorsal view; C) anterior part of carapace, lateral view; D) pterygostomial region; E) right cheliped; F) right third walking leg; G) right third walking leg.



FIG. 41. *Paralomis spectabilis* Hansen (ZMC, ♂, paralectotype, CL = 43 mm., Ingolf Exp., Sta. 96): A) dorsal view of carapace; B) abdomen.

the cardiac region. A thick spine on the anterior half of each branchial region, and a somewhat smaller spine near the gastro-cardiac groove. Two-three spines near the posterior edge proximate to the intestinal region. Some scattered granules on both the cardiac and branchial regions, thicker and more acute in juveniles. Pterygostomian region with a spine on the terminal angle.

Rostrum slightly pedunculate. Basal spine smooth ventrally, curving slightly upwards. Two divergent, slightly upward-slanting dorsal spines.

Well-developed external orbital spine on carapace edge that does not reach the end of the cornea but does reach the base of the penultimate article of the antennal peduncle. Anterolateral spine larger than the external orbital spine. A robust hepatic spine similar to the anterolateral spine in size, with a spinule between them. Several spines similar to the hepatic spine in size on the anterior half and posterior angle of the edges of the branchial regions. Some small spines on the posterior edge.

Some small spines mainly at the centre and borders of the second abdominal segment. Some granules on the plates on the remaining segments. Marginal plates on the left side of the third and fourth segments of the lectotype fused with the lateral

plates; marginal plates in the adult male fused only on the third segment.

Ocular peduncles with some granules dorsally.

Basal article of antennal peduncle with a small antero-external spine. A small, terminal, inner spine and a long, terminal, outer spine on the second article, the latter reaching the base of the last antennal segment. Scaphocerite rather compressed, with a large, central spine and one-two small spines at the base of the outer border. Central spine extending to the midpoint of the last antennal segment. Inner border smooth.

Chelipeds with merus and carpus bearing well-developed spines dorsally and some small spines on the outer surfaces. Hand with five-six dorsal spines and some spiniform granules on the outer, ventral surface. Tufts of yellowish setae on fingers.

Walking legs elongate. Second pair somewhat longer than the first and third pairs of walking legs.

Third walking leg about 2.5 times carapace length in adults. One-two spines and a few granules on the posterior, terminal border of basis-ischium. Merus 1.8 times carpus length and slightly longer than the propodus, 5.8 times longer than high in the lectotype and 4.7 times in the adult male. A row of 10-13 spines on the anterior border, six-eight spines on the dorsal

surface, and another six-eight on the posterior border. Carpus with a row of five-six spines on the anterior surface and several more on the dorsal surface. Propodus seven times longer than high in the lectotype and 4.7 times in the adult male, bearing two ragged rows of spines on the anterior border and

several smaller spines on the dorsal surface and posterior border. Dactylus slightly curved, a little shorter than the propodus, with several spines on the base and a row of corneous spinelets on the posterior border. Various tufts of setae on the anterior and posterior margins.

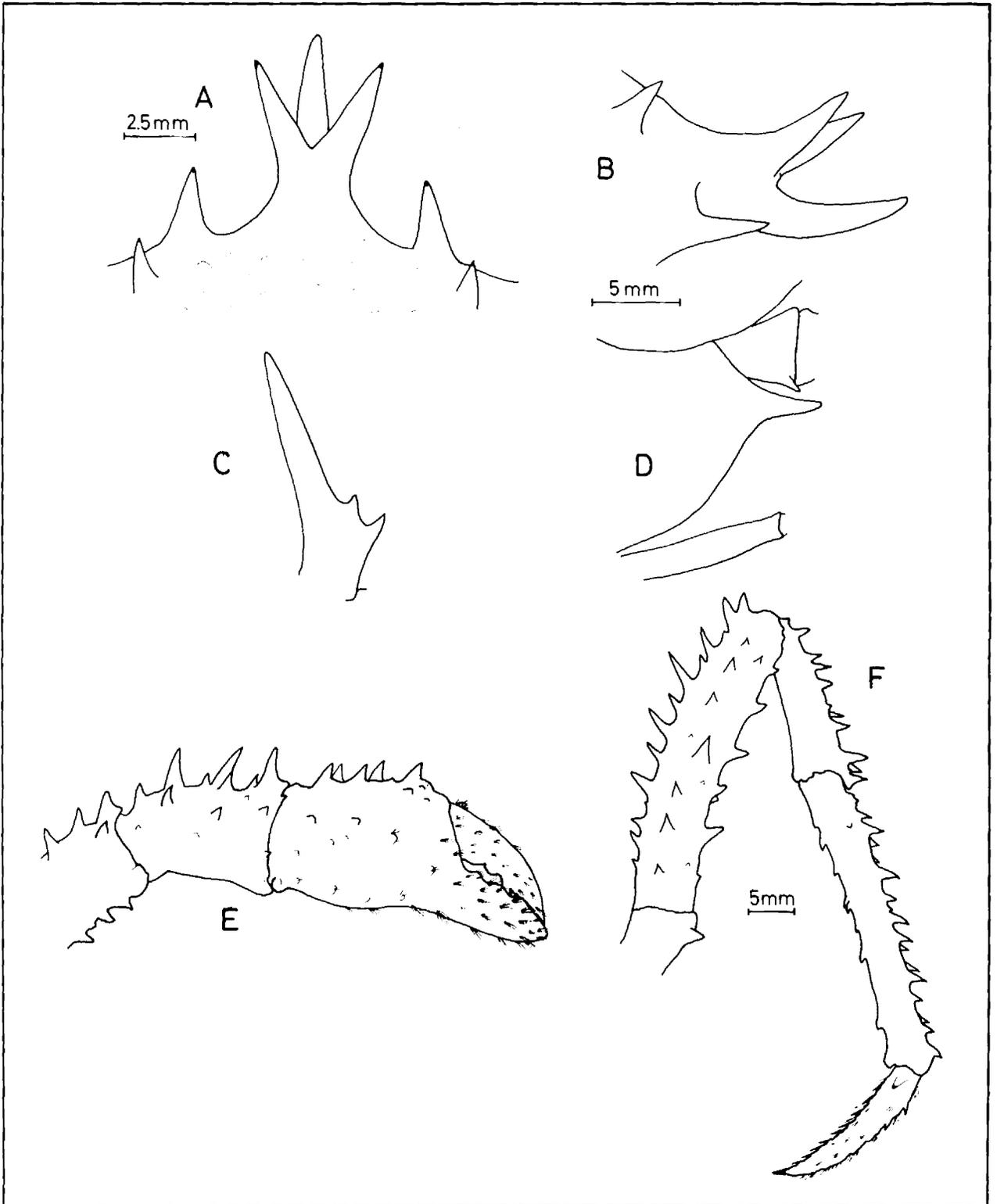


FIG. 42. *Paralomis spectabilis* Hansen (ZMC, ♀ ov., lectotype, CL = 47 mm, Ingolf Exp., St. 96): A) dorsal view of rostrum; B) lateral view of rostrum; C) right scaphocerite; D) pterygostomial region; E) right cheliped; F) right third walking leg.

Size

In the adults, carapace length is 47 mm, width 45 mm in the lectotype, length 43 mm, width 42 mm in the male paralectotype. The three juvenile males range between 10 and 17 mm in length and between 8 and 16 mm in width.

Distribution

This species has only been reported off Iceland and eastern Greenland at depths between 1 470 and 2 075 m.

Remarks

Paralomis spectabilis has sometimes been mistaken

for *P. birsteini* Macpherson, from Antarctic waters near the Scott Islands (67°29' S, 179°55' W) (Macpherson, 1988), yet it is readily differentiable by the following features:

—Legs much more elongate and the dactylus longer than the propodus in *P. birsteini*, dactylus shorter than the propodus in *P. spectabilis*.

—Rostrum slightly pedunculate in *P. spectabilis*, not pedunculate in *P. birsteini*.

—Scaphocerites different: inner border smooth in *P. spectabilis*, bearing one-two small spines in *P. birsteini*.

Paralomis spectabilis is also closely related to *P. formosa* Henderson, from the Southwest Atlantic, but it is distinguishable by the spinulation of the carapace, chelipeds, walking legs, and scaphocerite (p. 91).

Paralomis granulosa (Jacquinot, 1847)

(Figure 43; Plate 22A)

Lithodes granulosa Jacquinot, 1847, Pl. 8, Figs. 15-21

Lithodes granulosa White, 1847, p. 56

Lithodes granulata Jacquinot, 1853, p. 94

Lithodes verrucosa Dana, 1852, p. 428; Dana, 1855, Pl. 26, Fig. 16; Cunningham, 1871, p. 494

Paralomis verrucosa Bouvier, 1895, p. 187, Pl. 13, Fig. 3; Bouvier, 1896, p. 26

Paralomis granulosa White, 1856, p. 134; Faxon, 1895, p. 45; Bouvier, 1895, p. 187, Pl. 11, Fig. 9, Pl. 12, Figs. 11, 22; Bouvier, 1896, p. 26; Stebbing, 1900, p. 532; Porter, 1903, p. 264, text. Fig. 6; Lagerberg, 1908, p. 14; Ortmann, 1911, p. 658; Doflein and Balss, 1912, p. 32; Haig, 1955, p. 14; Garth *et al.*, 1967, p. 175; Birstein and Vinogradov, 1967 (in list); Retamal, 1973, p. 12; Scelzo, 1973, p. 165; Scelzo and Boschi, 1973, p. 207; Takeda, 1974 (in list); Boschi, 1979 (in list); Boschi *et al.*, 1981, p. 244; Retamal, 1981 (in list), Fig. 60; Takeda and Hatanaka, 1984, p. 14; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list); Takeda, 1986, p. 334, text, figure; Ingle and Garrod, 1987, p. 220, Figs. 1-8

Paralomis granulosa Stimpson, 1858, p. 231; Miers, 1881, p. 72; A. Milne Edwards, 1891, p. 20; Stebbing, 1914, p. 276

Paralomis verrucosus Stimpson, 1858, p. 231; Miers, 1881, p. 71; Henderson, 1888, p. 45; Cano, 1889, pp. 95, 98, 264; Berg, 1900, p. 227; Lenz, 1902, p. 747

Echinocerus granulatus Benedict, 1894, p. 484

March 1883, Pacherraía

1 ♀, 3 ♂, Mission Cap Horn 1882-83, La Romanche, Orange Bay

1 ♀, Strait of Magellan, Frances Channel, Londonderry Island, 18 December 1897

1 ♀ ov., 3 ♂, Punta Arenas, Strait of Magellan, C.A. Serres, 1877

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

2 ♂, Punta Arenas

2 ♂, Tierra del Fuego, Mellon Exp. Coll.

1 ♂, Falkland Islands, Port William, 9 April 1927

2 ♂, 12 February 1964, 53°32' S, 64°55' W, 119 - 124 m

1 ♂, Patagonia

1 ♀ ov., 2 ♀, 4 ♂, USARP, R/V Hero, Cruise no. 702, St. 474, 26 April 1970, 53°39' S, 70°55.5' W, 15 - 18 m

1 ♂, USARP, R/V Hero, Cruise no. 712, St. 71-2-13, 25 April 1971, 54°47.8' S, 65°15' W

4 ♂, 4 ♀, USARP, R/V Hero, Cruise no. 715, St. 681, 14 October 1971, 54°48.1' S, 65°15.5' W, 0 m

3 ♀ ov., 2 ♂, USARP, R/V Hero, Cruise no. 712, St. 71-2-15, 26 April 1971, 54°47.8' S, 65°15.5' W, 0 m

3 ♀ ov., 14 ♂, USARP, R/V Hero, Cruise no. 702, St. 468, 25 April 1970, 53°39.3' S, 70°55.4' W, 38-42 m

British Museum (Natural History), London

1 ♂, Puerto Bueno, 7 m

1 ♀ ov., 1 ♂, Tierra del Fuego, Isidoro Point

1 ♂, Falkland Islands, Stebbing Coll., 1928, 14 m

Material examined

Muséum National d'Histoire Naturelle, Paris

3 ♂, Mission Cap Horn 1882-83, La Romanche, 18

3 ♀ ov., Discovery Exp., St. WS576, 17 April 1931,
24 - 34 m

1 ♂, Strait of Magellan, near Punta Arenas

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♂, Strait of Magellan, Punta Arenas, 52°47' S,
70°44' W

Instituto de Ciencias del Mar, Barcelona

4 ♂, Beagle Channel, Dr. E.E. Boschi Collection

Description

Carapace more or less pentagonal, somewhat broader than long. All regions covered with clusters of granules variable in size, quite closely spaced and pedunculate in juveniles, more spread out in adults. Gastric region convex, somewhat more prominent than the cardiac and branchial regions. A spiniform granule on the terminal angle of the pterygostomian region.

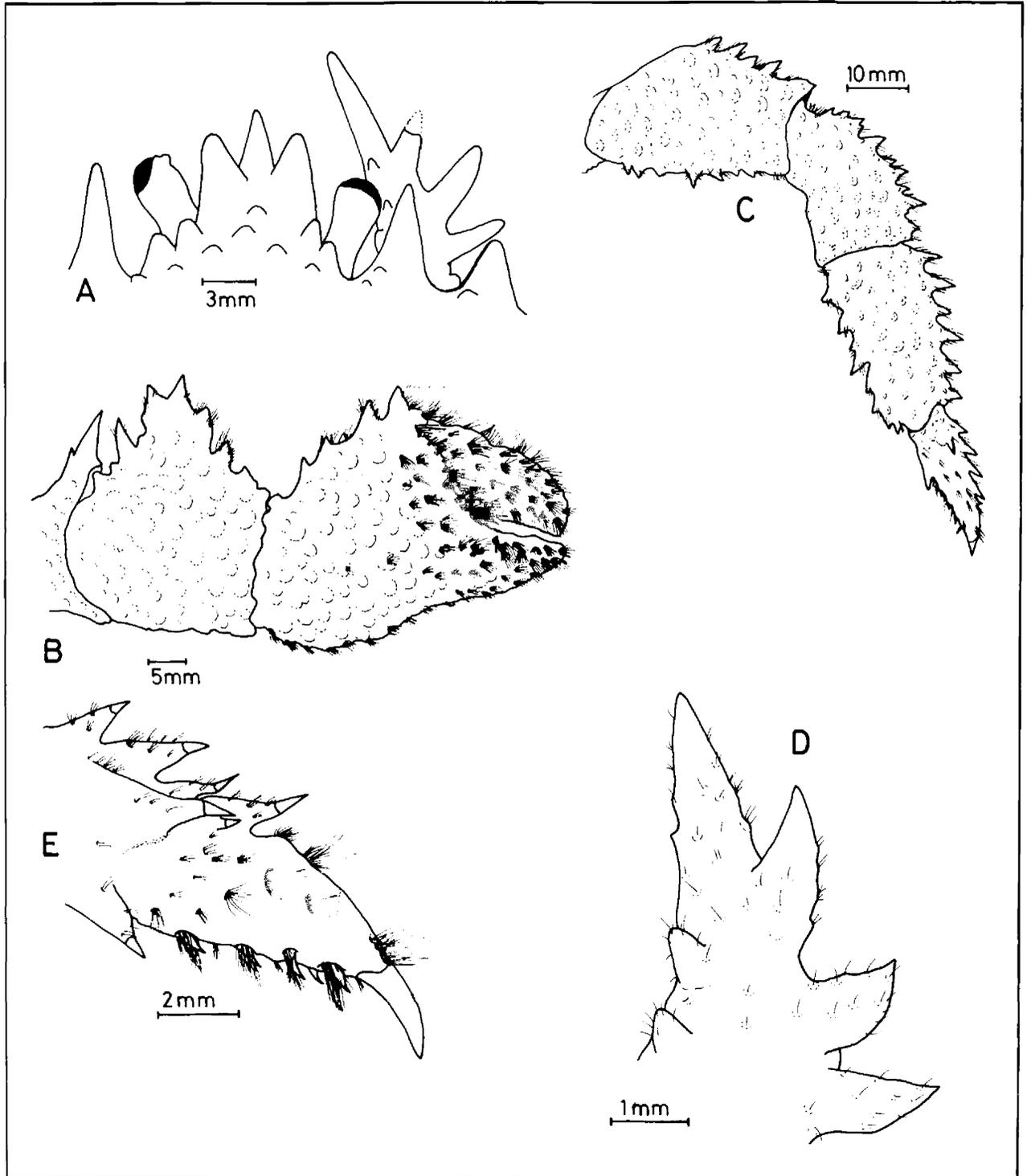


FIG. 43. *Paralomis granulosa* (Jacquinot) (A-D: ICM, ♀, CL = 76 mm, Beagle Channel; E: BM, ♂, CL = 54 mm, Puerto Bueno): A) anterior part of carapace, dorsal view; B) right cheliped; C) right third walking leg; D) right scaphocerite; E) dactylus, right third walking leg.

Basal spine of rostrum short, curved, and smooth ventrally, reaching the midpoint of the last antennal segment. A pair of somewhat divergent, dorsal spines, pointing slightly upwards.

Anterolateral margins of carapace armed with 12-14 spines, all similar in size, extending to the level of the gastro-cardiac groove. Posterior to these, only granules. External orbital spine well-developed, somewhat larger than the rest of the spines on the lateral edge, sometimes reaching the base of the last antennal segment.

Abdominal segments covered with clusters of granules. Marginal and lateral plates sometimes fused on third segment. In the smallest individuals examined (CL = 10 mm), marginal plates on third to fifth segments extremely small, hardly discernible.

Ocular peduncles with small granules dorsally.

A robust, outer spine on the basal segment of the antennal peduncle. Two-three spines on the outer surface of the second segment, the terminal spine more developed and extending to the base of the last antennal segment. Another spine on the inner angle. Scaphocerite with a long, central spine extending well past the tip of the antennal peduncle. Three-four spines on the outer surface and three-four smaller spines on the inner surface.

Chelipeds with merus armed with a row of five-six dorsal spines increasing in size as they approach the terminal border. Carpus with a high crest medially and six-seven stout spines. Five-six spines, less developed than the spines on the carpus, on the dorsal border of the hand. Numerous granules scattered over all articles, except on the inner surfaces. Some small spines dorsally on the base of the movable finger. Numerous tufts of setae on both fingers.

Walking legs short. Third walking leg less than twice carapace length. On third walking leg, basis-ischium bearing granules, more acute on the terminal border. Merus about one-half carapace length, a little less than 1.5 times carpus length, and twice as long as high. Anterior border bearing a row of four-five spines; posterior margin with five-six spines somewhat smaller than the dorsal spines, not in any clearly defined row. Carpus with an anterior row of six-seven spines similar in size to those on the merus. Propodus a little shorter than the merus, as long as the dactylus, and less than twice as long as high, with a row of six-seven spines on the anterior margin and another row of six-seven smaller spines on the posterior margin. Dactylus slightly curved, with five-six spines on the anterior margin, not in a row, extending to the midpoint of the article. A basal spine on each side and five-six corneous spinelets along the entire length of the posterior border. All articles covered with clusters of granules, except on the ventral surfaces.

Size

The males examined ranged in length between 10 and 100 mm, in width between 10 and 115 mm. The females were from 11 to 64 mm long and from 11 to 70 mm wide.

While studying a population off the coast of Chile, Campodónico (1977) found specimens of up to 111 mm in length and ovigerous females from 51 mm.

Colour

Red, darker on granules and spines. Takeda (1986) included a colour photograph of this species.

Distribution

Off the coast of Chile, from Valdivia to Cape Horn, Argentina, Falkland Islands (Malvinas), from inshore to 50 m.

Biology

This species supports a commercial fishery of some importance in Chile and Argentina. Campodónico (1977) reported the onset of sexual maturity to be at around 71 mm in length in males. Females bear between 1 540 and 8 200 eggs. Campodónico (1978) also reported a case of inverted abdominal asymmetry in a female.

Common names: In Spanish, "centollón" (Argentina, Chile).

Remarks

The name of this species, along with the author and the year of description, has often been a subject of controversy.

The text was first published in 1853. As Haig (1955) pointed out, the issue of the authorship of the description was settled in "Voyage au pôle sud et dans l'Océanie sur des corvettes l'Astrolabe et la Zélée", p. 4, Section Crustacea, volume 3, where the new species was attributed to Jacquinot.

The year is more questionable. The results of the expeditions were published in several parts. Sherbon and Woodward (1934) cited the date of the text, 1853, but they did not indicate the date of the figures, published in a separate work between 1842 and 1853.

In his list of crustaceans for the British Museum (p. 56), White (1847) cited this species under the name *Lithodes granulatus*. Consequently, and in accordance with the practice recommended by the

International Code of Nomenclature, in the absence of a definite date of publication for the figures, the correct date should be 1847.

As a number of authors have already pointed out, the species described by Dana (1852), *Lithodes verrucosa*, should therefore be considered synonymous with the species described by Jacquinot.

Paralomis granulosa is readily differentiated from all the other Atlantic species in that its carapace,

abdomen, chelipeds, and walking legs are covered by clusters of granules.

The most closely related species in this genus is *P. dofleini* Balls, from off the coast of Japan. Distinguishing features include, among other characters, less developed spines along the carapace edge and smaller spines on the walking legs in this latter species.

***Paralomis cubensis* Chace, 1939**

(Figure 44; Plates 22B, 23A)

Paralomis cubensis Chace, 1939, p. 49; Birstein and Vinogradov, 1967 (in list); Takeda, 1974 (in list); Takeda *et al.* 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

Material examined

Museum of Comparative Zoology, Cambridge

1 ♀ ov., holotype, Harvard-Havanna Exp., Atlantis, St. 3003, 22 March 1938, 23°12.3' N, 82°12' W, 439 - 550 m

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, M/V Aleutian Bounty, December 1983, 26°45' N, 84°55' W, 467 - 730 m

1 ♂, R/V Oregon, St. 2083, 18 November 1957, 01°49' N, 46°48' W, 412 m

1 ♀, R/V Oregon II, St. 11137, 10 August 1970, 24°17' N, 87°35' W, 550 m

1 ♂, Miss Virginia «Trawler», March/April 1962, Pea Patches, 329 - 366 m

Description

Carapace more or less pentagonal, with the surface covered with flattened granules of different sizes. Granules near the carapace edge more pointed in the holotype. Granules very acute in the smallest male (CL = 28 mm), forming small spines. Regions well-defined but not very convex. Gastric region slightly more prominent than the rest. Branchial regions hardly at all convex in the holotype, such that the cardiac region is more prominent. In the remaining specimens the converse is true. A small terminal spine on the pterygostomian region.

Proximal portion of basal spine of rostrum slanting downwards, terminal portion inclined upwards. Ventral border smooth. Two somewhat divergent, dorsal spines shorter than the central spine, directed

slightly upward, overreaching the end of the cornea in the holotype but not in the remaining specimens. A small spine or spiniform granule at the base of each dorsal spine, sometimes a spiniform tubercle between the two.

External orbital spine somewhat larger than the anterolateral spine. Spines all around the carapace edge (except for the posterior edge), somewhat more developed on the anterior half.

Second abdominal segment covered with granules. Marginal and lateral plates on third segment fused on the largest male, rudimentary but separate on the male with a CL = 28 mm. In the females, marginal plates developed and present on the right side of the third to fifth segments. All plates bearing rounded granules.

Ocular peduncles with some dorsal granules, more acute on the terminal portion.

A small, terminal, outer spine on the basal article of the antennal peduncle. Second segment bearing a small spine on the terminal, inner angle, a long, terminal, outer spine extending slightly beyond the terminal border of the penultimate segment (except in the largest specimen, CL = 80 mm), and a small spine on the base. Scaphocerite with a long, central spine nearly reaching the end of the last antennal segment, two long spines on the outer border, and two smaller spines on the inner border.

Chelipeds with merus bearing some spines, longer on the terminal border, and numerous spiniform tubercles on the outer surface. Carpus with a row of four-five dorsal spines, the medial spine longer than the rest. Outer surface bearing many small spines. Some granules on the ventral border. Hand with two more or less well-defined rows of four-five small, dorsal spines. Numerous spiniform granules on the outer border, some on the ventral and inner borders as well. Numerous tufts of yellow setae on fingers.

Second pair of walking legs somewhat longer than the first and third pairs.

Third walking leg about 1.8 times carapace length.

A few terminal spines on the basis-ischium. Merus a little more than one-half carapace length, about three times longer than high, and a bit more than 1.5 times carpus length. A row of nine-eleven spines on the anterior margin, several spines on the posterior margin that do not form a clearly defined row, and some spiniform granules on the dorsal surface that

are spines on the third walking leg. Carpus with a row of six-seven spines on the anterior surface and many small spines on the dorsal surface. Propodus between three and four times longer than high and a little longer than the dactylus, with a row of seven-eight spines on the anterior margin and another row of six-seven less developed spines on the

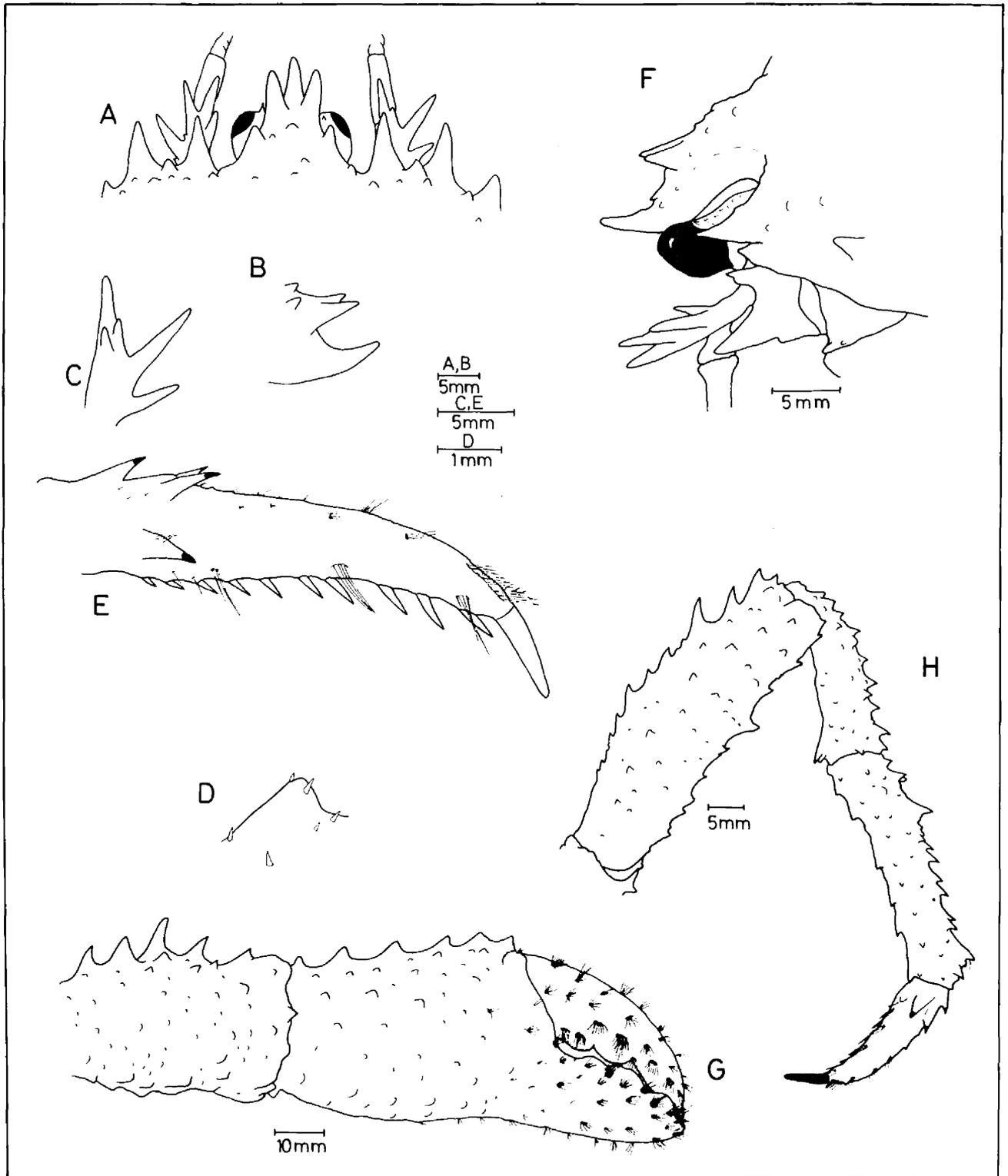


FIG. 44. *Paralomis cubensis* Chace (A-E: MCZC, ♀ ov., holotype, CL = 52 mm, Harvard Havanna Exp., St. 3003; F-H: USNM, ♂, CL = 80 mm, Oregon II, St. 2083): A) anterior part of carapace, dorsal view; B) lateral view of rostrum; C) right scaphocerite; D) granule on carapace; E) dactylus, right third walking leg; F) anterior part of carapace, lateral view; G) right cheliped; H) right third walking leg.

posterior border. Two rows of six-eight spines of different sizes dorsally, the rows not as straight in larger specimens, the spines in the anterior of the two rows thicker. A row of four-five small spines on the ventral surface. Ventral borders of the other articles smooth. Dactylus with spines on the base, three on the anterior border, and one on each side. Ten corneous spinelets along the posterior border. Tip of dactylus formed by a rather curved corneous unguis. Tufts of small setae on the anterior and posterior borders.

Size

The length and width of the female holotype are both 52 mm. The other female examined was 51 mm long and 53 mm wide. The males ranged between 28 and 80 mm in length and between 30 and 86 mm in width.

Distribution

The holotype was caught off northwestern Cuba at a depth between 493 and 550 m. The other specimens were taken east of Florida, in the Gulf of Mexico, and off northern Brazil at depths between 329 and 730 m.

Remarks

In addition to the differences in the size of the chelipeds in the males, associated with sexual maturity, referred to on p. , the chelipeds of the two largest male *Paralomis cubensis* specimens (CL = 45 and 80 mm) are much larger than the chelipeds of the females and the younger male. In

larger males the length of the right cheliped (from the beginning of the merus to the tips of the fingers) is 2.5 times carapace length, only 1.8 times in the smaller male (CL = 28 mm). In the two females it is 1.5 times carapace length. Such dimorphism has been observed in other species, e.g., *P. formosa* Henderson and *P. africana* Macpherson, although the differences are not as pronounced. This dimorphism is also present in *P. medipacifica* Takeda, from the Pacific Ocean.

It is likely that differences of this kind between the sexes and length groups are associated with sexual maturity in the males. However, more specimens of these species need to be examined in order to confirm this.

Paralomis cubensis is a member of the group of species lacking spines on the carapace, and it is readily distinguishable from all the other Atlantic species by the thick, flattened granules on the dorsal carapace surface. It is closely related to *P. medipacifica* Takeda, from the Pacific Ocean and *P. indica* Alcock & Anderson, from the Indian Ocean. However, it is easily differentiated by the appearance of the carapace edge, which in these other two species is armed with fewer but much thicker spines. Moreover, in *P. medipacifica* the scaphocerite is simply bifurcate, with no accessory spines on either side, while *P. indica* has a spine and a spinule on the outer margin. In *P. cubensis* there are two strong spines on the outer surface and two small spines on the inner surface.

Takeda (1985) recently described a new species on the Kyushu-Palau Ridge, *P. kyushupalauensis*, which is also close to *P. cubensis*. The two species are differentiable above all by the spinulation of the carapace edge. In the species described by Takeda the spines are much thicker and more numerous than in *P. cubensis*.

Paralomis grossmani n. sp.

(Figure 45; Plate 23B, C)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀ ov., holotype, 1 ♀ ov., paratype, R/V Oregon II, St. 10611, 5 December 1969, 07°13' N, 52°52' W, 770 m

Description

Carapace more or less pentagonal, slightly wider than long, dorsum and sides covered with granules

that are more or less acute, without forming spines. Granules bearing thin setae. Regions well-defined, convex, gastric and cardiac regions somewhat more prominent than the branchial regions. A small, clearly differentiated prominence on each branchial region near the posterior carapace edge. Another prominence on the carapace edge near the posterolateral angle. Pterygostomian region with a spine on the terminal angle.

Basal spine of rostrum more or less horizontal, extending past the corneas. Ventral border smooth or bearing small granules. Two dorsal spines slanting slightly upwards, a small spines at the base of each

of the dorsal spines, and a single, small, dorsal spine at the centre of the base of the rostrum. External orbital spine not overreaching the cornea, reaching spine on each side of the base (sometimes on one

side only). Small spines, smaller than the external orbital spine, on the anterior half of the carapace edge, turning into tubercles laterally on the posterior half and posterior carapace edge.

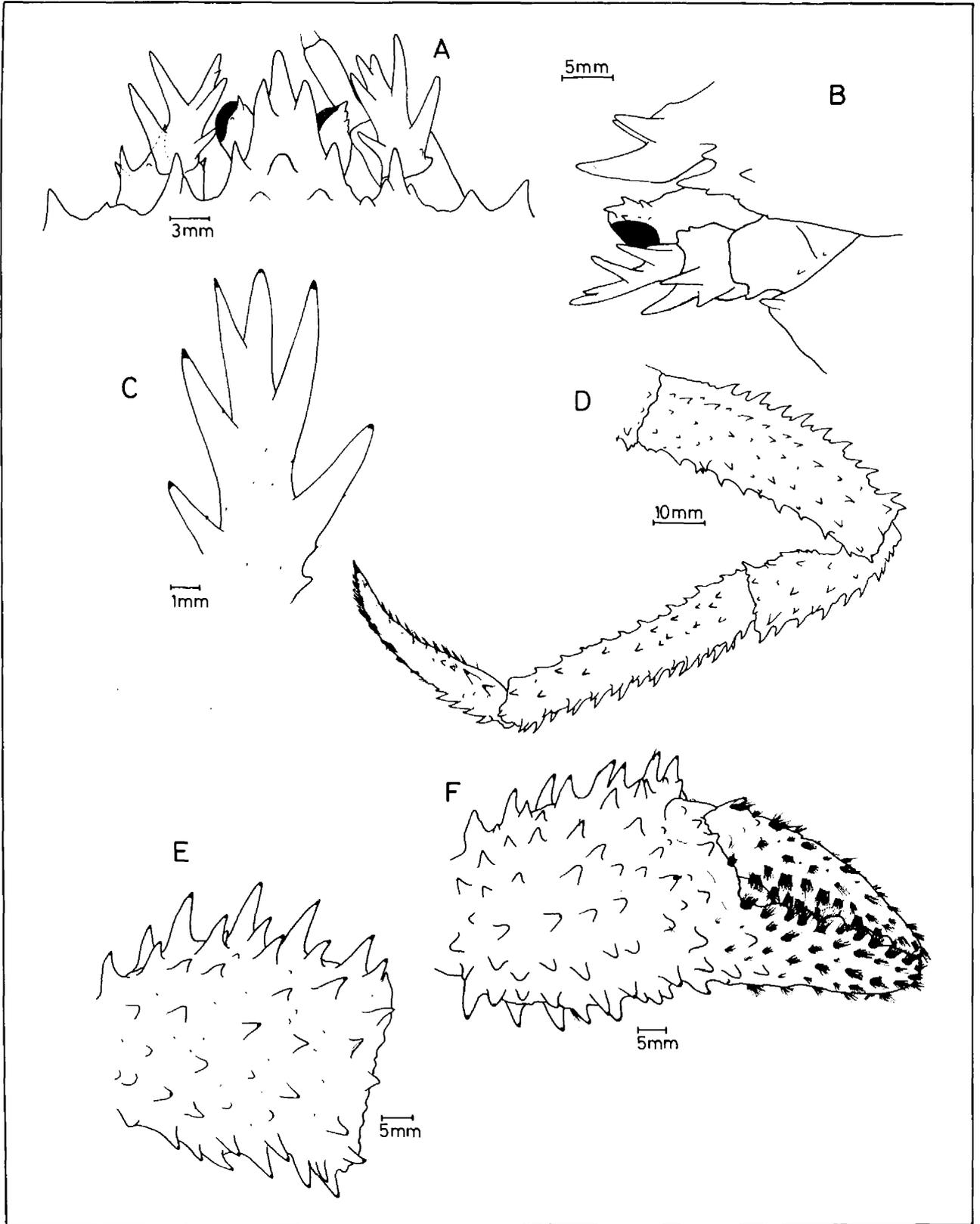


FIG. 45. *Paralomis grossmani* n. sp. (USNM, ♀ ov., holotype, CL = 94 mm, Oregon II, St. 10611): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right scaphocerite; D) right third walking leg; E) carpus, right cheliped; F) claw, right cheliped.

Numerous granules on all abdominal plates. Marginal plates on third segment differentiated from the lateral plates on the two specimens examined. Marginal plates on fourth and fifth segments subdivided.

Ocular peduncles with some spiniform granules dorsally.

Basal segment of antennal peduncle with a terminal, outer spine. A thick, terminal, outer spine on the second segment, reaching the base of the last antennal segment, and one-two smaller spines on the base. Scaphocerite terminating in a spine that nearly reaches the end of the last antennal segment, two robust spines on the outer border (sometimes with a spinule at the base), and two-three somewhat smaller spines on the inner border.

On chelipeds, all articles armed with numerous, well-developed spines on the various borders (few on the inner border), more developed on the dorsal borders. Dorsal surface of carpus with a row of five-six spines, three of which are thick but do not form a crest. Tufts of yellowish setae on fingers.

Walking legs elongate. Third walking leg a little more than twice carapace length. A terminal ridge of spiniform granules on the coxa. Several spines on the posterior margin of the basis-ischium. Merus about 3.5 times longer than high, somewhat more than one-half carapace length, and 1.5 times carpus length. A row of eight well-developed spines on the anterior border, with a like number of smaller spines interspersed. Dorsal surface with a row of spines near the anterior border numerous spines scattered over the lower half. Some 10-11 spines, smaller than those on the anterior border, in a row on the posterior margin. Another row of spines, also smaller than those on the anterior border, on the upper half of the ventral surface, with a few spines on the lower half. Carpus with a row of seven-eight strong spines on the anterior margin, another row of four-five spines dorsally, and a few spines on the posterior border. A row of five spines similar to those on the anterior border on the ventral surface. Propodus somewhat shorter than the merus, about four times longer than high, and as long as the dactylus. A number of rows with 10-13 well-developed spines each, three on the anterior margin and three on the posterior margin (one truly anterior, two dorsal, one posterior, and two ventral). The rows of spines on the anterior margins and upper part of the dorsal surface of the merus, carpus, and propodus forming ridges with shallow grooves in between. Dactylus slightly curved, with four-six spines on the base of the anterior margin and three-four on the dorsal and ventral surfaces. Rest unarmed, except for the posterior border, which has 10-11 small corneous spicules. Two rows of large tufts of setae on the

terminal two-thirds of the anterior margin. Some smaller tufts of setae on the posterior margin.

Size

Carapace length in the holotype is 94 mm, width 106 mm. Both length and width measure 98 mm in the paratype.

Distribution

The two sole specimens were taken off the coast of French Guiana at a depth of 770 m.

Remarks

P. longidactyla Birstein & Vinogradov, from the Southeast Atlantic, is the closest Atlantic species to *P. grossmani*. The two species are readily differentiable by the armature of the carapace, chelipeds, walking legs, and scaphocerite (p.).

This new species is also closely related to *P. papillata* (Benedict), from off the coasts of California and Peru (holotype, USNM, CL = 110 mm, CW = 130 mm), and to *P. inca* Haig, from off Peru, but it is differentiated by the following characters:

— Cardiac region in both *P. papillata* and *P. inca* closed in by the branchial regions, which are much more prominent. Carapace also more pyriform in shape. Cardiac region in the new species as prominent as or more prominent than the branchial regions and not closed in between them. Furthermore, carapace more pentagonal in shape.

— Ventral border of basal spine of rostrum smooth in the new species, in both *P. papillata* and *P. inca* bearing a more or less spinulates or granular ridge or thickening.

— Spines absent from the anterior edge of the carapace in *P. papillata* but present in the new species. Granules in *P. inca* more spiniform and similar to those on the new species.

— Second segment of antennal peduncle more spinulate in both *P. papillata* and *P. inca*.

— Spine on legs rather blunt or weaker in *P. papillata* than in the new species, in which the spines more closely resemble those on *P. inca*.

Etymology

This species is dedicated to Dr. G.D. Grossman of the School of Forest Resources in Athens, Georgia, USA, both a valued colleague and a good friend.

Paralomis longidactyla Birstein & Vinogradov, 1972

(Figure 46; Plate 24)

Paralomis longidactylus Birstein and Vinogradov, 1972, p. 354, Figs. 3, 4

Paralomis longidactyla Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

Material examined

Moscow University Zoological Museum

1 ♂, holotype, R/S Akadiemik Knipovich, St. 249, 12 April 1965, 35°34.5' S, 52°40.3' W, 485 - 500 m

Description

Carapace more or less pyriform, slightly broader than long, covered with numerous, spiniform tubercles of variable size and sharpness. Each tubercle has a crown of small setae near the apex. Regions well-defined, the gastric region clearly more prominent than the others, the cardiac region slightly more prominent than the branchial regions.

Basal spine of rostrum more or less horizontal, with a smooth ventral ridge two very slightly divergent, dorsal spines with a smaller spine at the base of each. A single, small spine between these two dorsal spines. Basal spine reaching the end of the ocular peduncles.

External orbital spine small, much shorter than the ocular peduncles. Some small, spiniform tubercles between the external orbital and anterolateral spines. Many spiniform tubercles around the carapace edge, more acute on the anterior half, where they form true spines.

Abdominal segments covered with numerous, more or less spiniform granules. Marginal and lateral plates on third segment fused. Marginal plates on fourth and fifth segments subdivided.

Ocular peduncles with some granules dorsally.

Basal segment of antenna with a robust antero-external spine. On the second segment, a long, terminal, outer spine that does not reach the base of the last antennal segment, with another, smaller spine at the base. Three-five small spines on the inner surface and one-two on the dorsal surface. Scaphocerite with a central spine that does not extend beyond the midpoint of the last antennal segment. Two long, outer spines and another two, smaller, inner spines.

On the chelipeds, spines and spiniform granules on all articles, more developed on the dorsal and terminal borders. A row of five spines on the dorsal surface of the carpus, without forming a crest. Tufts of setae on both fingers.

Walking legs elongate. Third walking leg three times carapace length. Some small spiniform tubercles on the posterior margin of the basis-ischium. Merus a little more than four times longer than high, somewhat shorter than carapace length, and less than twice carpus length. A row of about 15 spines of differing sizes on the anterior margin. Many spines on the dorsal surface, not in clearly defined rows. Two ragged rows of 10-11 smaller spines on the posterior border, smaller than those on the anterior margin and the dorsal surface. Numerous spiniform tubercles on the ventral border. Carpus with a row of six-seven spines on the anterior surface, another row of five spines similar in size dorsally, with a few additional, small, dorsal spines, and some more on the posterior border. Some spines on the ventral border as well. Propodus somewhat shorter than the merus, some 4.5 times than high, and as long as the dactylus, with a row of 15-16 spines of different sizes, similar to these in size, dorsally. Numerous spines, a little smaller, on the posterior border and on the lower portion of the dorsal surface. Another row of about ten spines on the inner surface, also smaller than those on the anterior margin. Several small spines scattered unevenly on the ventral surface. Dactylus slightly curved, with five-six spines on the anterior margin, extending to the midpoint of the article, and two spines, one on each side of the base. Rest of anterior border unarmed. A row of 11-12 small, corneous spines on the posterior margin. Numerous tufts of setae, but no well-defined rows.

Size

The only specimen yet caught is 99 mm long and 105 mm wide.

Distribution

Near the mouth of the River Plate (35°34' S, 52°40.3' W), at depths between 485 and 500 m.

Remarks

Paralomis longidactyla is closely related to *P. grossmani* n. sp., from off French Guiana. The two species are differentiated by a series of characters:

— Carapace shape different: carapace rather pyriform in *P. longidactyla*, more rounded in *P.*

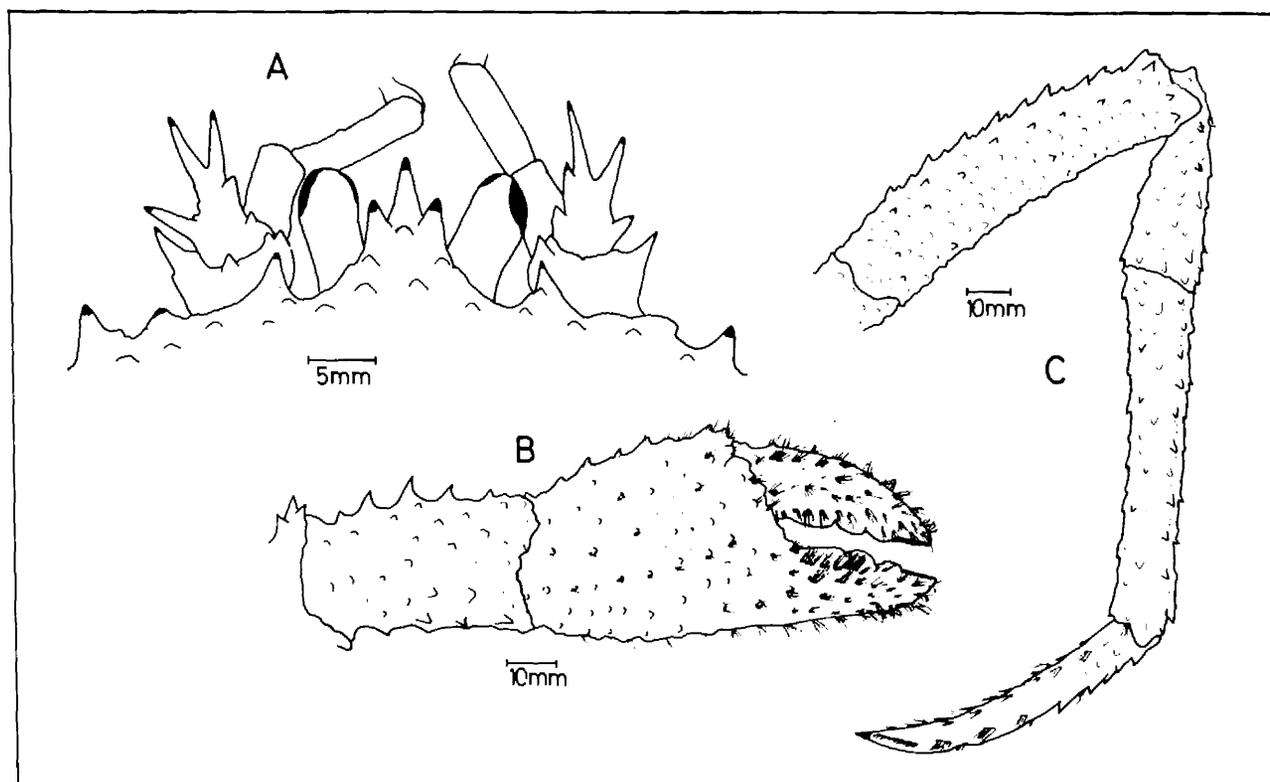


FIG. 46. *Paralomis longidactyla* Birstein & Vinogradov (ZMUM, ♂, holotype, CL = 99 mm, Akadiemik Knipovich, St. 249): A) anterior part of carapace, dorsal view; B) right cheliped; C) right third walking leg.

grossmani. Additionally, anterior margin of carapace between the two anterolateral spines nearly one-half carapace width in *P. longidactyla*, only about one-third in *P. grossmani* (Plates 22B, C, 24).

— Protuberances on posterior edge of carapace and on branchial regions present in *P. grossmani*, absent in *P. longidactyla*.

— Scaphocerite shorter, without reach the

midpoint of the last antennal segment in *P. longidactyla*, in *P. grossmani* reaching practically to the end of the article. Second segment of antennal peduncle not spinulated in *P. longidactyla* (Figures 45A, 46A).

— Ridges formed by the rows of spines on walking legs less well-defined in *P. longidactyla* (Figures 45D, 46C).

Paralomis pectinata n. sp.

(Figure 47; Plate 25A)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀ 6 ov., holotype, Pillsbury Exp., St. 719, 20 July, 1968, 11°30' N, 64°35.5' W, 1 490 - 1 629 m

Description

Carapace more or less pentagonal, as long as wide. Dorsal carapace surface covered with small granules of various sizes. Regions well-defined. Gastric region

rather more prominent than the other regions, with a thick granule on the apex. Another pair of thick granules between this granule and the base of the rostrum, and a further pair on the posterior portion, near the gastro-cardiac groove. Prominence of cardiac and branchial regions similar. A small spine on the terminal angle of the pterygostomian region.

Basal spine of rostrum smooth ventrally, reaching the tip of the antennal peduncle. Two slightly divergent, dorsal spines extending well past the end of the cornea to the midpoint of the last segment of the antennal peduncle. External orbital spine barely overreaching the end of the cornea. Anterolateral spine smaller than the external orbital spine.

Three-four small spines anterior to the cervical groove. Four spines on the anterior portion of the branchial edge posterior to the groove, the first two similar to the anterolateral spine in size, the last two smaller. A longitudinal denticulate crest near the posterolateral angle. Some granules on the posterior border.

Proximal border of second abdominal segment bearing crests, with other, smaller crests on the terminal margin. Granules of different sizes on all segments. Marginal and lateral plates on fourth and fifth segments subdivided.

Ocular peduncles with some dorsal granules and a terminal spine.

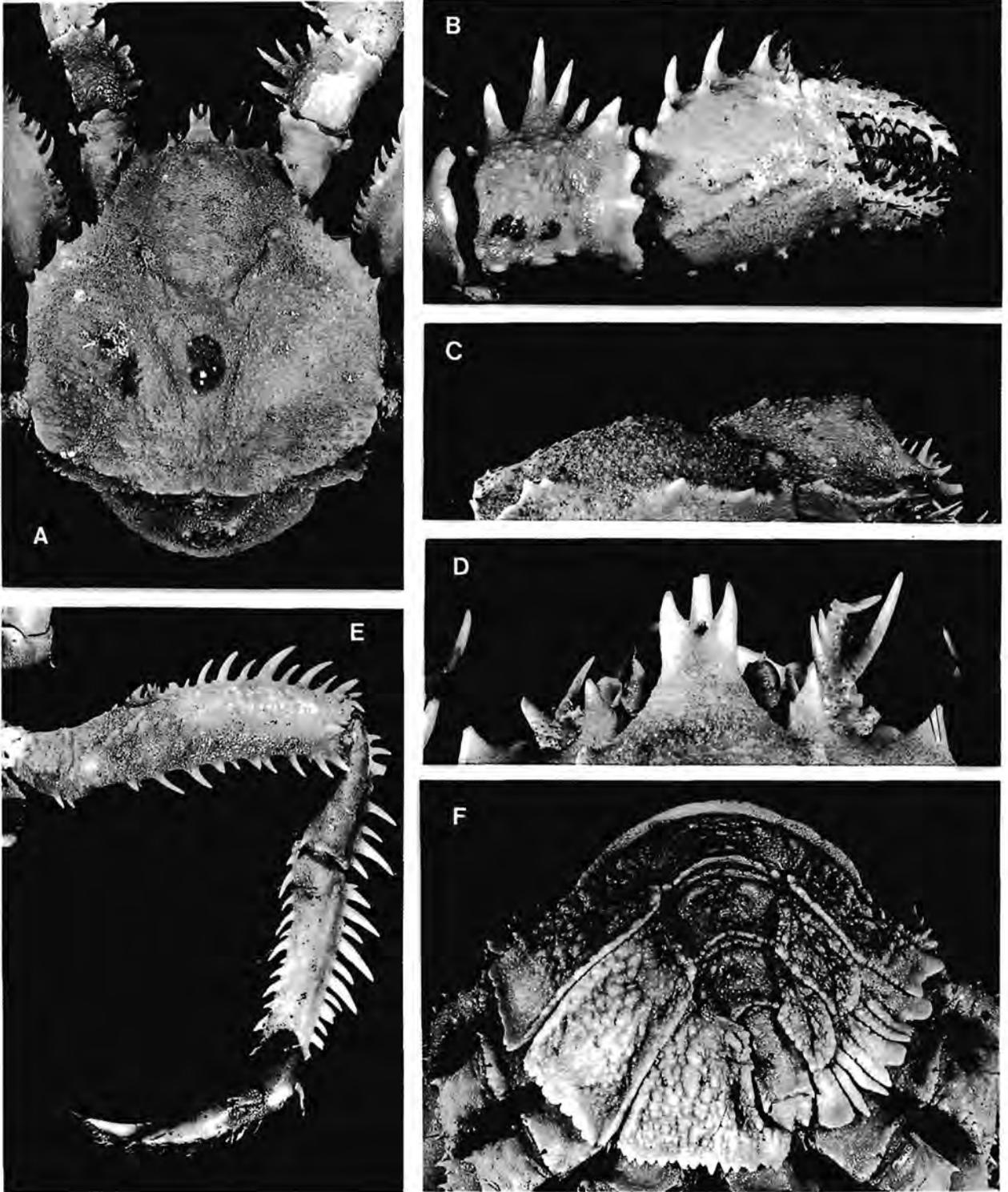


Fig. 47. *Paralomis pectinata* n. sp. (USNM, ♀ ov., holotype, CL = 96 mm, Pillsbury, Sta. 719): A) dorsal view of carapace; B) right cheliped; C) lateral view of carapace; D) anterior part of carapace; E) right third walking leg; F) abdomen.

Basal segment of antennal peduncle with a spine on the terminal, outer angle. A long spine, overreaching the base of the last segment, on the outer border of the last segment, and a smaller spine at the base. A spine on the terminal angle of the inner border. Scaphocerite with a long, central spine extending beyond the tip of the antennal peduncle. A long spine on the outer surface and a smaller spine near the base. A small spinule between the central spine and the longest spine. Three small spines on the inner border.

Chelipeds with merus armed with thick spines near the terminal border. Six strong, dorsal spines on the carpus, the three medial spines more developed. Two spines near the ventral border, and a few more, smaller spines on the inner surface. Terminal, outer borders of the merus and carpus each bearing a conspicuous crest with rounded teeth pointing towards the base of the next article. Hand with several spines on the dorsal margin, two well-developed. Two longitudinal rows of granules on the outer surface and some granules ventrally. Tufts of setae on fingers.

First and second walking legs longer than the third, which is twice carapace length.

Third walking leg with two-three spines on the terminal, dorsal border of the basis-ischium. Merus 3.5 times longer than high, 1.8 times the carpus, and 1.2 times the propodus, with a row of 13-14 long spines on the anterior border, and another row of 10-11 somewhat smaller spines on the posterior margin. Four-five spines on the proximal half of the dorsal surface (these spines are merely granules on the second leg and are not present at all on the first leg). Carpus with a row of eight spines on the anterior surface, plus a small, terminal spine on the posterior border. Propodus as long as the dactylus, with a row of 13-14 spines, longer than the spines on the merus, on the anterior border. Another row of 13-14 smaller spines on the posterior edge. Dactylus slightly curved, with three spines at the base of the anterior border and one on each side of the base. Tufts of setae in two rows along the anterior border and a row of 13-14 corneous spinules on the anterior margin.

Size

Carapace length and width in the only specimen caught up to now both measure 96 mm.

Distribution

Isla Margarita (Venezuela), between 1 409 and 1 629 m in depth.

Remarks

The characteristic spinulation of the walking legs readily differentiates this species from the rest of the species in this genus. The species is close both geographically and taxonomically to *Paralomis serrata* n. sp., from off Colombia. Only the holotype of these two species are known to date, and they are of different sexes, so the exact degree of variation in many of the diagnostic characters is not yet known. The main differences are as follows:

— Evident crests on the posterolateral edge of the carapace and on the second abdominal segment in *P. pectinata*, barely noticeable on *P. serrata* (Figures 47, 48).

— Carapace of *P. pectinata* more or less pentagonal in shape, more pyriform in *P. serrata*.

— Rostral spines more developed in *P. pectinata*.

— Two long spines on the outer border of the scaphocerite in *P. serrata*, only one long spine in *P. pectinata* (Figures 47D, 48A).

— Crests on the terminal borders of the cheliped merus and carpus more developed in *P. pectinata* (Figure 47B, Plate 25B).

— Spines on walking legs much more developed in *P. pectinata* (Figure 47E, Plate 25B).

Etymology

The name *pectinata*, from the Latin "pecten", comb, refers to the characteristic spinulation of the walking legs.

Paralomis serrata n. sp.

(Figures 48, 49; Plate 25B)

Material examined

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♂, holotype, Oregon II, St. 11245, 11 August 1970, 11°07' N, 75°30' W, 1 100 m

Description

Carapace more or less pyriform, slightly longer than wide. Dorsal surface covered with small, rounded granules varying in size. Regions well-defined. Gastric region, particularly the anterior

half, much more prominent than the others. Cardiac region somewhat less prominent than the branchial regions. Pterygostomian region with a thick granule on the terminal angle.

Abdominal segments bearing granules of different sizes. Marginal and lateral plates on third segment not fused. Marginal plates on fourth and fifth segments subdivided.

Basal spine of rostrum more or less horizontal, smooth ventrally, reaching to the midpoint of the last segment of the antennal peduncle. Two slightly divergent dorsal spines that do not overreach the end of the cornea. Short external orbital spine that does not extend beyond the end of the cornea.

Anterolateral spine smaller than the external orbital spine. Several small spines on the anterior half of the carapace edge (two-three on the hepatic region and three-four behind the cervical groove). Small granules around the rest of the carapace edge.

Ocular peduncles with small, spiniform granules on the dorsal surface.

A small, terminal, outer spine on the basal segment of the antennal peduncle. Second segment bearing a long antero-external spine extending past the base of the last segment and one-two small spines on the base. A small spine on the antero-internal angle. Scaphocerite with a long, central spine nearly reaching the end of the last segment of the antennal peduncle. Two long spines on the outer border and a small spinule on the base. Three-four small spines on the inner border.

Chelipeds with merus bearing three-four strong spines at the end of the dorsal border and two-three somewhat smaller spines on the outer and inner surfaces. Carpus with six spines on the dorsal border, the three medial spines more developed than the others. Two-three small, ventral spines. Rest of this article practically smooth, except for some granules. Dorsal border of hand with five-six spines much smaller than those on the carpus. Two longitudinal rows of thick granules on the outer surface and some granules on the inner surface and ventral border. Fingers bearing some granules on the base and numerous tufts of setae.

Walking legs elongate, the first and second somewhat longer than the third.

Third walking leg 2.7 times carapace length. Some thick granules and small spines on the terminal borders of the basis-ischium. Merus 4.7 times longer than high, a little more than twice carpus length, and 1.3 times propodus length. A row of 14-15 poorly developed spines on the anterior border. Another row of 10-11 smaller spines on the posterior border. Four-five small spines on the dorsal surface on the



FIG. 48. *Paralomis serrata* n. sp. (USNM, ♂, holotype, CL = 106 mm Oregon II. Sta. 114245): A) dorsal view of carapace; B) lateral view of carapace; C) abdomen

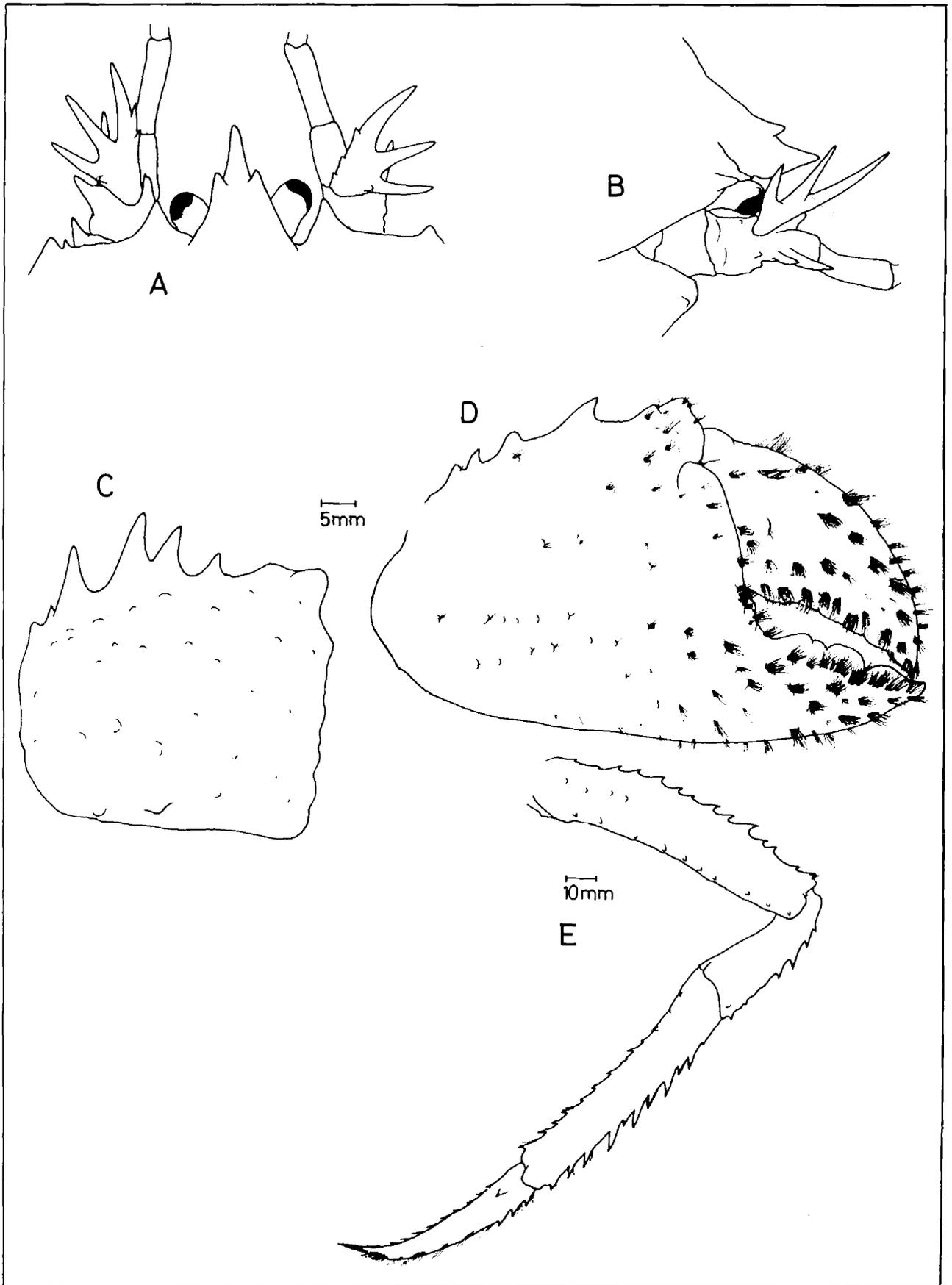


FIG. 49. *Paralomis serrata* n. sp. (USNM, ♂, holotype, CL = 106 mm, Oregon II, St. 11245): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) carpus, right cheliped; D) claw, right cheliped; E) right third walking leg

third walking leg only (small granules instead of spines on the other legs). Rest of this article smooth. Carpus with a row of seven-eight spines on the anterior border. Propodus somewhat longer than the dactylus, with a row of 12-13 spines on the anterior margin and another row of 11-12 somewhat smaller spines on the posterior margin. Rest of the carpus and propodus surfaces smooth, with neither granules nor spines. Dactylus slightly curved, with two-three spines on the base of the anterior border and another spine on either side. Two parallel rows of tufts of setae along the entire anterior border. A row of 14-15 corneous spinules on the posterior margin, with some scattered setae.

Size

The only specimen caught up to the present time has a carapace length of 106 mm and a carapace width of 112 mm.

Distribution

Caribbean Sea off the coast of Colombia (depth: 1 100 m).

Remarks

Paralomis serrata is differentiated from the other

Atlantic species by the shape and armature of the carapace and by the spinulation of the chelipeds and walking legs. *P. pectinata* n. sp., from the vicinity of Isla Margarita, is the closest species geographically and taxonomically, but it is readily differentiated by the size of the spines on the walking legs and chelipeds and by its crests on the carapace, abdominal segments, and chelipeds (p. 105).

P. serrata also resembles *P. verrilli* (Benedict), from the North Pacific (USNM, D-5685, 1 ♂, 1 ♀ (holotype), 1 ♀ ov.), but it is distinguished by features such as:

— Carapace shape similar, but the posterolateral carapace edge in *P. verrilli* bearing a conspicuous crest with five-six teeth, absent in *P. serrata*. In addition, a spine on the apex of the gastric region in *P. verrilli*, also absent in this new species.

— Spinulation of walking legs quite distinct. Only a single row of spines on the merus in *P. serrata*, two clearly identifiable rows in *P. verrilli*.

— Dactylus in *P. verrilli* as long as or longer than the propodus, shorter than the propodus in *P. serrata*.

— Scaphocerite more spinulated in *P. verrilli* than in *P. serrata*.

Etymology

The name *serrata*, from the Latin “serra”, saw, refers to the appearance of the spines on the walking legs.

Paralomis cristulata n. sp.

(Figure 50; Plate 26A)

Material examined

Muséum National d'Histoire Naturelle, Paris
1 ♀ ov., holotype, Campagne Villa Ana, St. 67, 7
July 1983, 12°23' N, 17°31.6' W, 650 m

Instituto de Ciencias del Mar, Barcelona
1 ♀, ov., paratype, Guinea Bissau, P-89, 13 January
1985, 11°22' N, 17°21' W, 251 - 398 m

Description

Carapace more or less pentagonal, somewhat broader than long, covered with small granules varying in size, with a small seta on the apex. Gastric region convex and somewhat more prominent than the other regions.

Rostrum formed by a basal spine with two dorsal

spines above it. Basal spine practically horizontal, dorsal spines slanting slightly upwards and outwards.

Lateral carapace edges with a crest, more or less denticulate on the holotype, bearing small spines on the paratype. External orbital spine well-developed and acute, terminating nearly at the level of the dorsal rostral spines. An incision at the beginning of the cervical groove, and a broad furrow in the middle of the branchial edge. Posterior carapace edge smooth, without crests.

Abdominal segments covered with small granules. Marginal and lateral plates on third segment fused in the two specimens examined. Marginal plates on fourth and fifth segments subdivided or entire.

Ocular peduncles with a small, terminal spine dorsally.

A spine on the terminal, outer angle of the first antennal segment. Two-four spine on the outer surface of the second segment, the most terminal the

most developed, reaching nearly to the midpoint of the last segment.

Scaphocerite overreaching the tip of the antennal peduncle, with a central spine, three-four well-developed spines on the outer border (and sometimes a small spine on the base), and three-five smaller spines on the inner border.

Chelipeds bearing spines only on the dorsal borders of the merus, carpus, and palm. Carpus with a crest bearing six spines on the dorsal border, the medial spines more developed. Rest of article

surfaces smooth, except for some small tubercles and granules. Few setae, except on fingers, where they are grouped in the form of tufts.

Walking legs not particularly elongate. Third walking pair less than twice carapace length, with denticulate crests on the anterior borders of the merus, carpus, and propodus. On the posterior surface, denticulate crests only on the merus, with a few small spines on the propodus. Rest of article surfaces smooth, except for small, scattered granules. Merus a little more than twice as long as high,

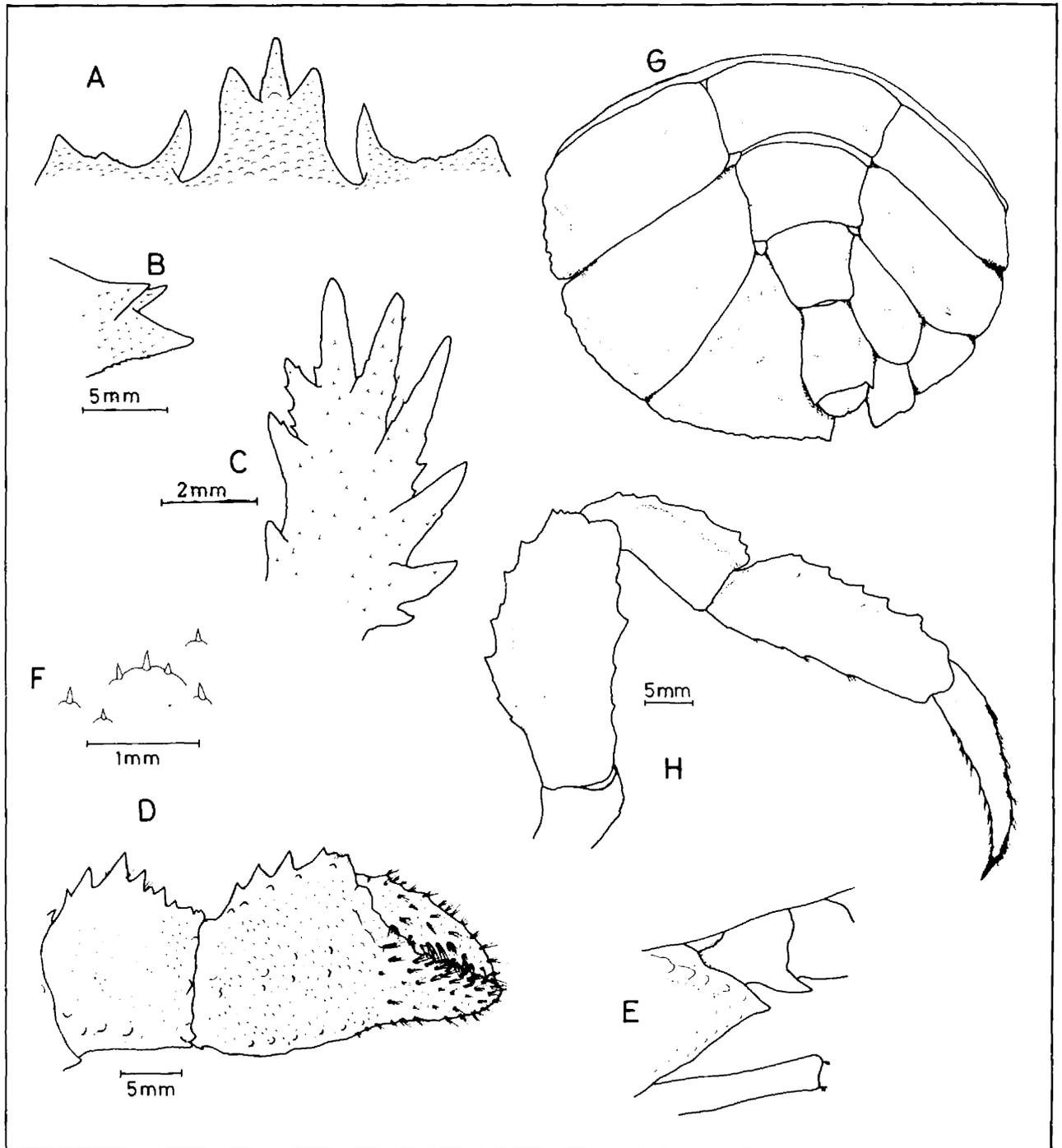


FIG. 50. *Paralomis cristulata* n. sp. (A-F: ICM, ♀ ov., paratype, CL = 48 mm, Guinea Bissau, P-89; G - H: MP, ♀ ov., holotype, CL = 55 mm, Campagne Villa Ana, St. 67): A) anterior part of carapace, dorsal view; B) lateral view of rostrum; C) right scaphocerite; D) right cheliped; E) pterygostomian region; F) granules on dorsal carapace surface; G) abdomen, H) right third walking leg.

one-half carapace length, and 1.6 times carpus length. Propodus somewhat shorter than the merus, 2.5 times longer than high, and slightly longer than the dactylus. Dactylus slightly curved, with a row of corneous spines along the posterior border to the end of article. Some small spines on the base. Two rows of tufts of setae on the anterior border and some scattered setae on the dorsal surface and posterior border.

Size

Carapace length is 55 mm, width 57 mm in the holotype. The paratype is 48 mm long and 51 mm wide.

Distribution

Off the coasts of Guinea Bissau and Sengal on muddy bottoms at depth of from 261 to 650 mm.

Remarks

The closest Atlantic species is *P. africana* Macpherson, from off Namibia. These two species are distinguished by the distinct appearance of the crest on the edge of the carapace. In *P. africana* the lateral edges are armed with many, well-developed spines (Plate 26B), whereas in this new species the crest is practically smooth, with only small incisions and/or spines (Plate 26A).

Furthermore, the anterior borders of the walking legs in *P. cristulata* bear a conspicuous crest with

small spines (Figure 50H). In *P. africana* the crests are barely visible, while the spines are well-developed (Figure 51I).

Paralomis cristulata is closely related to *P. cristata* Takeda & Ohta, from off Japan, in view of the crests on the edges of the carapace and pereopods, but it is readily differentiated by a number of characters:

— Dorsal carapace regions more prominent in *P. cristata*.

— Crests and spinulation on chelipeds and walking legs different. Large teeth on the anterior crests on the cheliped carpus and on the merus, carpus, and propodus of the walking legs in *P. cristata*, crests in *P. cristulata* bearing spines which are more or less developed, but not large. Posterior border of propodus on walking legs nearly smooth in the new species, bearing teeth in *P. cristata*.

— Scaphocerite with five-six spines on the inner border in *P. cristata*, three-five in the new species.

P. cristulata is also closely related to *P. diomedea* (Faxon), from the Northeast Pacific (see p. 23 for the position of this species in the genus; holotype, ♀, CL = 34 mm, CW = 40 mm). The most important difference between these two species is the presence of conspicuous, smooth crests on the ventral border of the cheliped carpus and on the anterior margin of the first walking leg forming a characteristic hollow, similar to that in *Lopholithodes foraminatus* Brandt, when the legs are drawn in.

Etymology

From the Latin "cristula", small crest, referring to the crests on the walking legs and lateral carapace edges.

Paralomis africana Macpherson, 1982

(Figure 51; Plate 26B)

Paralomis africana Macpherson, 1982, p. 142, Figs. 1, 2; Macpherson, 1983, p. 10, Fig. 4; Takeda *et al.*, 1984 (in list); Dawson and Yaldwyn, 1985 (in list)

Material examined

Instituto de Ciencias del Mar, Barcelona

1 ♀, holotype, 2 ♀, 1 ♂ (juvenile), paratypes, Benguela IV, P-119, 24 April 1981, 24°40.3' S, 13°27.5' E, 570 m

1 ♂, allotype, Benguela I, P-13, 15 November 1979, 20°31.7' S, 12°02' E, 600 m

2 ♂, 1 ♀, Benguela IV, P-102, 20 April 1981, 22°03' S, 12°36' E, 639 - 651 m

4 ♂, 7 ♀, Benguela IV, P-119 (not included in the original description)

5 ♂, Valdivia I, P-25, 29 May 1982, 24°50.7' S, 13°26.5' E, 770 m

National Museum of Natural History (Smithsonian Institution), Washington, D.C.

1 ♀, ov., Benguela IV, P-119, 24 April 1981, 24°40.3' S, 13°27.5' E, 570 m

1 ♂, Valdivia I, P-25, 9 May 1982, 24°50.7' S, 13°26.5' E, 770 m

Rijksmuseum van Natuurlijke Historie, Leiden

1 ♂, 1 ♀, Benguela IV, P-119, 24 April 1981, 24°40.3' S, 13°27.5' E, 570 m

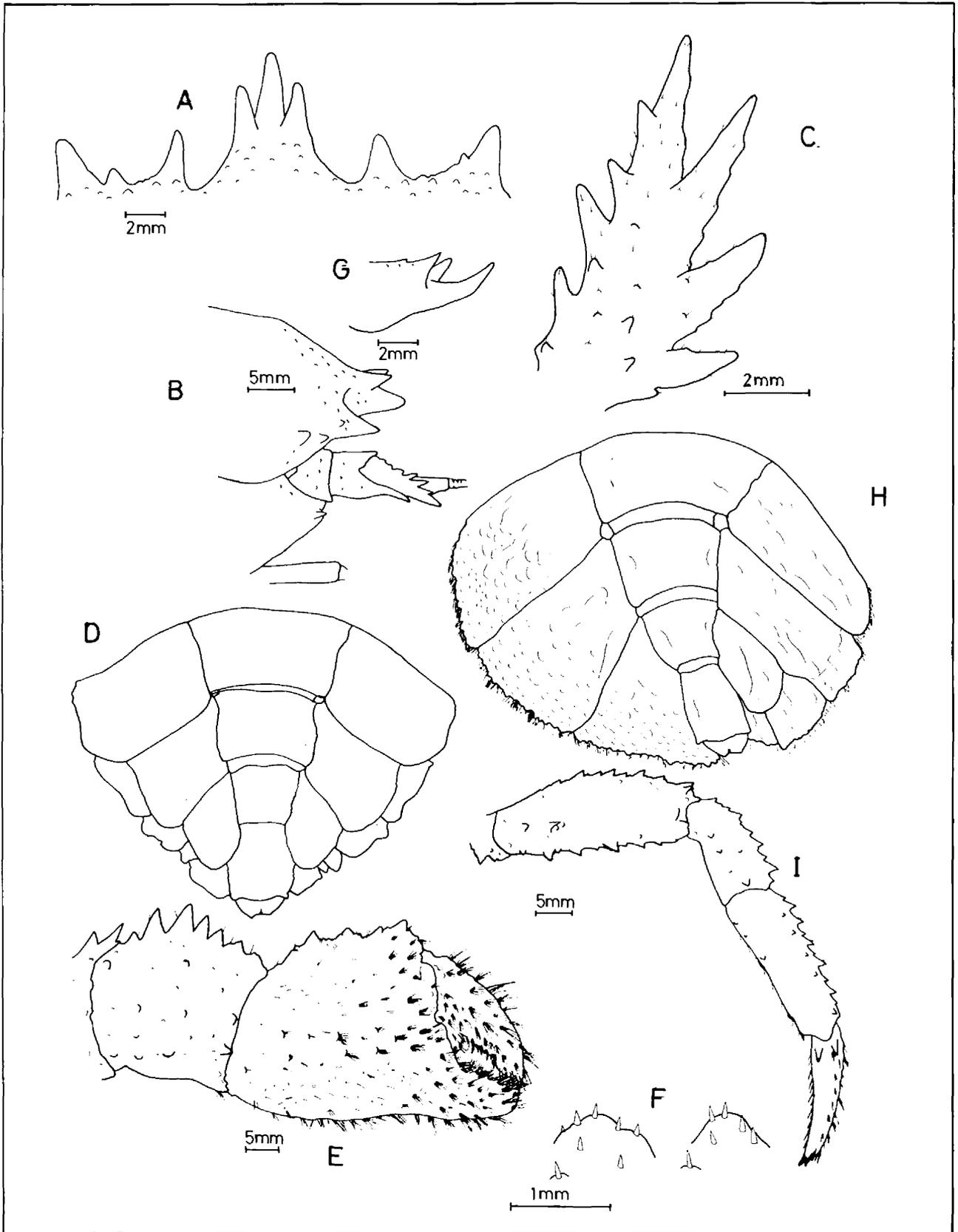


FIG. 51. *Paralomis africana* Macpherson (A-F: ICM, ♂, paratype, CL = 57 mm, Benguela IV, P-119; G: ICM, ♀, holotype, CL = 62 mm, Benguela IV, P-119; H - I: ICM, ♀ ov., paratype, CL = 57 mm, Benguela IV, P-119: A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right scaphocerite; D) abdomen; E) right cheliped; F) granules on dorsal carapace surface; G) lateral view of rostrum; H) abdomen; I) right third walking leg.

Description

Carapace more or less pentagonal, slightly wider than long, covered with granules of different sizes, some bearing setae. Gastric region convex, somewhat more prominent than the cardiac and branchial regions. Sometimes a small depression just in front of the rostrum. Branchial regions a little less protuberant than the cardiac region.

Rostrum formed by a basal and two dorsal spines. Basal spine directed slightly upwards, smooth on the ventral surface. The two dorsal spines overreaching the ends of the corneas and slanting upwards. A small spine usually present at the base of each of the dorsal spines.

External orbital spine overreaching the cornea. Anterolateral spine larger than the external orbital spine. Spines all along the lateral edge of the carapace. Hepatic spine somewhat smaller than the anterolateral spine, with three-four smaller spines between them. Behind the hepatic spine, six-seven spines similar to it in size, with two-three smaller ones interspersed, followed by a depression located a little behind the level of the gastro-cardiac groove. Three spines similar to the hepatic spine in size and one-two smaller ones behind the depression on the posterolateral angle. Posterior edge practically smooth.

Plates on abdominal segments covered with granules of varying size. Marginal and lateral plates on third segment fused in both males and females. Marginal and lateral plates separate on fourth and fifth segments, although they may sometimes be partially fused on the fourth segment. Marginal plates sometimes subdivided.

Ocular peduncles with several granules and a dorsal spine near the cornea.

A spine on the terminal, outer angle of the basal segment of the antennal peduncle. Two spines and a spinule on the outer border and a spinule on the inner border of the second segment.

Scaphocerite with a long, central spine, three-five strong spines and a spinule on the outer border, and four-five small spines on the inner border. Sometimes two-four spiniform granules on the dorsal surface.

Chelipeds with merus armed with some thick spines dorsally near the terminal border. Carpus with a dorsal row of seven-eight spines, four very large ones in the middle of the row. Various spiniform granules dorsally on the hand. Numerous granules on the outer and ventral borders of all articles. Many tufts of setae on fingers and hand.

Second walking leg somewhat longer than the first and third walking legs. Third walking leg a little more than twice carapace length in males and a little less in females. Some spiniform granules on the posterior

border of the basis-ischium. Merus somewhat more than 1.5 times longer than the carpus and somewhat less than 1.5 times longer than the propodus, more than three times longer than high in males, less than 2.5 times in females. A row of eight-ten spines on the anterior border, forming a small crest. Several spines on the posterior border and some smaller ones scattered on the dorsal surface. Carpus with a row of eight-nine spines on the anterior border and some spiniform granules on the outer surface. Propodus 2.7-3.5 times longer than high in males, 2.2-2.5 times in females, with a row of about eight spines on the anterior surface. A few granules scattered over the outer surface. Dactylus slightly curved, as long as or longer than the propodus, with some spines on the base. A row of 11-13 corneous spinules on the posterior border and two rows of tufts of setae on the anterior surface. Ventral borders of all articles smooth.

Colour

Orange-red, somewhat darker on walking legs.

Size

The holotype is 62 mm long and 67 mm wide. The allotype is 66 mm long and 74 mm wide, the female paratypes 46 mm long and 49 mm wide and 55 mm long and 55 mm wide, respectively. The juvenile paratype is 16 mm long and 18 mm wide.

The rest of the males range between 38 and 79 mm in length, the females between 38 and 68 mm in length. Ovigerous females form 38 mm in length.

Distribution

Off the coast of Namibia between 20°31' S and 24°50' S on muddy bottoms between 570 and 770 m in depth.

Remarks

P. africana is closely related to *P. cristulata* n. sp., from off northwestern Africa. The two are differentiated by the appearance of the carapace edge and by the spinulation on the walking legs (p. 110).

It is also close to *P. anamerae* n. sp., from the Southwest Atlantic, though the two species are differentiated by the spinulation of the rostrum, carapace, scaphocerite, and walking legs (p. 117).

Paralomis microps Filhol, 1884.

(Figure 52)

Paralomis microps Filhol, 1884, p. 330, text fig. p. 329. *Rhinolithodes biscayensis* A. Milne Edwards and Bouvier, 1894, (manuscript); Bouvier, 1895, p. 187, 199, Pl. XI, Fig. 10,18, Pl. XII, Fig. 12, 23, 30, 32, Pl. XIII, Fig. 5; Bouvier, 1896, p. 26; A. Milne Edwards and Bouvier, 1900, p. 269, Pl. XXVII, Fig. 21; Dawson and Yaldwyn, 1985 (in list)

Material examined

Muséum National d'Histoire Naturelle, Paris
1 ♀, holotype, Talisman, St. 156, 30 August 1883,
46°04'N, 08°49'N, 1 480 m

Description

Carapace more or less pentagonal, covered with small, more or less spiniform granules. Granules turning into small spinelets on the hepatic region and anterior part of the gastric region. All these small spinelets bearing some setae. Gastric region more prominent than the other regions.

Basal spine of rostrum slightly curved, smooth ventrally. A pair of dorsal spines with an additional small spine at the base of each. Another single, small spine between the two dorsal spines.

External orbital spine smaller than the anterolateral spine, without overreaching the end of the cornea. Seven-nine spines on the anterior half of the carapace, the most developed of these at the level of the gastro-cardiac groove. The spines on the posterolateral half of the carapace smaller. Posterior edge bearing small spines and spiniform granules. Pterygostomian region with a small, terminal spine.

Third to fifth abdominal segments formed by a median and two lateral plates. Just two small marginal plates on the fifth segment. Some more or less spiniform granules on the proximal border of the second segment.

Ocular peduncle with some dorsal spines, the terminal of these the most developed, extending beyond the end of the cornea.

An antero-external spine on the basal article of the antennal peduncle. A long antero-external spine on the second article, overreaching the base of the last segment of the antennal peduncle, with two smaller spines at the base. Terminal, inner angle bearing a well-developed spine. Scaphocerite well-developed, formed by a long, central spine extending past the midpoint of the last segment of the antennal peduncle. Two spines on the outer margin, the more terminal of these the same size as the central spine.

Two more or less spiniform granules on the inner surface.

Chelipeds with merus and carpus armed with numerous spines, those on the dorsal border more developed. Carpus with four dorsal spines, the two medial spines thick and rising from a small crest. Inner borders of the articles smooth. Dorsal border of hand with two ragged rows of spines. Some granules forming two longitudinal rows on the medial portion of the outer surface. Ventral border smooth. A small, dorsal spine on the base of the movable finger. Tufts of yellow setae on both fingers.

First walking leg somewhat longer than the others, the third walking leg the shortest, 1.2 times carapace length.

On third walking leg, basis-ischium with two spines on the posterior border. Merus 2.5 times longer than high and 1.5 times carpus length. Anterior border armed with a row of five spines. Another row of spines, similar to the preceding ones in size, on the posterior border. Some spines of varying size but smaller than the spines on the anterior and posterior borders on the dorsal surface, not arranged in rows. Carpus with a row of spines on the anterior margin and numerous spines on the dorsal surface. Propodus the same length as the merus, nearly three times longer than high, and 1.1 times dactylus length. A row of spines on the anterior edge and another on the posterior border. Several spines on the dorsal surface. Dactylus slightly curved, with two small spines on the base and a row of ten small corneous spinelets along the posterior border. Terminal, corneous unguis strongly curved. Ventral borders of the articles smooth.

Size

The only specimen yet caught is a female 15 mm long and 15 mm wide.

Distribution

Bay of Biscay, 45°59' N, 06°29' W, 1 480 m, coral bottom.

Remarks

Filhol (1884) mentioned *Paralomis microps* A. Milne Edwards from a "dragage fait en face Rochefort à 1500 mètres de profondeur". The animal

is shown on the figure on p. 329. Filhol described the species and refers to the figure. There was no mention of description or figure by A. Milne Edwards.

Paralomis (= *Rhinolithodes*) *biscayensis* was described by A. Milne Edwards and Bouvier in a manuscript which was never published. The first description appeared in Bouvier (1895). The following year, this author (p. 26) attributed the species to A. Milne Edwards and Bouvier, although the reference was in fact his own paper (1895). As in

this paper there was no mention of coauthorship with A. Milne Edwards, the species in question should be attributed to Bouvier alone.

There can be little doubt (considering the locality and the figure) that *Paralomis microps* Filhol, 1884, is the same as *P. biscayensis* Bouvier, 1895, and that Filhol's name has priority. The figure has also been published in Filhol (1885b), pl. II. It also shows the Lithodid, but does not name it, neither in the legend to the figure, nor any where else in the text.

Paralomis microps was initially assigned to the

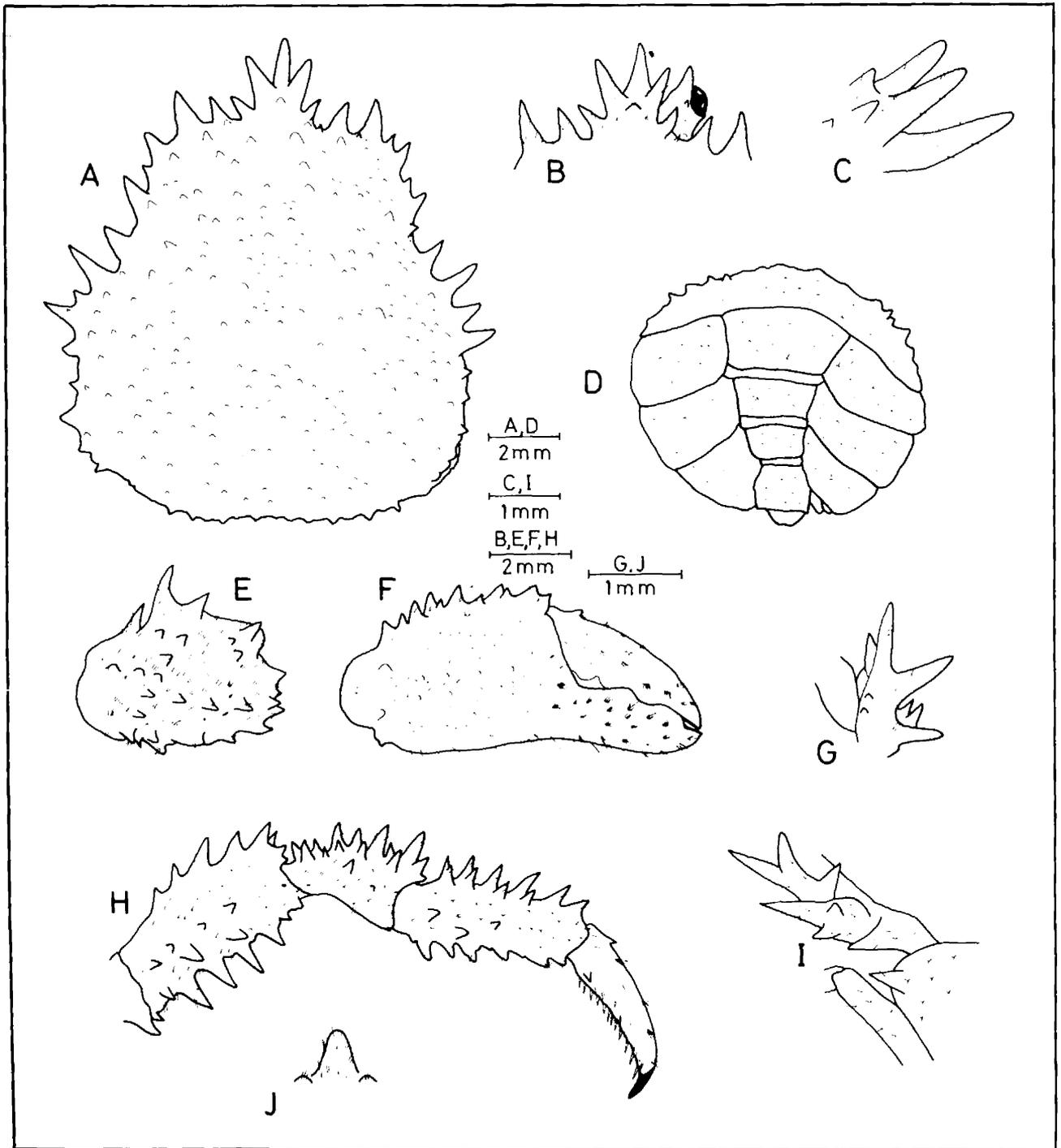


FIG. 52. *Paralomis microps* Filhol (MP, ♀, holotype, CL = 15 mm, Talisman, St. 14): A) dorsal view of carapace; B) anterior part of carapace, dorsal view; C) lateral view of rostrum; D) abdomen; E) carpus, right cheliped; F) claw, right cheliped; G) right scaphocerite; H) right third walking leg; I) left antenna and pterygostomian region; J) granules on dorsal carapace surface.

genus *Rhinolithodes* Brandt, 1848. Examination of specimens of *R. wosnessenski* (see p. 20), the type species for the genus, clearly highlights the main generic differences between these two species. In *Rhinolithodes* the second abdominal segment is formed by five plates, with the marginal and lateral plates fused on the third to fifth segments, giving rise to a slight abdominal asymmetry in females.

The only specimen of *P. microps* caught to date is very small (CL = 15 mm), and, as in very young females of other species of the genus *Paralomis* (*P. granulosa* (Jacquinot), p. 94), the marginal plates on the left side are small, but they are nevertheless present. Furthermore, all the plates on the second abdominal segment are fused, as is characteristic of all the species belonging to the genus *Paralomis*.

Because just a single specimen of *P. microps* is available, the possible variations in its morphological characters are unknown, making comparison with other species difficult. For instance, as pointed out in the general key, the armature of the dorsal carapace surface probably varies with length, with the spinelets turning into granules, as in the other species. The same may hold true for the spinulation of the chelipeds and walking legs.

The closest species geographically is *P. bouvieri* Hansen, from the North Atlantic. The two species are readily distinguished by the spinulation of the carapace and pereopods (Figure 38). In *P. bouvieri* both the dorsal surface and edges of the carapace are covered with numerous, well-developed spines, while in *P. microps* the dorsal carapace surface is covered with granules and small spinelets. In *P. bouvieri* the spines on the chelipeds and walking legs are more numerous and more developed. Moreover, *P. bouvieri* has a single spine on the outer border of the scaphocerite, while *P. microps* has two.

As previously indicated in the key, this species has been included in the group of species bearing only

granules on the dorsal carapace surface, even though the specimen exhibits small spinelets. On the basis of the shape and spinulation of the carapace, *P. microps* would seem to be closely related to *P. africana* Macpherson, from off Namibia, *P. cubensis* Chace, from the Caribbean, and *P. anamerae* n. sp., from the Southwest Atlantic; however, the difficulties involved in establishing such comparisons should not be overlooked.

P. microps is readily distinguished from *P. africana* by the spinulation of the rostrum, by the more convex ventral border of the basal spine, and by the additional pair of spines on the base, not discernible in *P. africana*. The spinulation of the chelipeds and walking legs is also different. In *P. africana* there is a crest with thick spines on the dorsal border of the carpus on the right cheliped; in *P. microps* there are fewer spines, and these do not form a well-defined crest. Moreover, *P. microps* has strong spines on the posterior border of the propodus on the walking legs; such spines are absent in *P. africana*. The dactylus is slightly curved in *P. africana*, whereas in *P. microps* the curvature of the dactylus is more pronounced. The scaphocerites are quite distinct.

P. microps is differentiated from *P. cubensis* by the shape and spinulation of the cheliped carpus, by the shape of the rostrum, the central spine of which is more strongly curved in *P. cubensis*, and by the spinulation of the carapace edges and walking legs.

P. anamerae is differentiated by its more spinulated scaphocerite and by the quite distinct spinulation of the chelipeds and walking legs. In *P. microps* there is a small, spiny, no well-defined crest on the dorsal border of the carpus on the right cheliped, while *P. anamerae* has thick spines but no crest. The carpus and propodus on the walking legs are more spinulate in *P. microps* than in *P. anamerae*. Furthermore, this latter species has a small depression on the lateral edges of the carapace, slightly behind the level of the gastro-cardiac groove. Such depressions are not present in *P. microps*.

***Paralomis anamerae* n. sp.**

(Figures 53; Plates 27, 28)

Material examined

Moscow University Zoological Museum
1 ♂, holotype, 1 ♀ ov., allotype, 2 ♂, paratypes,
R/S Ebrika, St. 90, 26 March 1972, 46°01.5' S,
60°40.3' W, 132 - 135 m

Description

Carapace rounded, more or less pentagonal,

covered with numerous, more or less pointed granules. Some small but conspicuous spines near the anterior edge of the carapace, present on all the specimens. Gastric region somewhat more prominent than the other regions, with a granule thicker than the rest (a small spine in smaller individuals) in the centre of the region. Branchial regions slightly convex, somewhat more prominent than the cardiac region. A thick, spiniform granule in the middle of each of the branchial regions, more acute in juveniles. Two thick, spiniform granules similar to

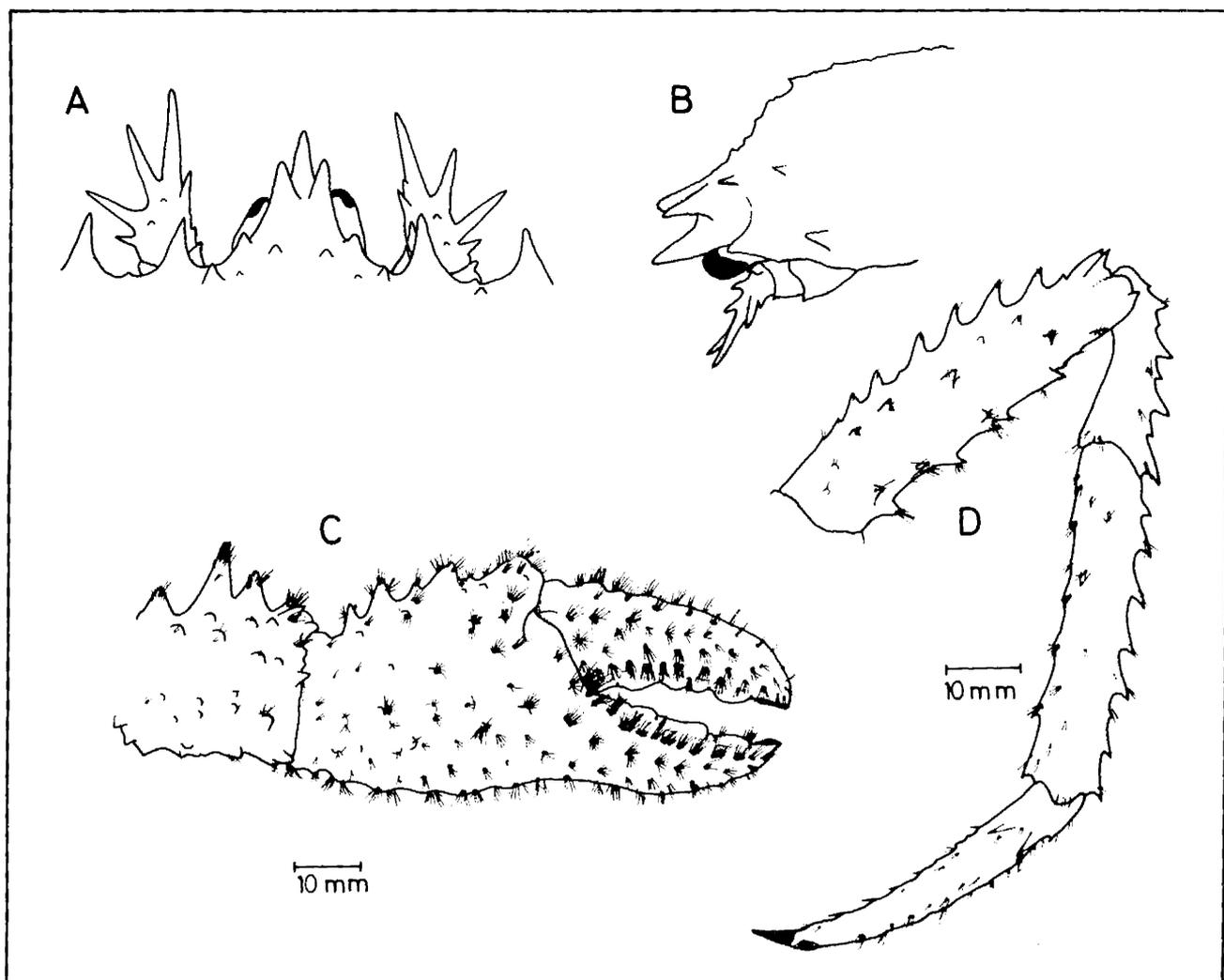


FIG. 53. *Paralomis anamerae* n. sp. (MUZM, ♂, holotype, CL = 97 mm, Ebrika, St. 90): A) anterior part of carapace, dorsal view; B) anterior part of carapace, lateral view; C) right cheliped; D) right third walking leg.

these near the posterior carapace edge. A small spine on the terminal angle of the pterygostomian region.

Basal spine of rostrum slightly curved, ventral surface smooth. Two slightly divergent, upward-slanting, dorsal spines. Two small spines at the base of each of the dorsal spines. Basal spine and the two dorsal spines all overreaching the corneas. External orbital spine somewhat shorter than the eyestalks, as long as or somewhat longer than the anterolateral spine. Numerous spines on the lateral carapace edge, forming an outward-projecting crest, the spines thicker and more developed on the anterior half of the carapace, becoming smaller granules on the posterior half.

A few small granules on the abdomen. Marginal and lateral plates on third segments separate from the lateral plates, subdivided in the female but no in the males.

Basal segment of antennal peduncle with a small antero-external spine. A long antero-external spine

on the second segment, overreaching the base of the last article of the antennal peduncle, with one-two spines at the base. Scaphocerite with a long, central spine extending slightly beyond the tip of the last segment of the antennal peduncle. Two long spines and one small spine on the outer border, and one-two spines on the inner border. Some granules dorsally.

Chelipeds with merus bearing thick spines on the terminal border. Carpus with thick spines on the dorsal border and other, smaller spines on the outer, and ventral surfaces. Spines on the dorsal border of the hand. Some smaller spines on the outer and, ventral surfaces. Numerous tufts of setae on fingers.

Third walking leg less than twice carapace length in the female and a little more than twice carapace length in the males. Some spines on the terminal border of the basis-ischium. Merus shorter than carapace length, between 3.5 and 4.5 times longer than high, and almost twice carpus length, with a row of eight-ten well-developed spines on the anterior

margin that do not form a crest. Various spines on the posterior border and dorsal surface not in well-defined rows. Carpus with a row of four-five spines on the anterior margin, with two-three smaller spines interspersed. Some scattered spines dorsally. Propodus somewhat shorter than the merus and as long as the dactylus, anterior margin with 10-12 spines that do not form a row. Some smaller spines on the posterior margin. Dorsal surface practically smooth. Ventral surfaces of all articles smooth. Dactylus slightly curved, with four spines at the base of the anterior border and a single spine at the base of the dorsal and ventral surfaces. A row of nine-ten corneous spinelets on the posterior border. Some scattered tufts of setae, mainly on the anterior border.

Tips of most of the spines on the chelipeds and walking legs on the holotype bearing tufts of more or less long setae. Such tufts of setae are less abundant and smaller in the rest of the specimens examined.

Size

Carapace length is 97 mm, carapace width 102 mm, in the holotype. Length and width are both 68 mm in the allotype. The two paratypes are the same size, 82 mm long and 85 mm wide.

Distribution

Continental shelf off Argentina, north of the

Falkland Islands (Malvinas), between 132 and 135 m in depth.

Remarks

Paralomis anamerae is closely related to *P. africana* Macpherson, from off Namibia (p. 110), but it is differentiated by a number of characters:

— More granules but no spinules on the dorsal carapace surface in *P. africana* (Plates 26B, 27).

— Two pairs of small spines on the base of the rostrum in *P. anamerae*, sometimes one pair in *P. africana* (Figures 51A, B, G, 52A).

— Three-four spines on the inner border of the scaphocerite in *P. africana*, one-two in the new species (Figures 51C, 53A).

— In *P. anamerae*, thick spines on the articles of the walking legs, no crest on the merus (Figure 53D). In *P. africana* spines smaller but forming a small crest on the merus (Figure 51I).

— Walking legs longer and more slender in the new species.

Etymology

This species is dedicated to the Asociación Nacional de Armadores de Buques Congeladores de Pesca de Merluza (ANAMER) (National Association of Owners of Freezer Trawlers Engaging in the Hake Fishery), in recognition of its valuable support and collaboration in the research work undertaken by our Institute.

4. ACKNOWLEDGEMENTS

This work was possible thanks to the invaluable assistance of a number of colleagues. Dr. R.B. Manning, together with other colleagues at the National Museum of Natural History in Washington, D.C., furnished a large amount of new material as well as advice on numerous aspects. With characteristic generosity, Dr. A. Crosnier of the Muséum National d'Historie Naturelle in Paris made arrangements giving me access to the extremely interesting material collected on French expeditions off Africa and in the North Atlantic. The help of Dr. M. de Saint Laurent during my stay in Paris is also much appreciated. Dr. L.B. Holthuis, of the Rijkmuseum van Natuurlijke Historie in Leiden provided valuable information on early references and made helpful suggestions. Dr. M. Türkay of the Senckenberg Museum in Frankfurt, made available to me the collections of German expeditions to the Southwest Atlantic. Dr. T. Wolff of the Zoologisk Museum in Copenhagen and Dr. R. Ingle of the British Museum (Natural History) in London both sent me type material of great value in the preparation of this work. Dr. Y. Geptner of the Moscow University Zoological Museum and colleagues at VNIRO provided valuable assistance during my stay in Moscow, and Ms. M. van der

Merwe of the South African Museum and A. Payne from the Sea Fisheries Research Institute did the same in Cape Town. Dr. E.E. Boschi of the Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP) (National Institute for Fisheries Research and Development), D. Lloris and J. Rucabado from Instituto de Ciencias del Mar de Barcelona sent me important material on Argentinian species. Dr. M. Takeda of the National Science Museum in Tokyo, Dr. E.W. Dawson of the New Zealand Oceanographic Institute, and Dr. J.C. Yaldwyn of the National Museum of New Zealand, kindly furnished extremely interesting illustrations of the species in their areas. My sincere appreciation to all for their help.

J. Biosca and R. Sacks spent many hours preparing the very detailed illustrations and English text appearing in this work.

This work was funded in part by the Research Program on the Coast off Namibia (Secretaria General de Pesca), by the U.S.A. - Spain Scientific Cooperative Program (Programa Hispano-Norteamericano de Cooperación Científica y Técnica) and by the Comissio Interdepartamental de Recerca i Innovacio Tecnologica (CIRIT) (Interdepartamental Commission for Research and Technological Innovation).

PLATES

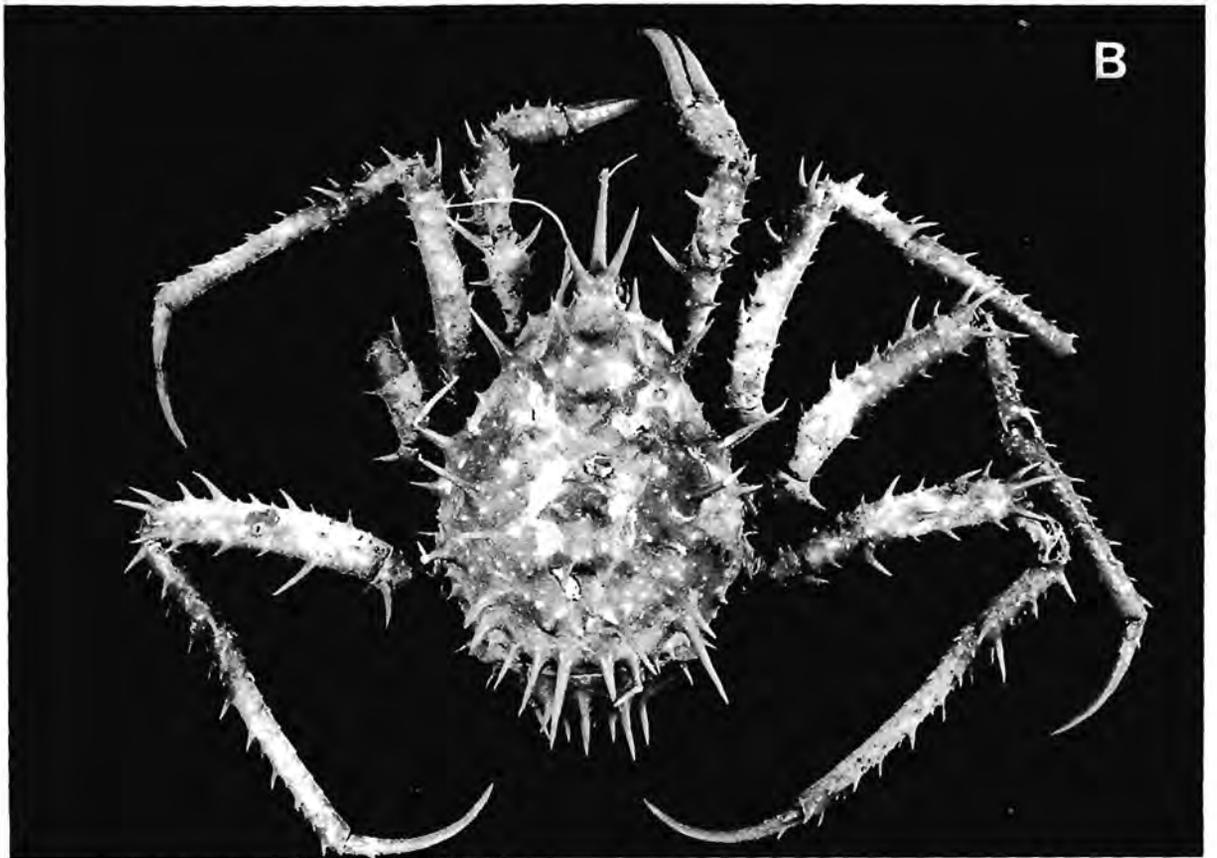
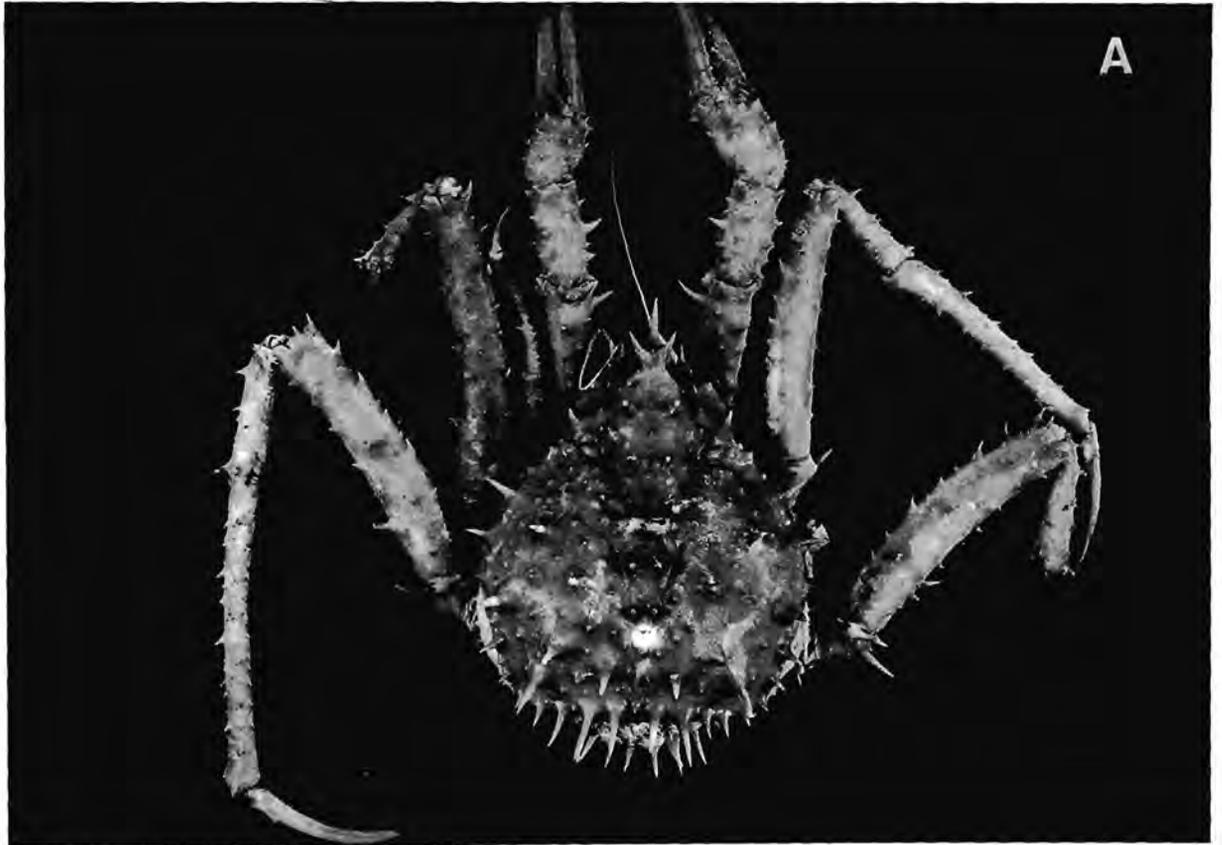
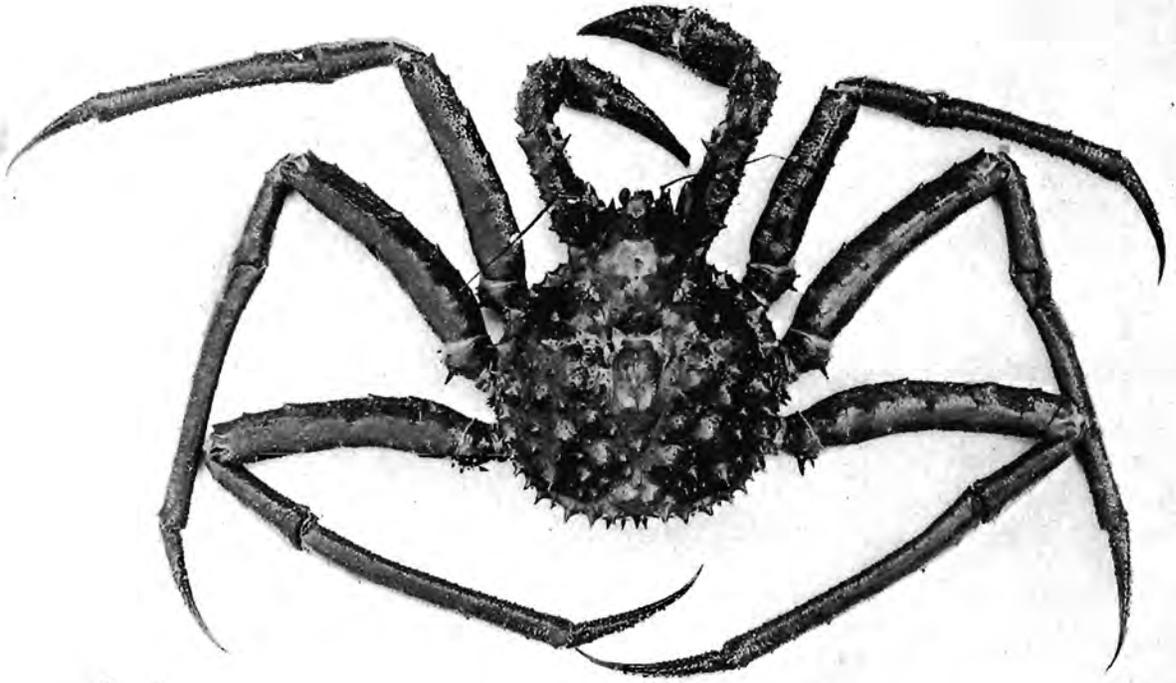


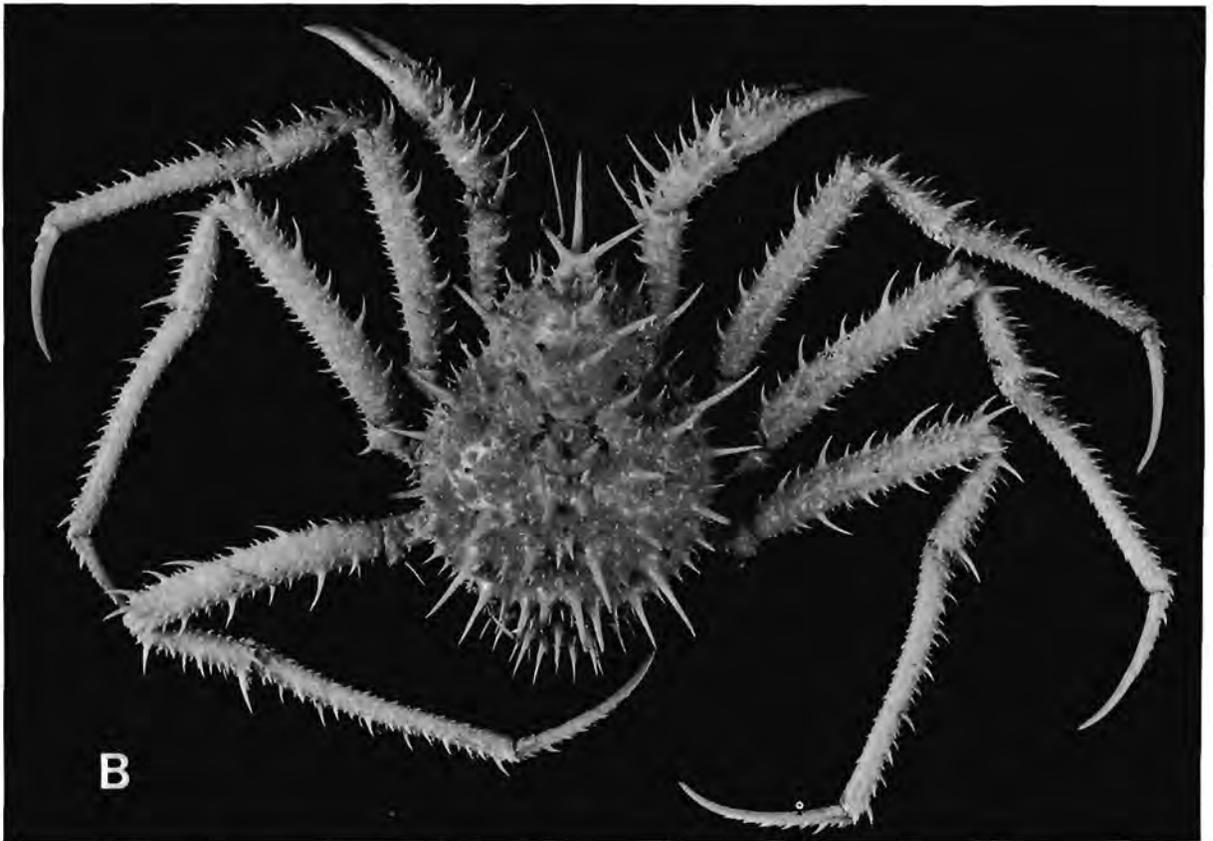
PLATE 1. *Neolithodes diomedae* (Benedict) (A: USNM, paralectotype, ♂, CL = 111 mm, Albatross, St. 2789; B: USNM, paralectotype, ♂, CL = 51 mm, Albatross, St. 2788): general appearance, dorsal view.



PLATE 2. A-B. *Neolithodes diomedea* (Benedict) (A: USNM, paralectotype, ♂, CL = 111 mm, Albatross, St. 2789; B: MP, ♂, paralectotype, CL = 127 mm, Albatross, St. 2789): A) dorsal view of carapace; B) abdomen, C) *Neolithodes agassizii* (Smith) (USNM, ♂, CL = 135 mm, east coast of United States): dorsal view of carapace.



A



B

PLATE 3. *Neolithodes asperrimus* Barnard (A: ICM, ♂, CL = 141 mm, Benguela IV, P-140; B: ICM, ♂, CL = 48 mm, Valdivia I, P-22): general appearance, dorsal view.

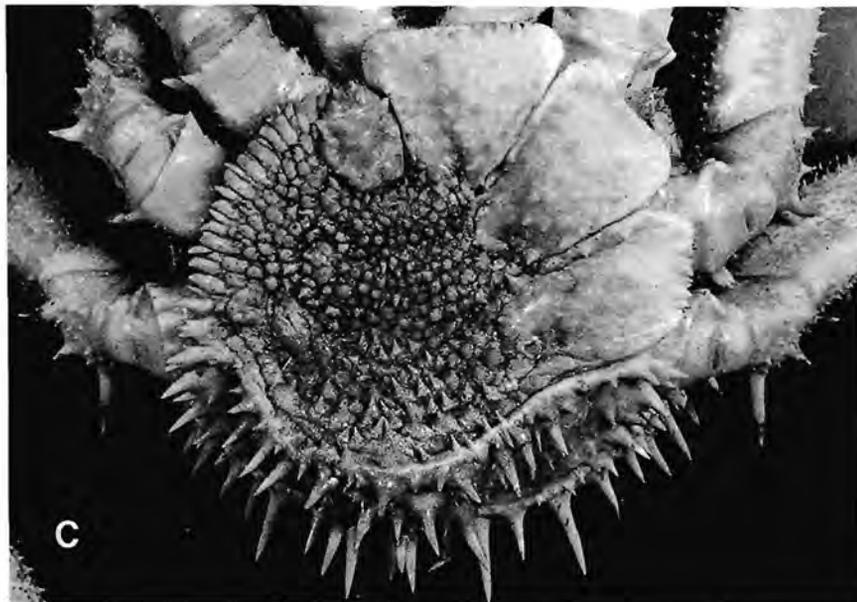
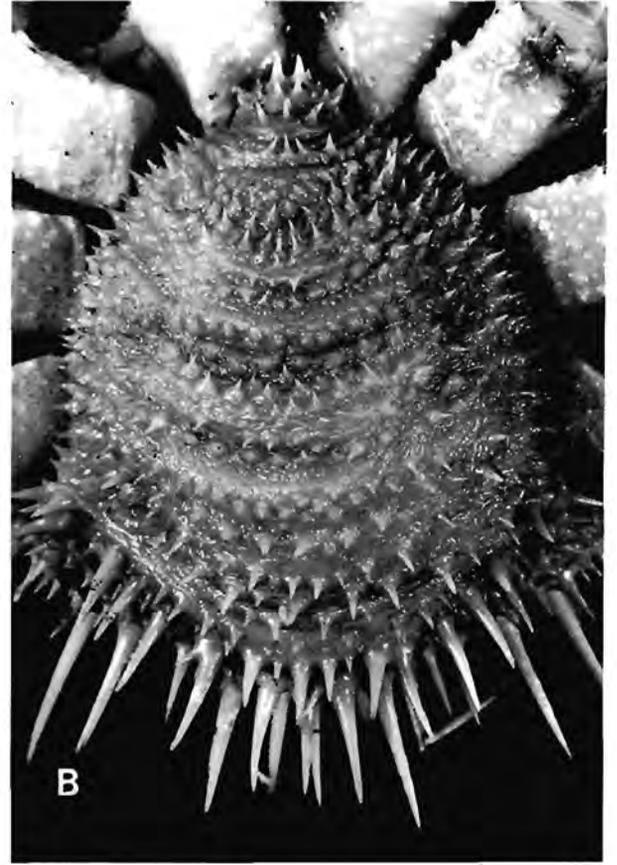
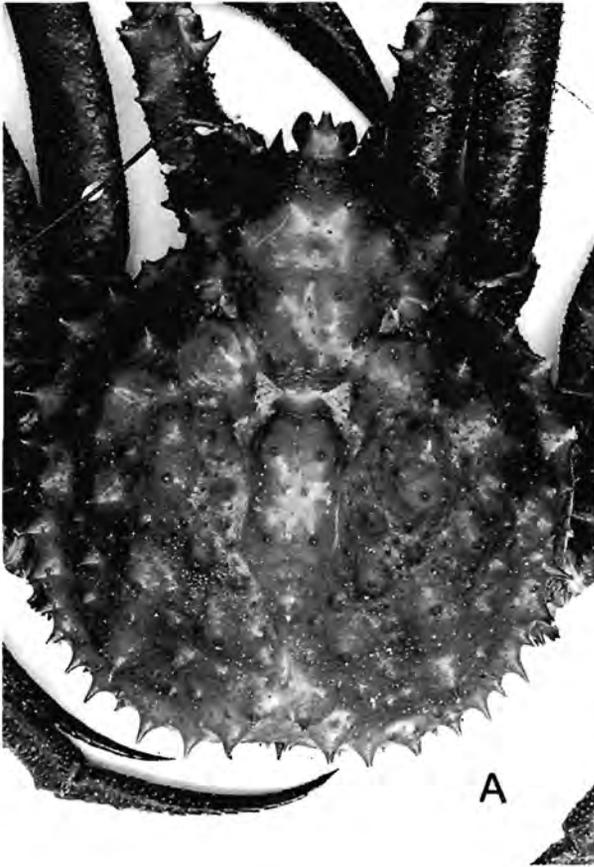
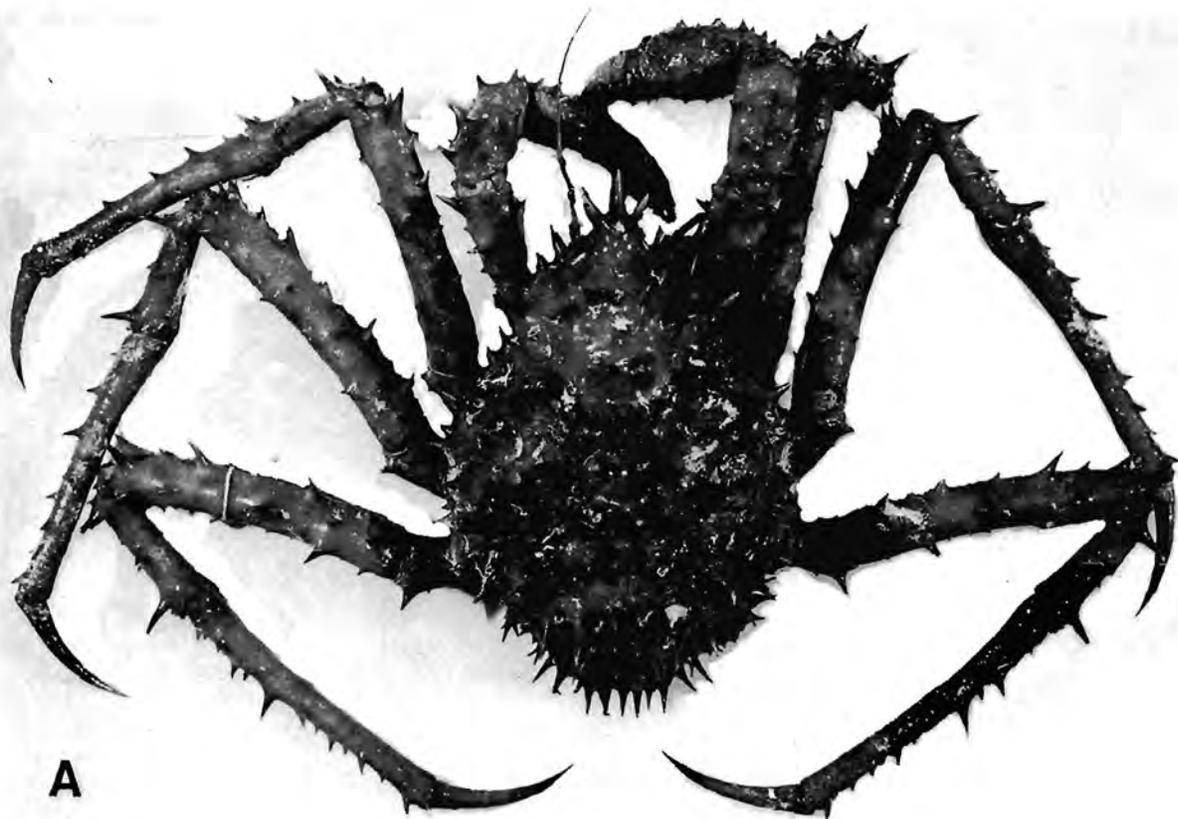
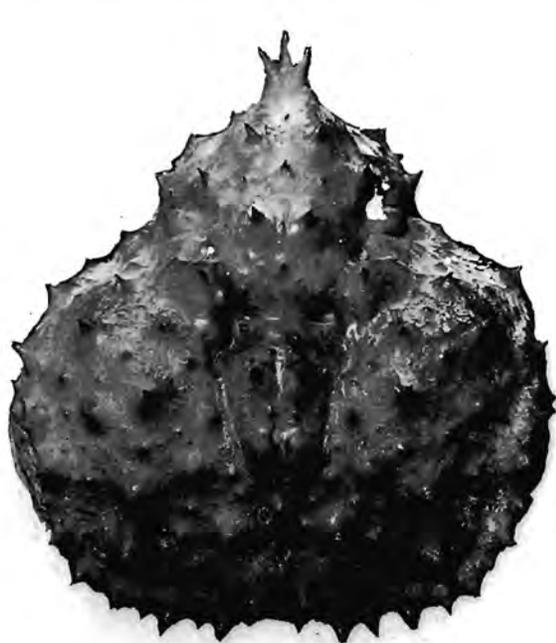


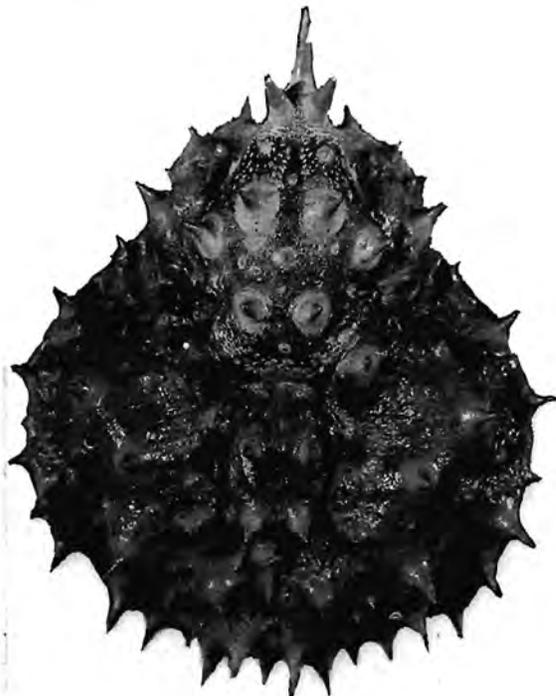
PLATE 4. *Neolithodes asperrimus* Barnard (A: ICM, ♂, CL = 141 mm, Benguela IV, P-140, B: ICM, ♂, CL = 48 mm, Valdivia I, P-25; C: ICM, ♀, CL = 90 mm, Valdivia I, P-25): A) dorsal view of carapace; B) - C) abdomen.



A



B

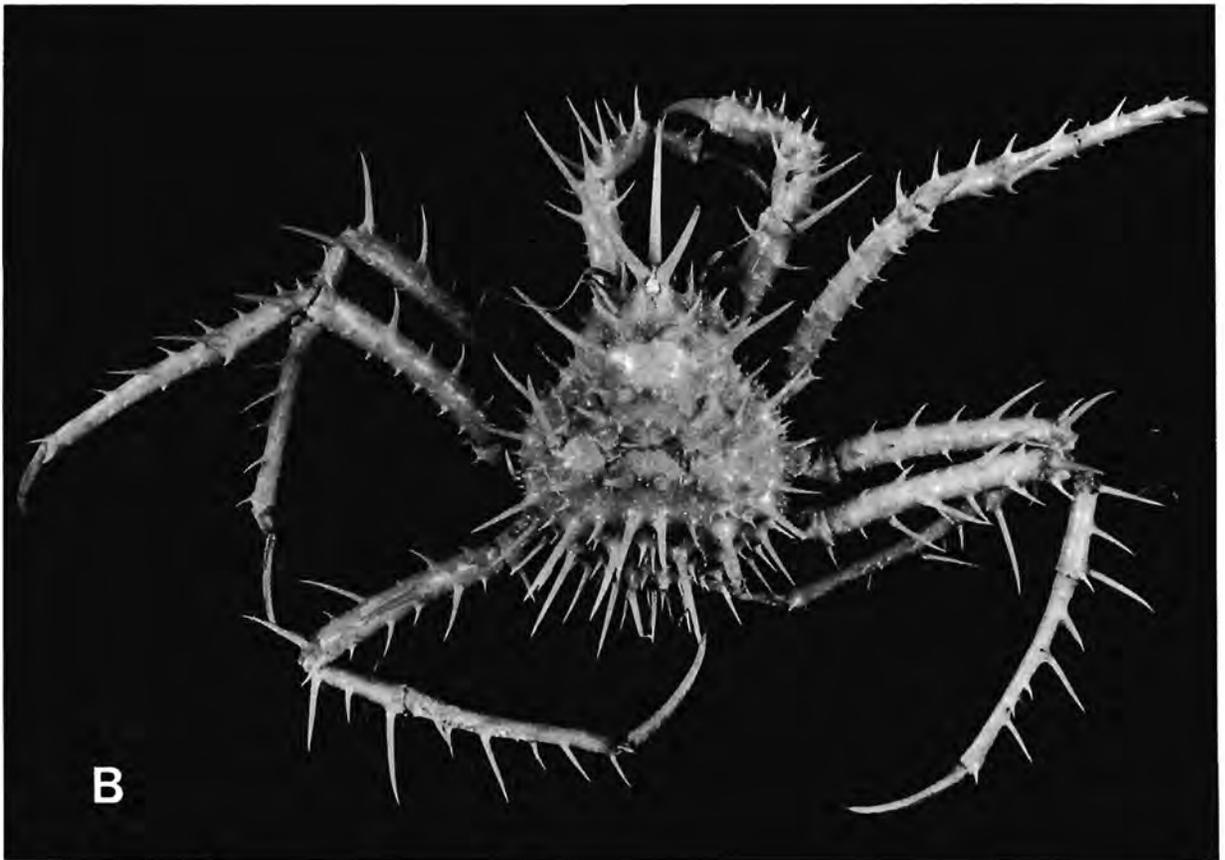


C

PLATE 5. *Neolithodes capensis* Stebbing (A: SAM, ♀, CL = 82 mm, Cape region; B: SAM, ♂, CL = 131 mm, Cape region; C: SAM, ♂, CL = 101 mm, Cape region): A) general appearance, dorsal view. B) - C) dorsal view of carapace.



A



B

PLATE 6. *Neolithodes grimaldii* (A. Milne Edwards & Bouvier) (A: USNM, ♂, CL = 152 mm, G1-74-04, St. 105; B: MP, ♀, CL = 42 mm, CENTOB-INCAL, CP07): A) general appearance, dorsal view; B) general appearance, dorsal view.

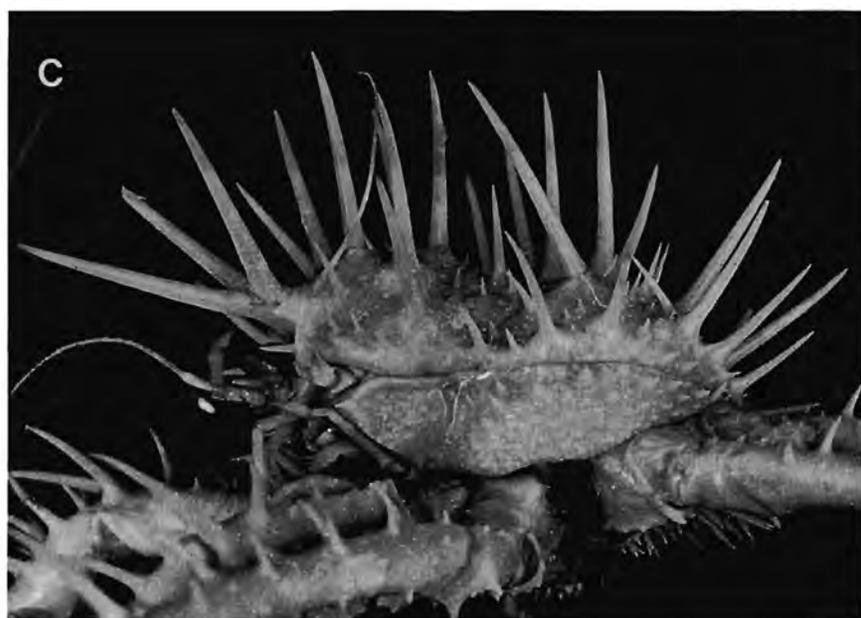
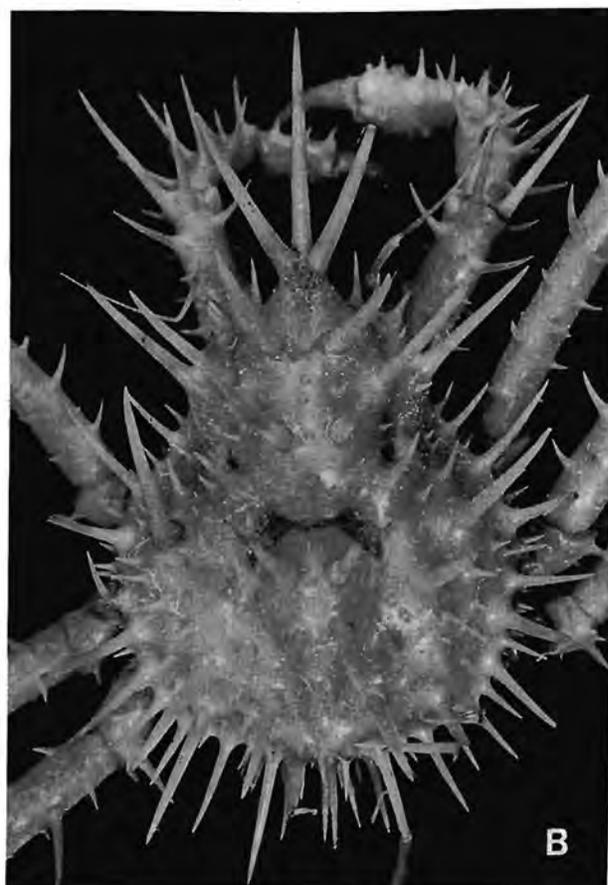


PLATE 7. *Neolithodes grimaldii* (A. Milne Edwards & Bouvier) (A: USNM, ♂, CL = 152 mm, GI-74-04, St. 105; B - C: MP, ♀, CL = 42 mm, CENTOB-INCAL CP07): A) dorsal view of carapace; B) dorsal view of carapace; C) lateral view of carapace.

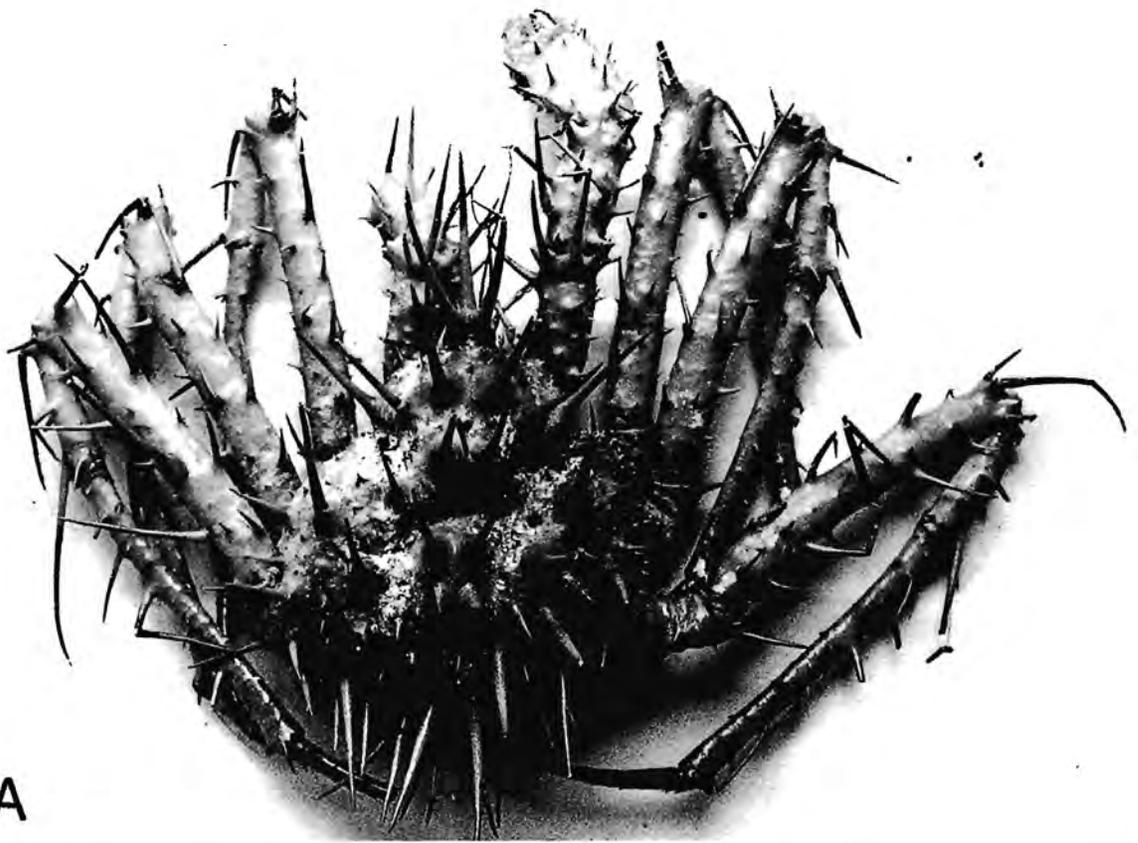


PLATE 8. *Neolithodes vinogradovi* n. sp. (MUZM, ♂, holotype, CL = 109 mm, Indian Ocean): A) general appearance, dorsal view; B) general appearance, ventral view.

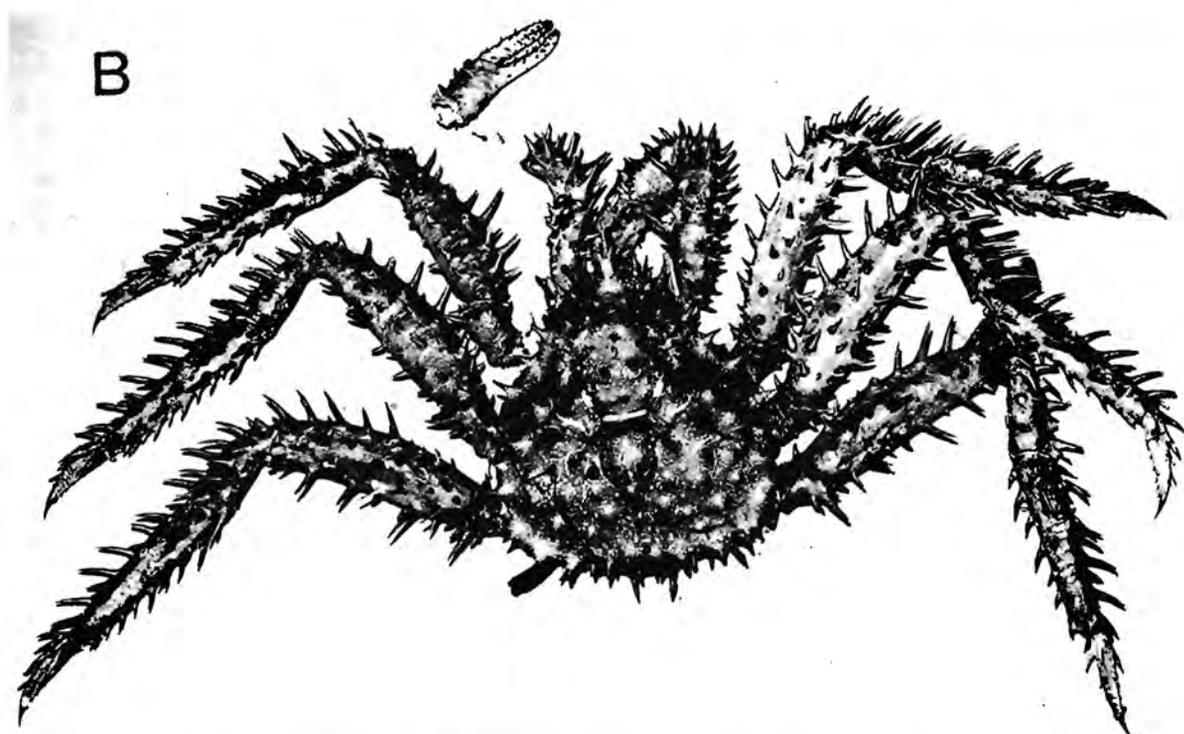


PLATE 9. *Lithodes santolla* (Molina) (A: MUZM, ♀ ov., CL = 142 mm, Akadiemik Knipovich, St. 245; B: MP, ♂, CL = 93 mm, Strait of Magellan: general appearance, dorsal view.

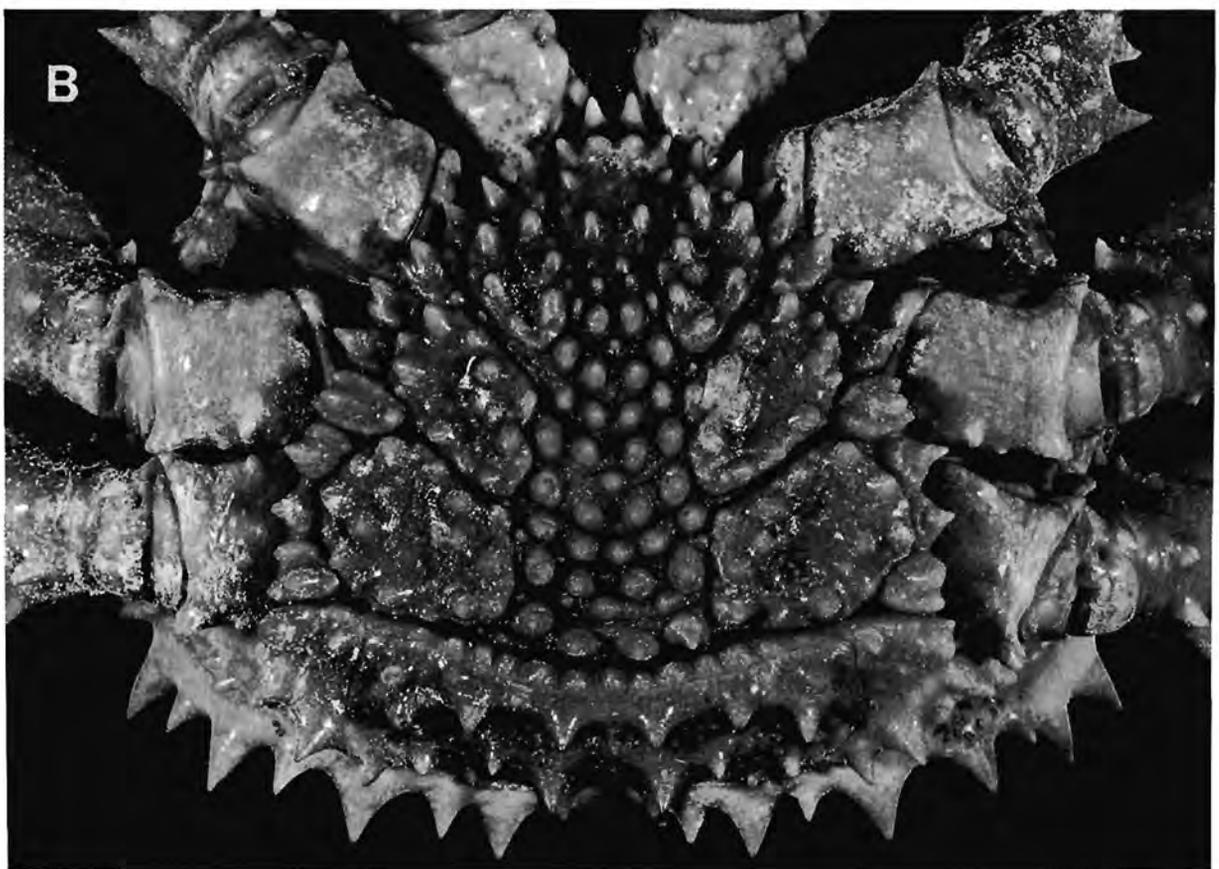
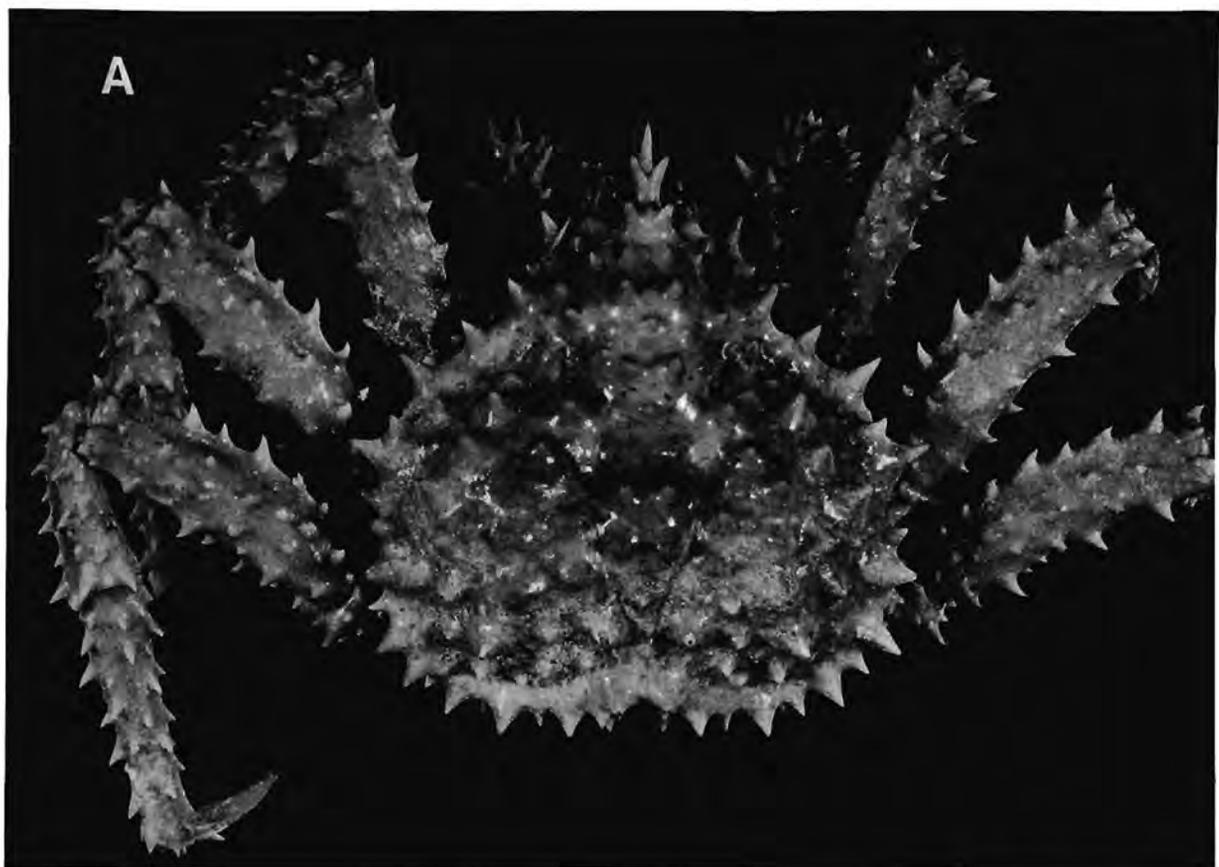


PLATE 10. *Lithodes santolla* (Molina) (USNM, ♂, CL =75 mm, USARP, Eltanin, Cruise 5, Sta. 214): A) general appearance, dorsal view. B) abdomen.

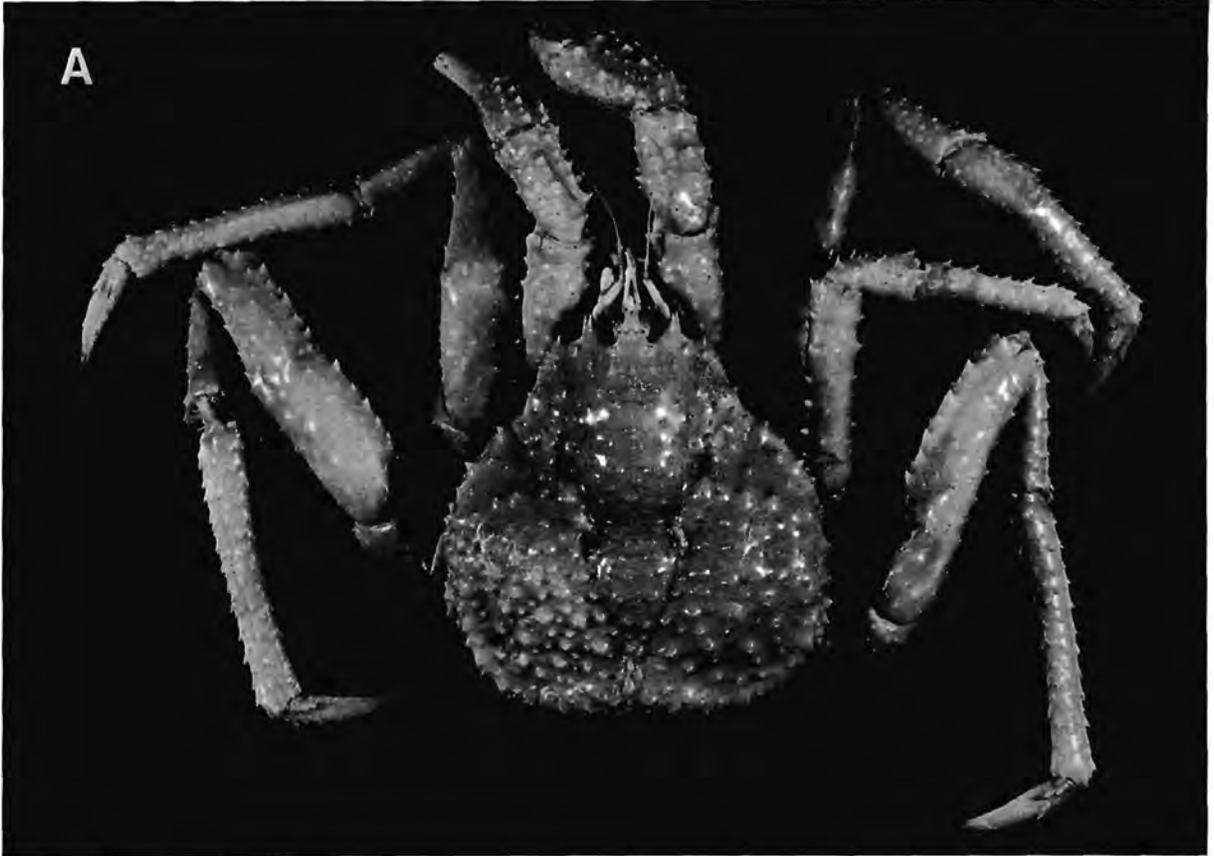


PLATE 11. *Lithodes confundens* n. sp. (A: USNM, ♂, holotype, CL = 84 mm, USARP, Eltanin, Cruise no. 6, St. 346; B: USNM, ♀ ov., allotype, CL = 75 mm, USARP, Eltanin, Cruise no. 6, St. 346) A) - B) general appearance, dorsal view.

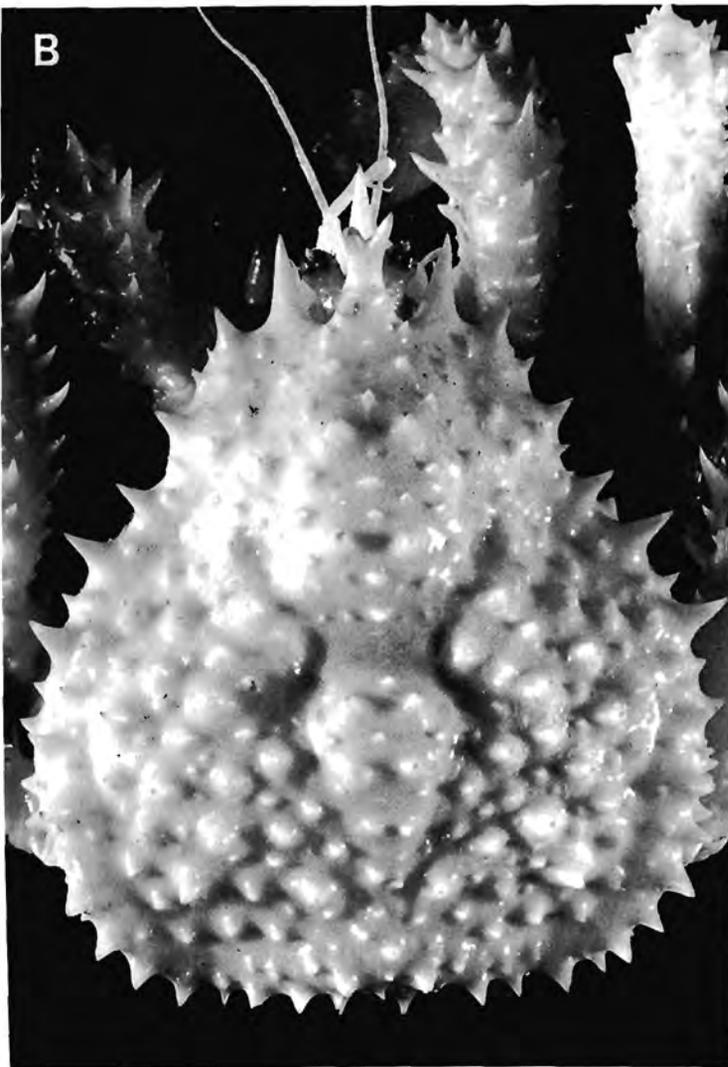
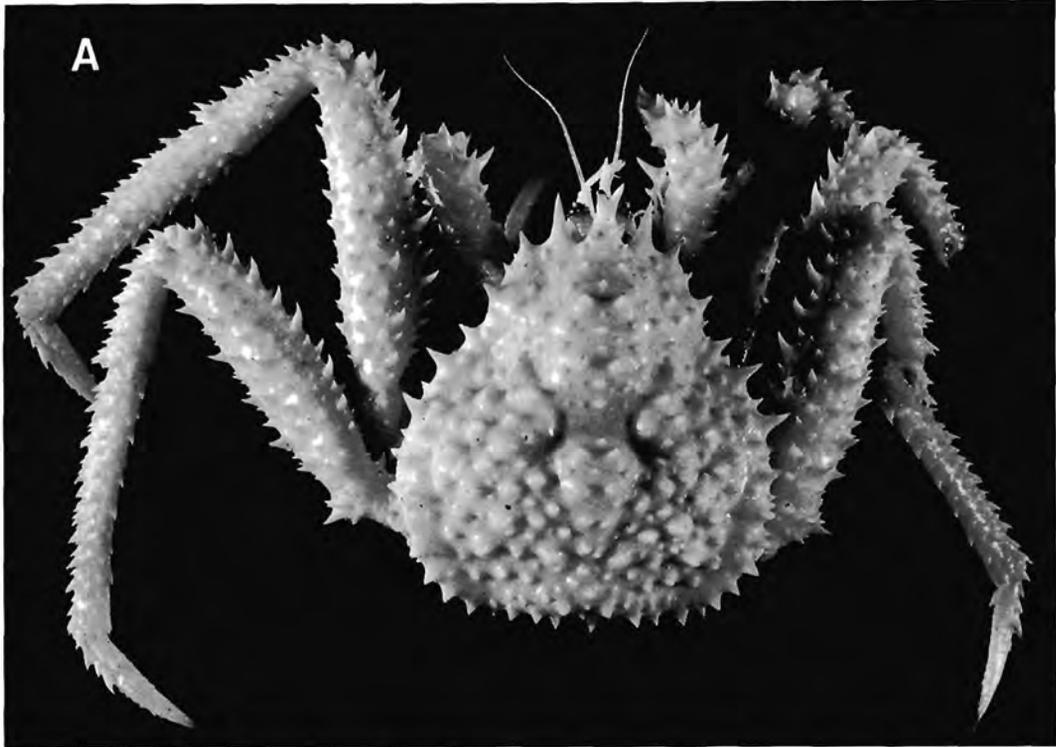


PLATE 12. *Lithodes confundens* n. sp. (BM, ♂, paratype, CL = 52 mm, St. 1285): A) general appearance, dorsal view; B) dorsal view of carapace.

A



B

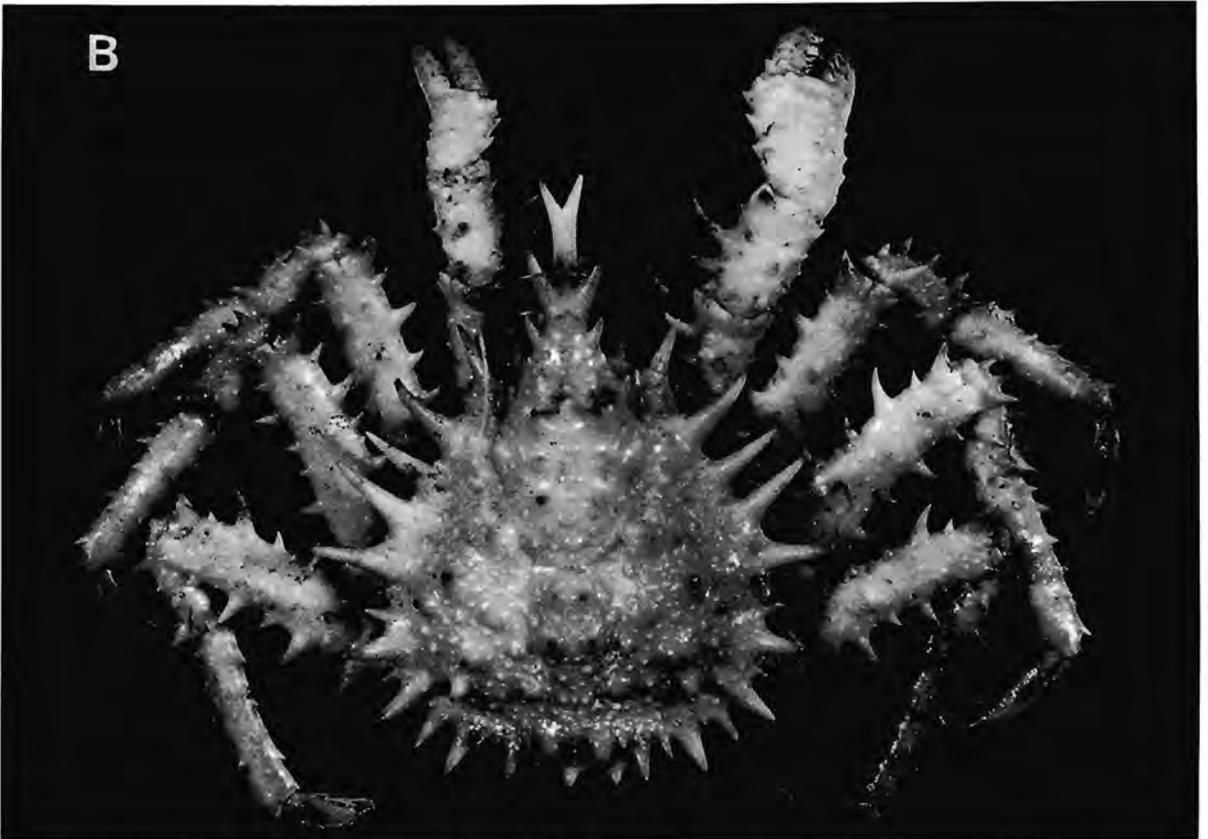


PLATE 13. *Lithodes maja* (Linnaeus) (A: ICM, ♂, CL = 85 mm, Canada; B: ICM, ♂, CL = 36 mm, North Sea): general appearance, dorsal view.

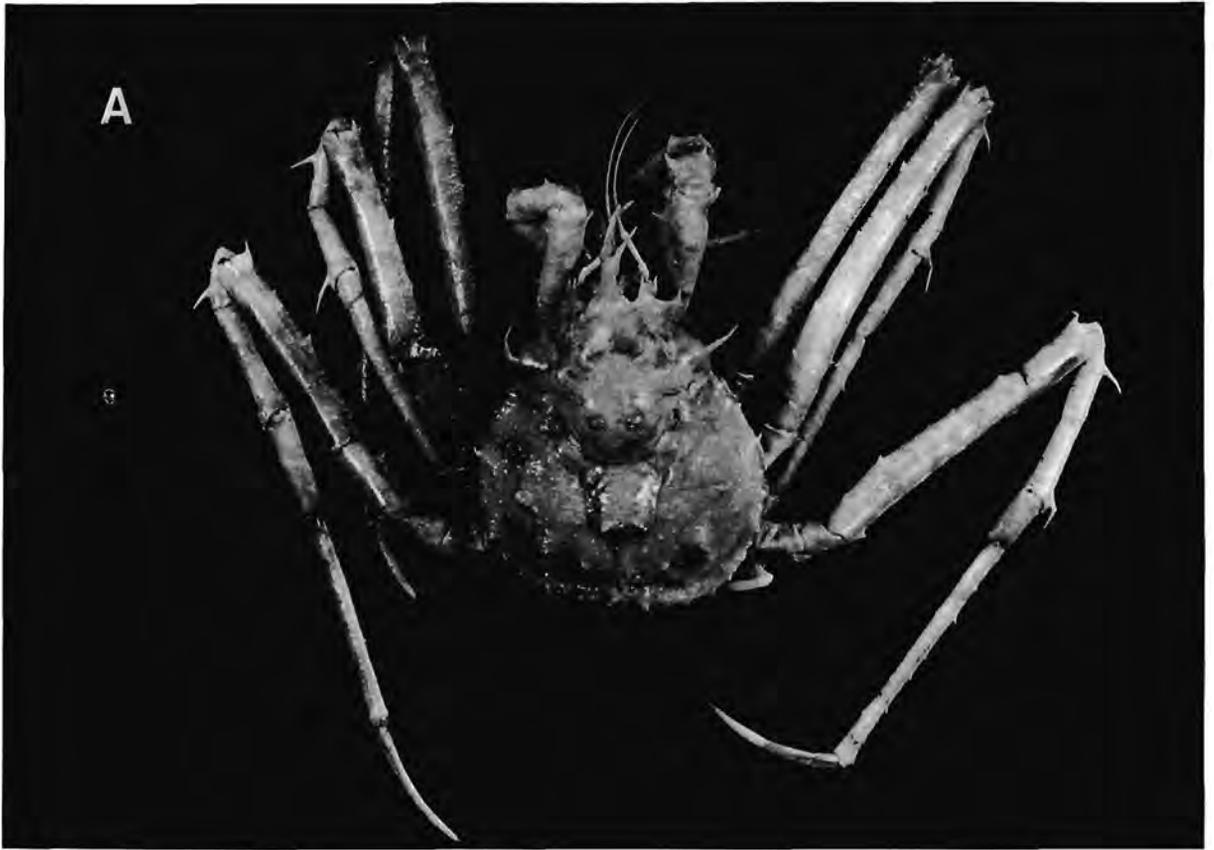


PLATE 14. *Lithodes manningi* n. sp. (A: USNM, ♂, holotype, CL = 103 mm, Oregon II, St. 10829; B: USNM, ♀ ov., allotype, CL = 120 mm, Oregon II, St. 10611): A) - B) general appearance, dorsal view.



PLATE 15. *Lithodes ferox* Filhol (A: ICM, ♂, CL = 92 mm, Benguela VIII, P-61; B: ICM, ♂, CL = 36 mm, Benguela IV, P-107): A) - B) general appearance, dorsal view.

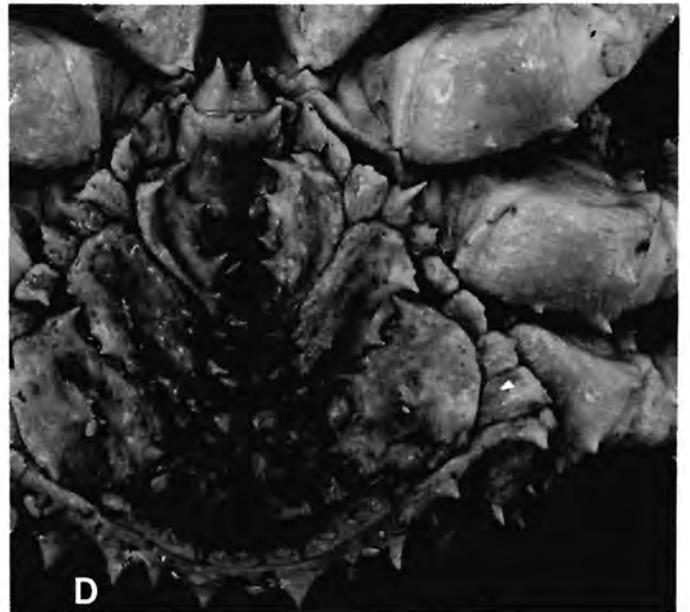
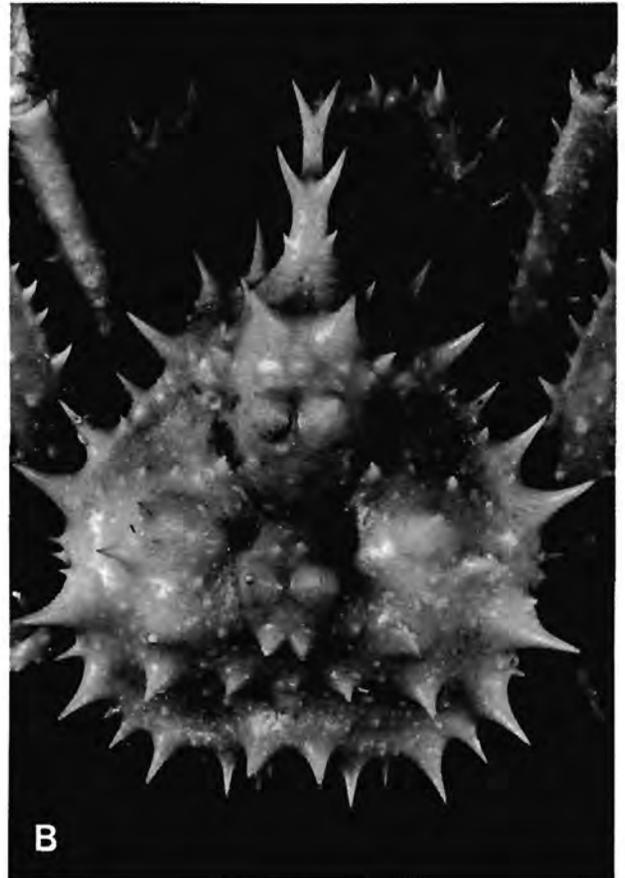


PLATE 16. *Lithodes ferox* Filhol (A: ICM, ♂, CL = 92 mm, Benguela VIII, P-61; B: ICM, ♂, CL = 36 mm, Benguela IV, P-107; C: ICM, ♀, CL = 68 mm, Benguela I, P-13; D: ICM, ♂, CL = 90 mm, Benguela VIII, P-61: A) - B) dorsal view of carapace; C) - D) abdomen.

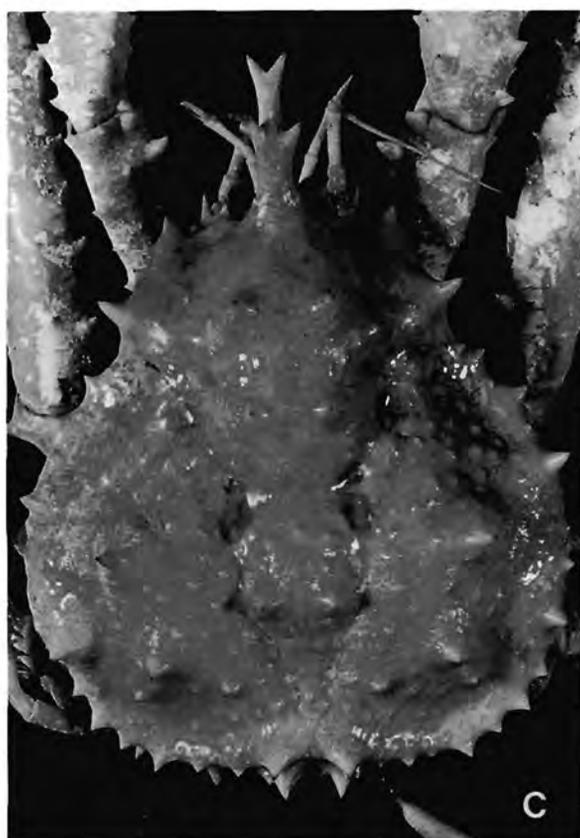
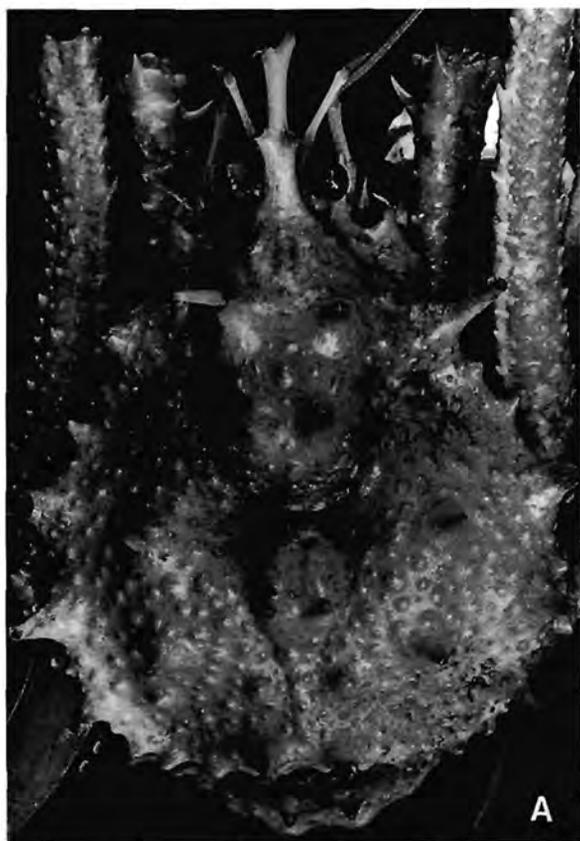


PLATE 17. A) *Lithodes turkayi* n. sp. (ZMH, ♀ ov., holotype, CL = 58 mm, Southwest Atlantic): carapace, dorsal view. B) - C) *Lithodes murrayi* Henderson (B: BM, ♂, lectotype, CL = 64 mm, Challenger Exp., Sta. 145A; C: MP, ♂, CL = 100 mm, Cruise MD03): carapace, dorsal view. D. *Lithodes unicornis* Macpherson (RMNH, ♀ ov., holotype, CL = 118 mm, Valdivia I, P-12): carapace, dorsal view.

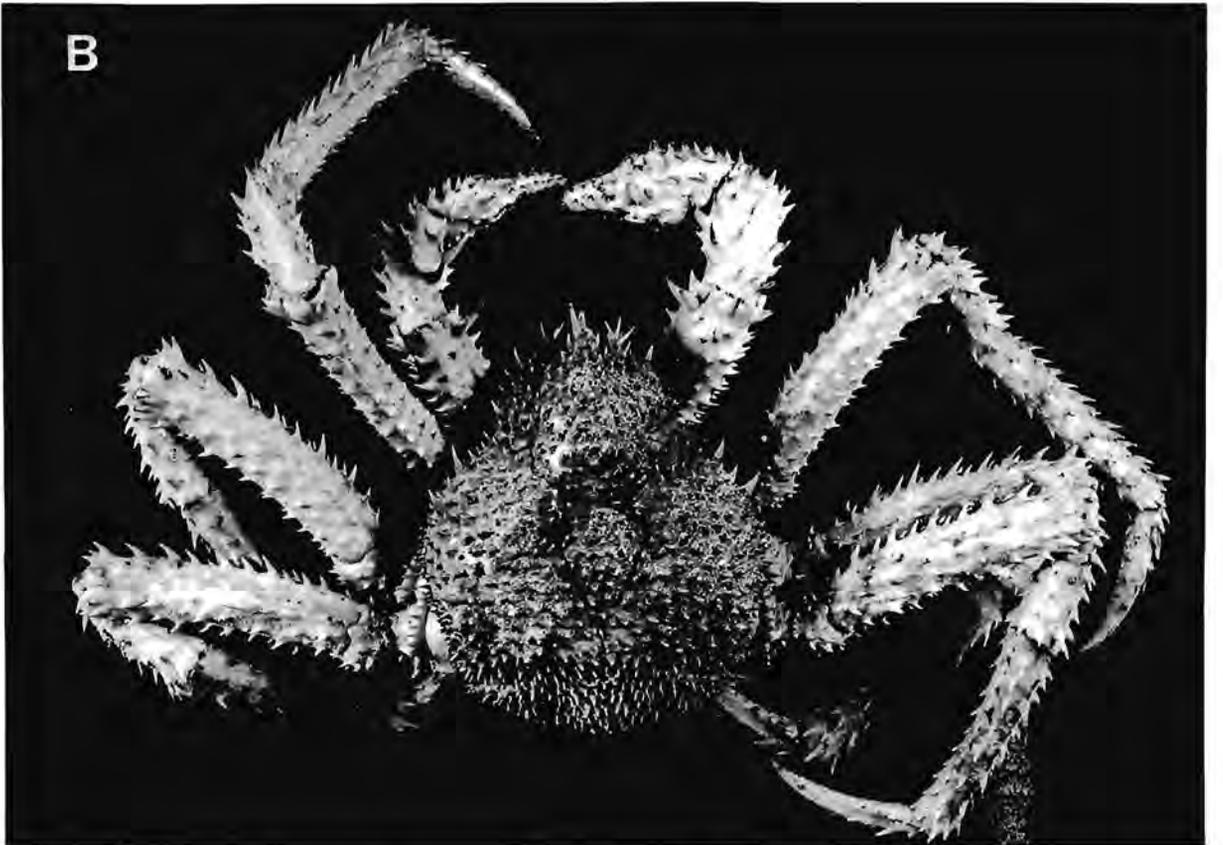
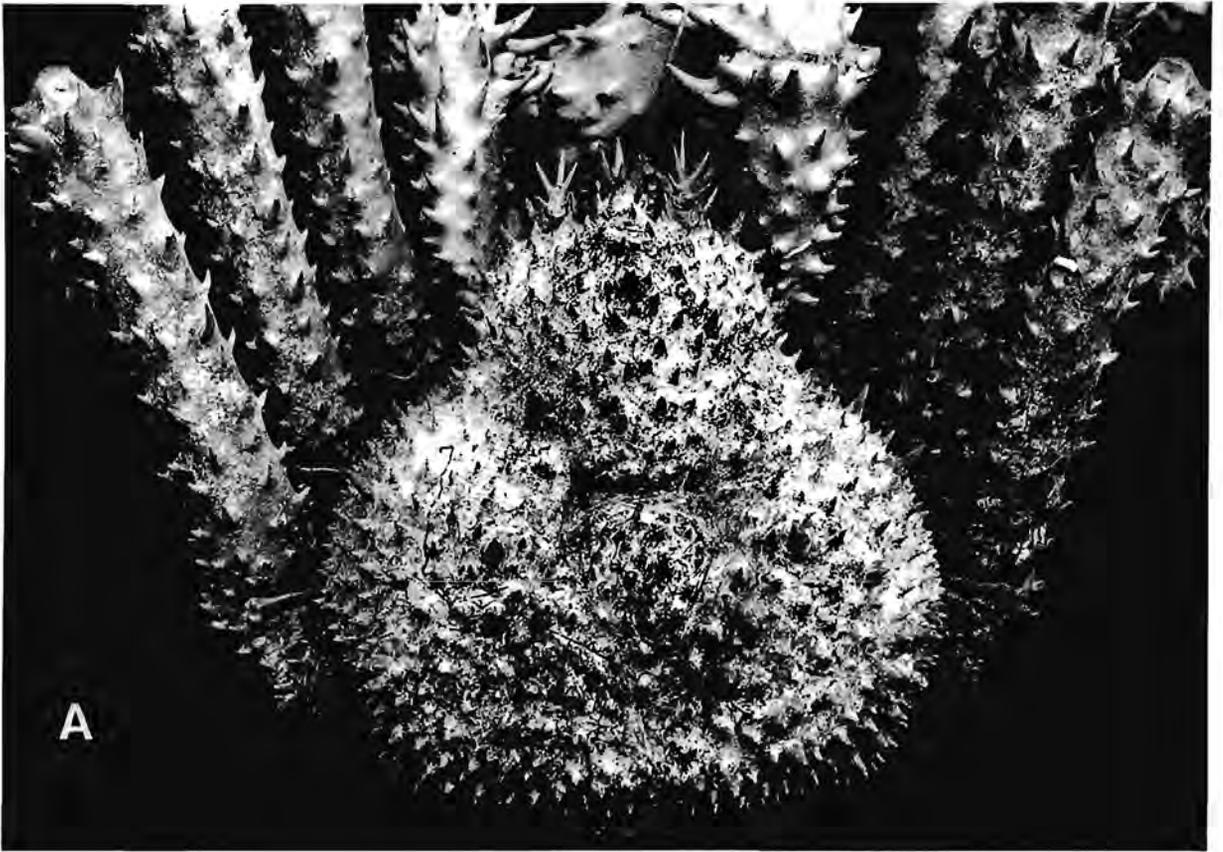


PLATE 18. *Paralomis spinosissima* Birstein & Vinogradov (A: MUZM, ♂, holotype, CL= 113 mm, Akademiik Knipovich, St. 171; B: USNM, ♂, CL = 101 mm, Southwest Atlantic): A) - B) general appearance, dorsal view of carapace.

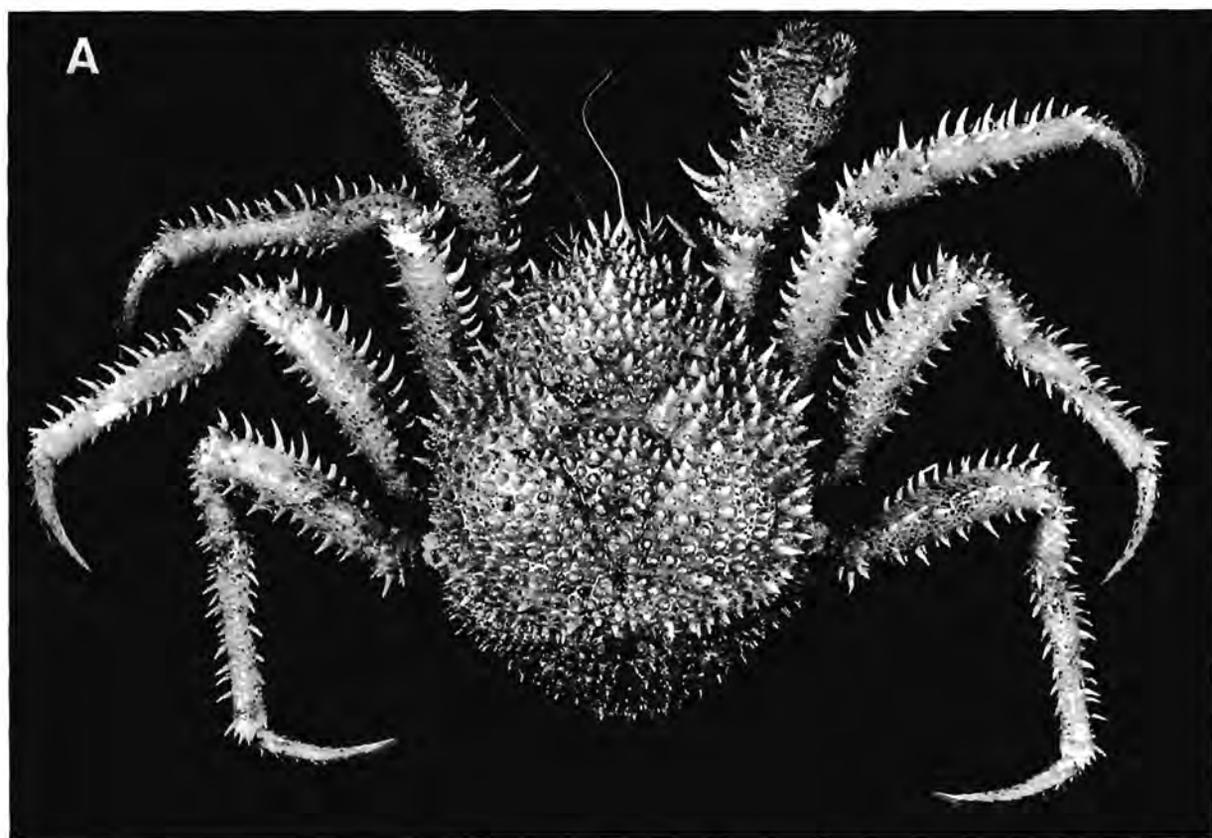


PLATE 19. A) *Paralomis erinacea* n. sp. (MP, ♀ ov., holotype, CL = 69 mm, Ivory Coast): general appearance, dorsal view. B) *Paralomis shinkaimaruae* Takeda (NSMT, ♀, holotype, CL = 75 mm, Bromley Plateau, from Takeda and Hatanaka, 1985): general appearance, dorsal view.



PLATE 20. *Paralomis formosa* Henderson (ICM, ♂, CL = 39 mm, Argentina): A) general appearance, dorsal view; B) lateral view of carapace.

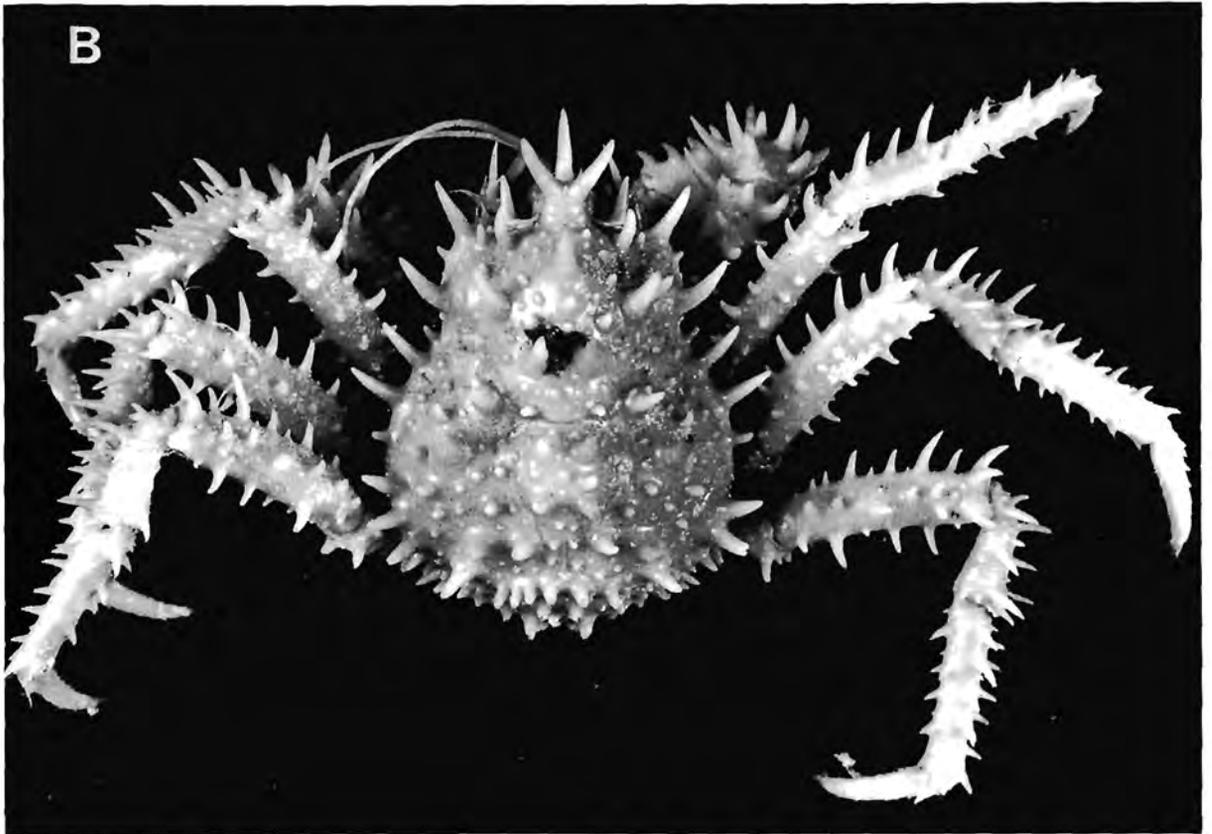


PLATE 21. *Paralomis spectabilis* Hansen (A: ZMC, ♀ ov., lectotype, CL = 47 mm, Ingolf Exp., St. 96; B: ZMC, ♂, paralectotype, CL = 17 mm, Ingolf Exp., St. 96): A) lateral view of carapace; B) general appearance, dorsal view.

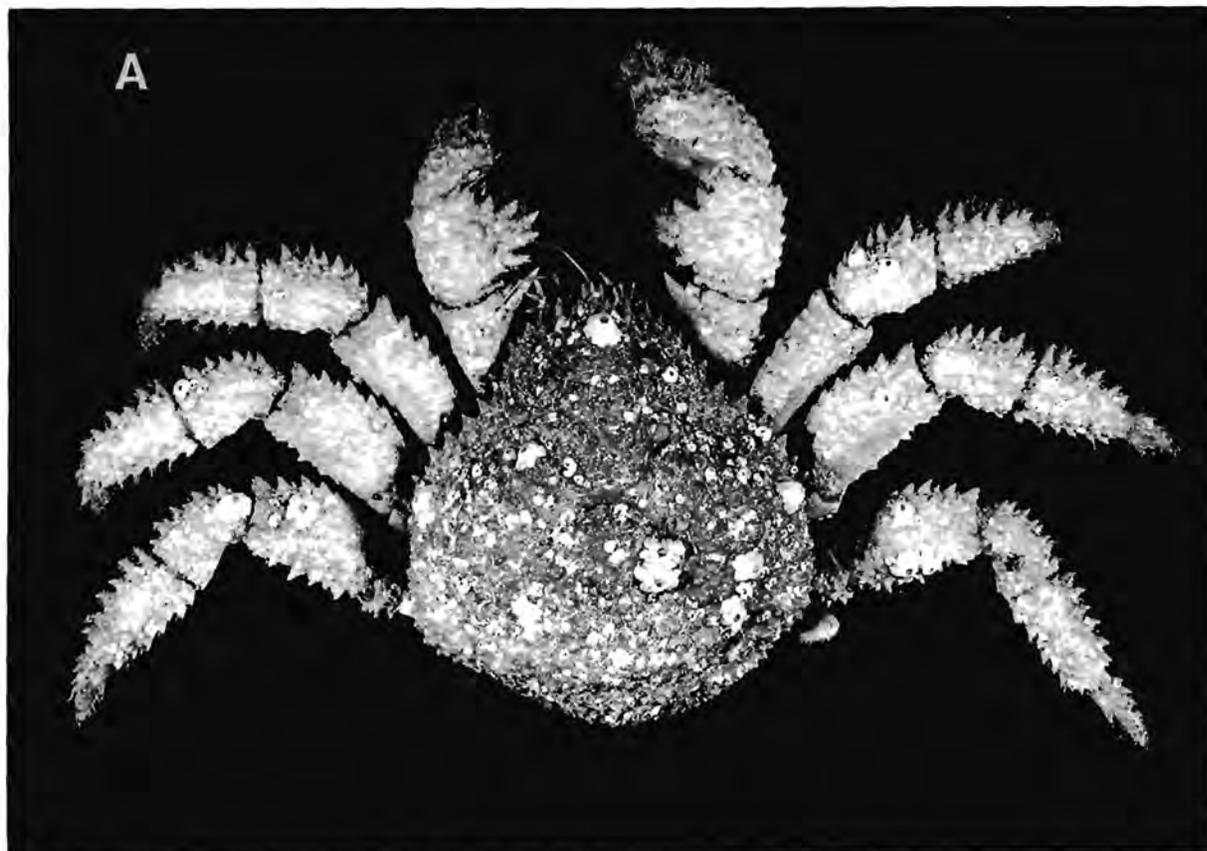


PLATE 22. A) *Paralomis granulosa* (Jacquinot) (ICM, ♀ ov., CL = 76 mm, Beagle Channel): general appearance, dorsal view. B) *Paralomis cubensis* Chace (USNM, ♂, CL = 80 mm, Oregon II, Sta. 2083): general appearance, dorsal view.

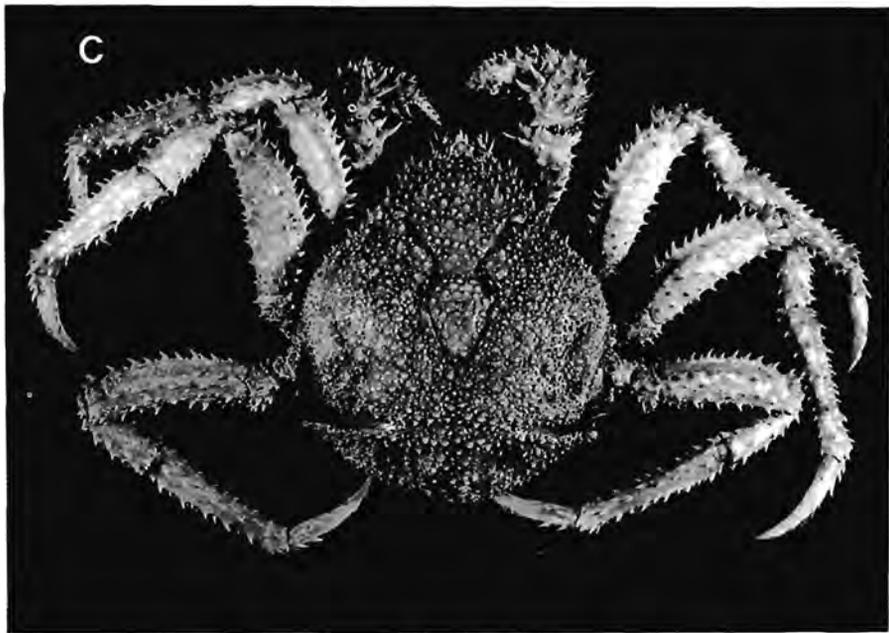
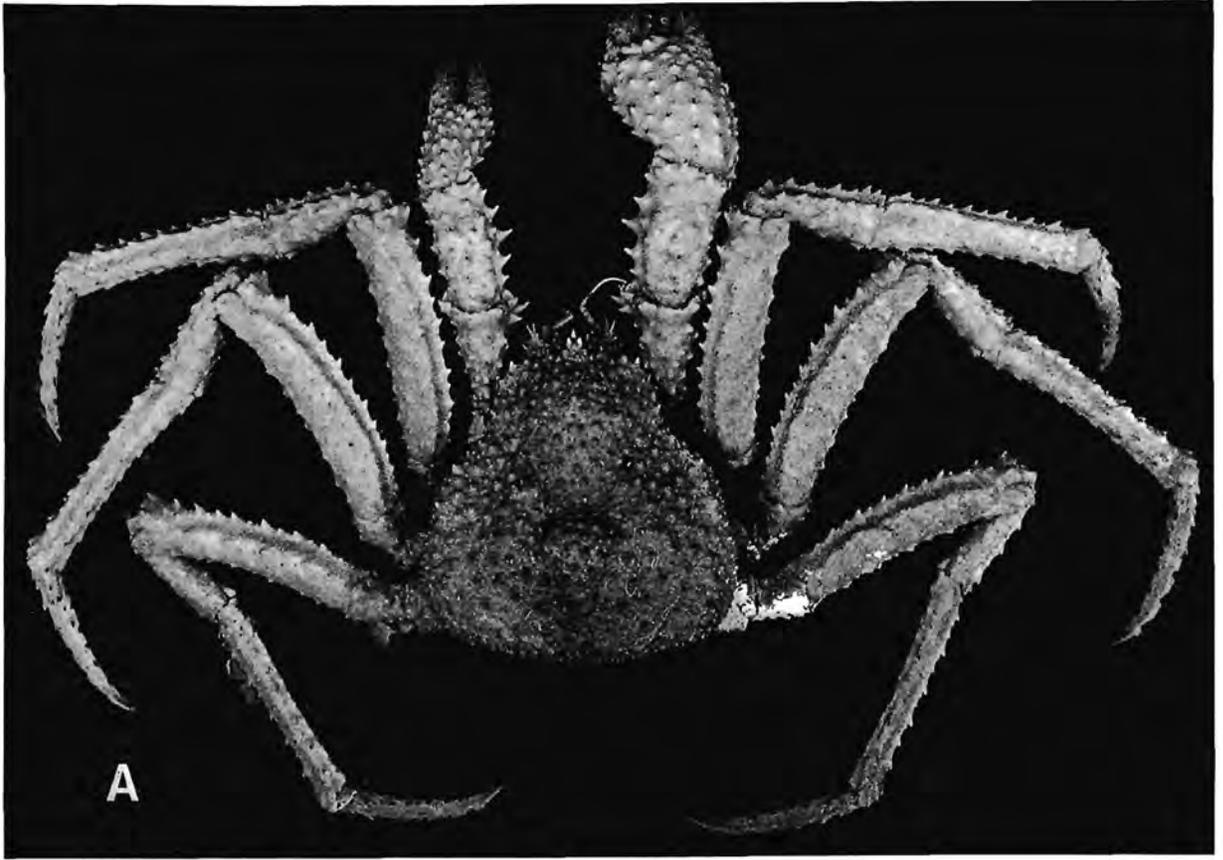
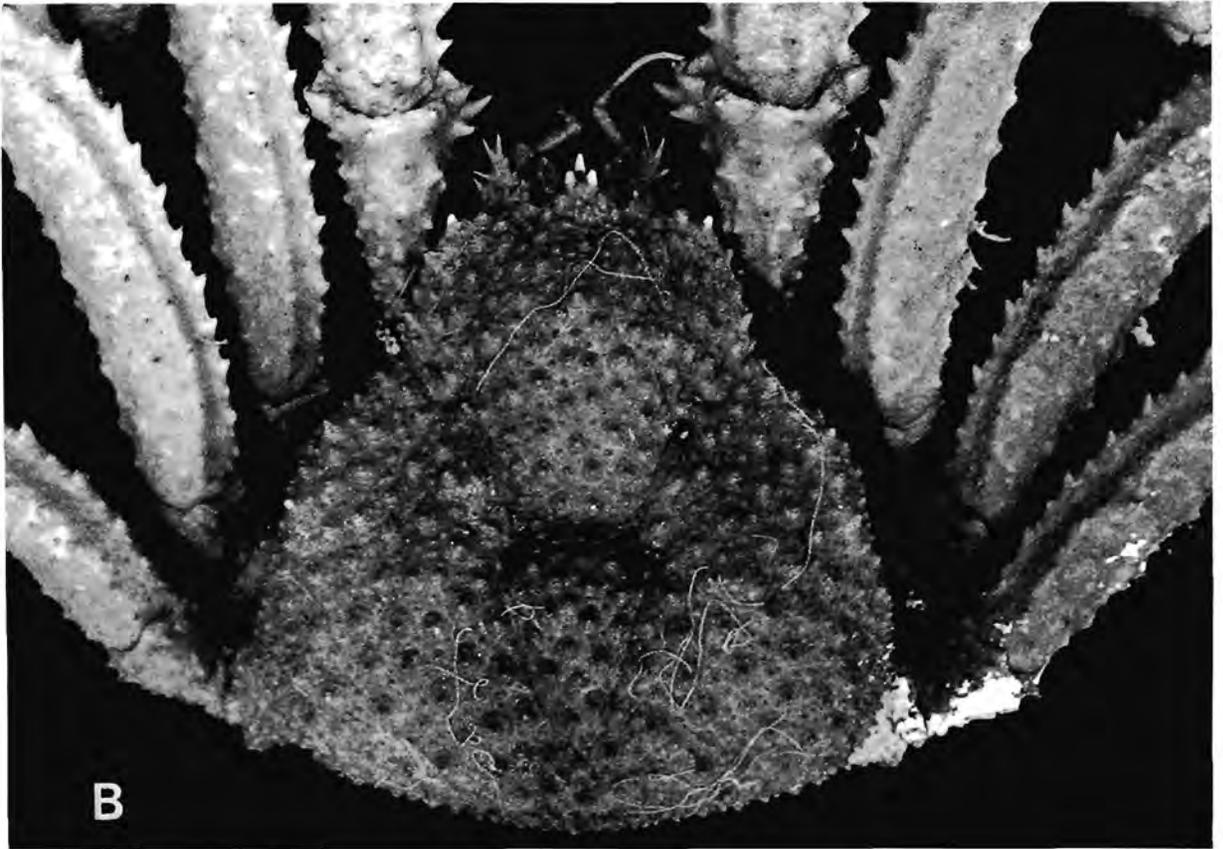


PLATE 23. A) *Paralomis cubensis* Chace (USNM, ♂, CL = 45 mm, Aleutian Bounty): dorsal view of carapace. B) C) *Paralomis grossmani* n. sp. (USNM, ♀ ov., holotype, CL = 94 mm, Oregon II, Sta. 10611): B) dorsal view of carapace; C) general appearance, dorsal view.



A



B

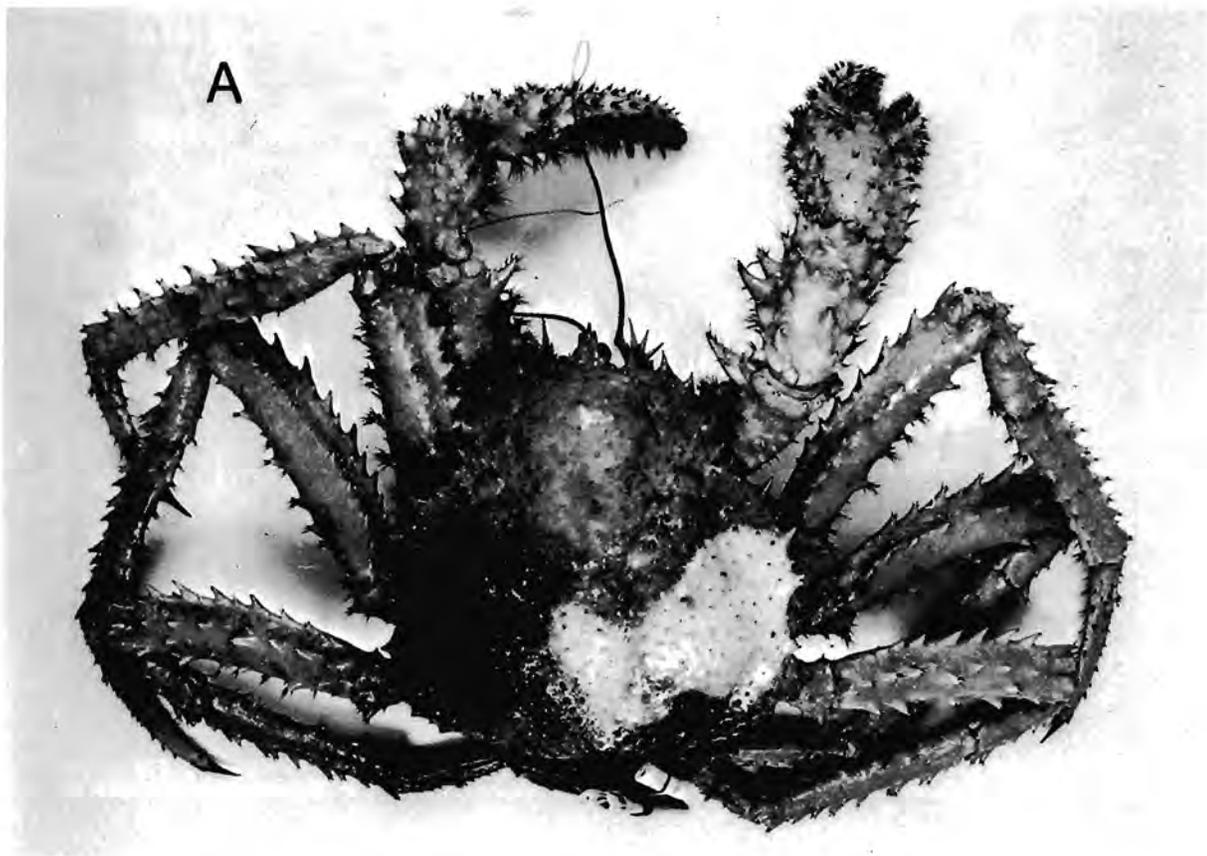
PLATE 24. *Paralomis longidactyla* Birstein & Vinogradov (MUZM, ♂, holotype, CL = 99 mm, Akademiik Knipovich, St. 249): A) general appearance, dorsal view: B) dorsal view of carapace.



PLATE 25. A) *Paralomis pectinata* n. sp. (USNM, ♀ ov., holotype, CL = 96 mm, Pillsbury, Sta. 719): general appearance, dorsal view. B) *Paralomis serrata* n. sp. (USNM, ♂, holotype, CL = 106 mm, Oregon II, Sta. 11245).



PLATE 26. A) *Paralomis cristulata* n. sp. (MP, ♀ ov., holotype, CL = 55 mm, Campagne Villa Ana, Sta. 67): general appearance, dorsal view, B) *Paralomis africana* Macpherson (ICM, ♀, holotype, CL = 62 mm, Benguela IV, P-119): general appearance, dorsal view.



B

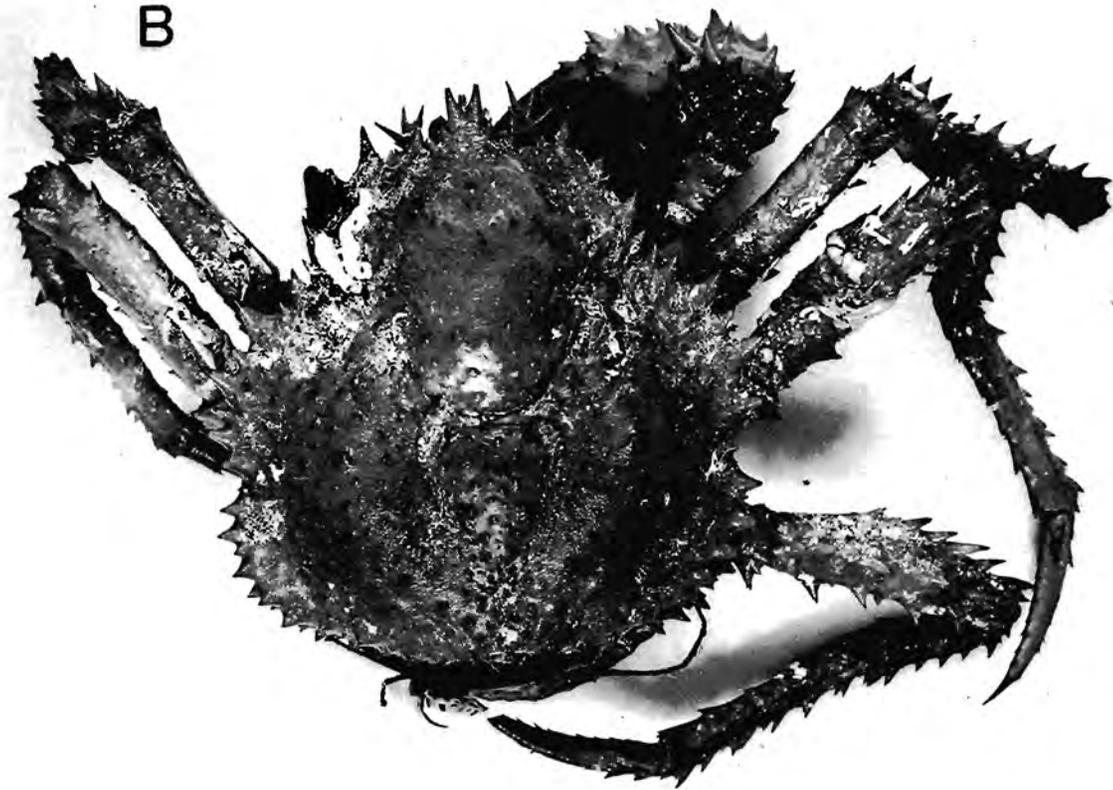


PLATE 27. *Paralomis anamerae* n. sp. (A: MUZM, ♂, holotype, CL = 97 mm, Ebrika, Sta. 90; B: MUZM, ♀ ov., allotype, CL = 68 mm, Ebrika, Sta. 90): general appearance, dorsal view.

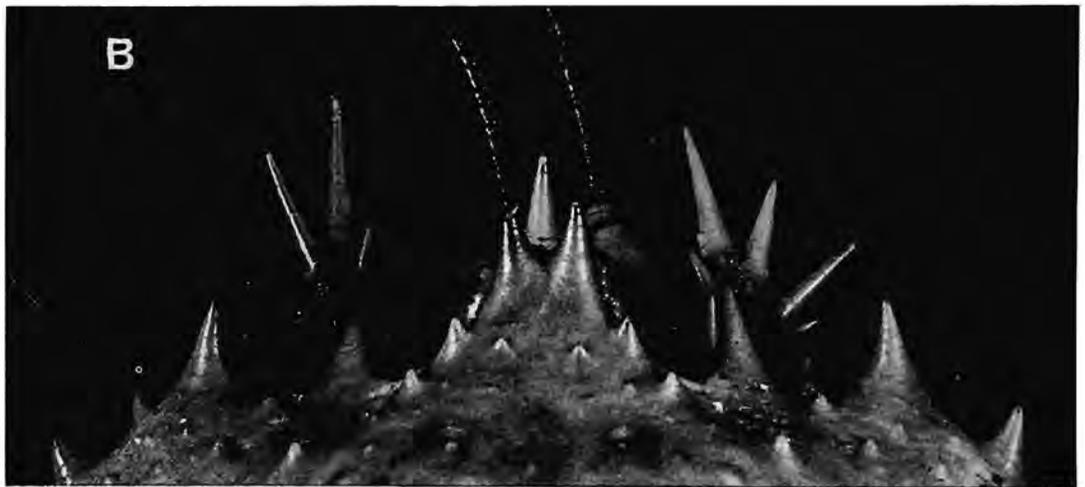
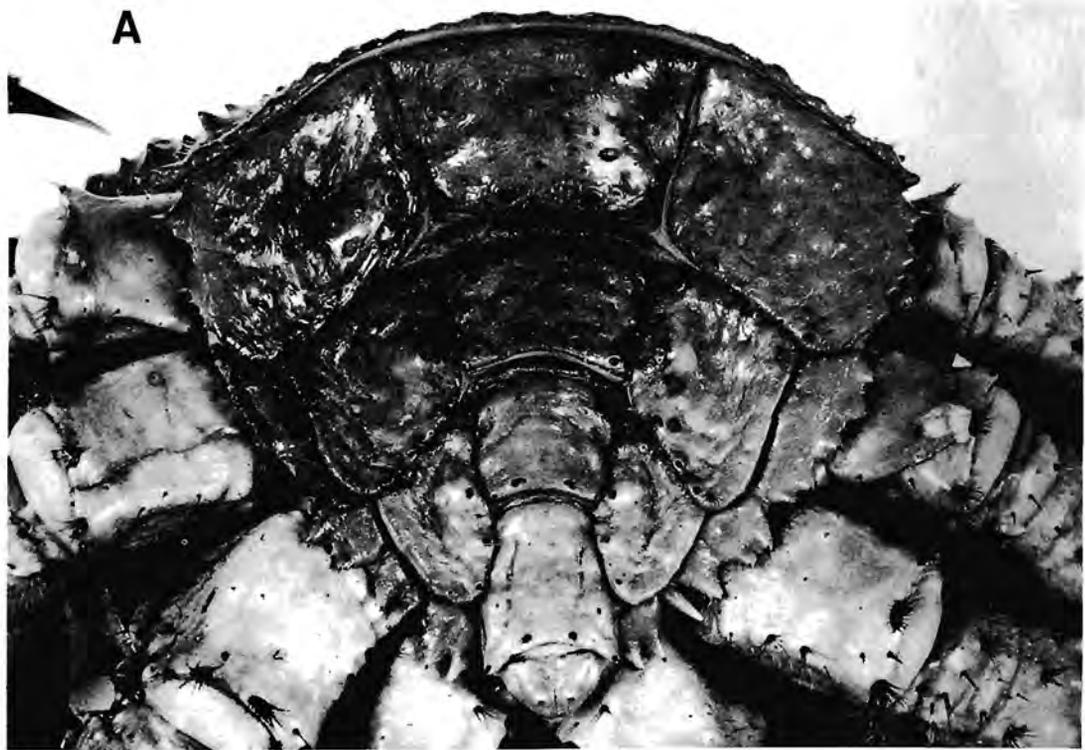


PLATE 28. *Paralomis anamerae* n. sp. A & B: MUZM, ♂, holotype, CL = 97 mm Ebrika, Sta.90; C: MUZM ♀ ov., allotype, CL = 68 mm, Ebrika, Sta. 90) A. abdomen; B. anterior part of carapace; C: lateral view.

5. REFERENCES

- ABELLÓ, P. & E. MACPHERSON. — 1986. Biología de algunos Crustáceos Decápodos de las costas de Namibia. *Colln. scient. Pap. int. Comm. SE. Atl. Fish.* 13: 7-23.
- AGASSIZ, A. — 1888. *Three cruises of the United States coast and geodesic survey steamer «Blake», in the Gulf of Mexico, in the Caribbean Sea, and along the Atlantic coast of the United States, from 1877 to 1880.* Vol. II, The Riverside Press, Cambridge, 200 pp.
- ALCOK, A. — 1901. *A descriptive catalogue of the Indian deep-sea Crustacea Decapoda Macrura and Anomala in the Indian Museum. Being a revised account of the deep-sea species collected by the Royal Indian marine survey ship Investigator.* Calcutta, iv + 286 p., 3 pl.
- ALCOK, A. & A.R.S., ANDERSON. — 1899. An account of the deep sea Crustacea dredged during the surveying-season of 1897-98. Natural history notes from H.M. royal indian marine survey ship «Investigator», Commander T.H. Heming, R.N., commanding. Ser. III, n.º. *Ann. Mag. nat. Hist.* ser. 7, 3: 1-27, 278-292.
- ANDERSON, A.R.S. — 1896. An account of the deep-sea Crustacea collected during the season 1894-1895. Natural history notes from R.I.M. survey steamer «Investigator», commander C.F. Oldham, R.N., commanding. Ser. II, n.º 21, *Jour. asiat. Soc. Bengal.* 65, pt. 2: 88-106.
- ANDRADE, H. — 1980. Nueva especie de *Paralomis* en aguas de Chile: *Paralomis chilensis* n. sp. (Crustacea, Anomura, Lithodidae). *Bol. Mus. Nac. Hist. Nat. Chile* 37: 269-273.
- ANONYMOUS. — 1776. *Compendio della storia geografica, naturale, e civile del regno del Chile.* pp. i-viii, 1-246, 1 map, pls. 1-10.
- ARNAUD, P.M. — 1971. *Lithodes murrayi* Henderson, 1888 (Crustacea, Decapoda, Anomura) dans les eaux côtières des îles Crozet (SW de l'Océan Indien), *Thetys* 3: 167-172.
- ARNAUD, P.M. — 1976. Pêches expérimentales de *Lithodes murrayi* Henderson, 1888 (Crustacea, Anomura) aux îles Crozet (SW de l'Océan Indien). *CNFRA* 39: 27-35.
- ARNAUD, P.M. & T. DO-CHI. — 1977. Données biologiques et biométriques sur les lithodes *Lithodes murrayi* (Crustacea: Decapoda: Anomura) des îles Crozet (SW Océan Indien). *Mar. Biol.* 39:147-159.
- BAEZ, P. & H. ANDRADE. — 1979. Crustáceos decápodos arquibentónicos frecuentes frente a las costas de Chile central. *An. Mus. Hist. Nat.*, Valparaíso, Chile. 12: 219-231.
- BAEZ, P., N. BAHAMONDE & A. SANHUEZA. — 1986. *Neolithodes diomedea* (Benedict, 1894) en Chile (Crustacea, Decapoda, Lithodidae), *Invest. Pesq.* (Chile) 33: 105-110.
- BAHAMONDE, N. — 1961. Crustáceos en la obra de Molina. *Not. Mensual Mus. Nac. Hist. Nat.*, Santiago, Chile, 136: 3-7.
- BALLS, H. — 1911. Neue Paguriden aus den Ausbeuten der deutschen Tiefsee-Expedition «Valdivia» unter der japanischen Expedition Prof. Doflein, *Zool. Anz* 38: 1-9.
- BALLS, H. — 1913. Ostasiatische Decapoden, 1. Die Galatheiden und Paguriden. *Abh. bayer. Akad. Wiss. (math.-phys. Kl.)*, Suppl. 2 (9): i-ix + 1-101, pls. 1-2.
- BALLS, H. — 1957. Decapoda. VIII. Systematik. In H.G. Bronn, *Klassen und Ordnungen des Tierreichs.* Band 5. Abteilung I, Buch 7, Lieferung 12: 1505-1672.
- BARNARD, K.H. — 1947. Descriptions of new species of South African Decapod Crustacea, with notes on synonymy and new records. *Ann. Mag. nat. Hist.*, ser. 11, 13: 361-392.
- BARNARD, K.H. — 1950. Descriptive catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Ann. S. Afr. Mus.*, 38: 1-837.
- BELL, T. — 1844-1853. *A history of the British stalk-eyed Crustacea.* London, John van Voorst, 1xv + 336 p.
- BENEDICT, J.E. — 1894. Descriptions of new genera and species of crabs of the family Lithodidae, with notes on the young of *Lithodes camtschaticus* and *Lithodes brevipes*. *Proc. U.S. Nat. Mus.* 17: 479-488.
- BERG, C. — 1900. Datos sobre algunos crustáceos nuevos para la fauna argentina. *Com. Mus. Buenos Aires* 1: 225-235.
- BIRSTEIN, Y.A. & L.G. VINOGRADOV. — 1967. Occurrence of *Paralomis spectabilis* Hansen (Crustacea, Decapoda, Anomura) in the Antarctic. Explorations of the fauna of the sea. IV (XII). *Biol. Res. Soviet Antarctic Exp.* 3: 390-398 (Israel Program for Scientific Translations).
- BIRSTEIN, Y.A. & L.G. VINOGRADOV. — 1972. Crustácea (Decapoda, Anomura, Lithodidae) of the Atlantic sector of the Antarctic, South America and South Africa, *Zool. Zh.* 51: 351-363. (in russian).
- BOAS, J.E.V. — 1880. Studier over Decapodernes Slaegtskabsforhold. *Vidensk. Selsk. Skr.*, 6. Raekke natur. mathem. Afd. I: 25-210.
- BOAS, J.E.V. — 1924. Die Verwandtschaftliche stellung der gattung *Lithodes*. *Det Kgl. Danske Videnskabernes Selskab. Biolog. Meddel.* IV, 4: 1-34.
- BOSCHI, E.E. — 1979. Geographic distribution of Argentinian marine decapod crustaceans. *Bull. Biol. Soc. Wash.* 3 (1979): 134-143.
- BOSCHI, E.E. — 1981. Larvas de Crustacea Decapoda. p. 699-758. In D. Boltovskoy (ed.), *Atlas del zooplankton del Atlántico Sudoccidental y métodos de trabajo con zooplankton marino.* INIDEP.
- BOSCHI, E.E., D.A. BERTUCHE & J.G. WYNGAARD. — 1984. Estudio biológico de la centolla (*Lithodes antarcticus*) del canal Beagle, Tierra del Fuego, Argentina, INIDEP Contr. n.º 441: 1-72.
- BOSCHI, E.E., M.I. IORIO & K. FISCHBACH. — 1981. Distribución y abundancia de los crustáceos capturados en las campañas de los B/I «Walther Herwig» y «Shinkai Maru» en el Mar Argentino, 1978-1979. INIDEP. Contr. n.º 383: 233-253.
- BOUVIER, E.L. — 1895. Recherches sur les affinités des *Lithodes* et les *Lomis* avec les Pagurides. *Ann. Scien. Natur. Zoologie* (7), 18: 157-213.

- BOUVIER, E.L. — 1896. Sur la classification des Lithodinéés et sur leur distribution dans les océans. *Ann. Sci. Nat., Zoologie* (8), 1: 1-46.
- BOUVIER, E.L. — 1922. Observations complémentaires sur les Crustacés Décapodes (abstraction faite des Caridea), provenant des campagnes de S.A.S. le Prince de Monaco. *Résult. Camp. sci. Monaco*. 62: 1-106, pls. 1-6.
- BOUVIER, E.L. — 1940. Décapodes marcheurs. *Faune de France*. 37: 1-399.
- BRANDT, J.F. — 1848. Die Gattung *Lithodes* Latreille nebst vier neuer ihr verwandten von Wosnessenski entdeckten, als Typen einer besondern Unterabtheilung (Tribus *Lithodes*) der Edward'shen Anomuren. *Bull. Phy.-Math. de l'Acad. de Saint-Pétersbourg*, VII: 171-176.
- BRANDT, J.F. — 1850. Bericht über die für die Reisebeschreibung des Herrn von Middendorff von J.F. Brandt bearbeiteten Krebsstiere aus den Abtheilungen der Brachyuren (Krabben), Anomuren und Makrouren (Krebse). *Bull. Phy.-Math. de l'Acad. de Saint-Pétersbourg*. VIII: 234-238.
- BRANDT, J.F. — 1851. Krebse. In: MIDDENDORFF, A.T.: Reise in den äußersten Norden und Osten Sibiriens. Bd. 2, Zoologie, Tiel 1. Wirbellose Tiere, S. 79-148, Taf. 5-6. St. Petesbourg.
- CAMPDONICO, I. — 1977. Algunos aspectos biológico-pesqueros del recurso centollón, *Paralomis granulosa* (Jacquinot) (Decapoda, Anomura, Lithodidae) en el estrecho de Magallanes. *Ans. Inst. Pat. Punta Arenas, (Chile)*. 8: 363-373.
- CAMPDONICO, I. — 1978. Un caso de inversión en la asimetría abdominal de las hembras de *Paralomis granulosa* (Jacquinot) (Decapoda, Anomura, Lithodidae). *Ans. Inst. Pat., Punta Arenas, (Chile)*. 9: 231-232.
- CAMPDONICO, I. & L. GUZMAN. — 1972. *Lithodes murrayi* Henderson, 1888, nuevo Litodido para la Patagonia Austral de Chile. *Ans. Inst. Pat., Punta Arenas (Chile)*. III: 221-231.
- CAMPDONICO, I., L. GUZMAN & A. SANHUEZA. — 1974. Madurez sexual en los machos de la centolla, *Lithodes antarctica*, del área Punta Arenas-Porvenir, estrecho de Magallanes. *Ans. Inst. Pat., Punta Arenas (Chile)*. 5: 215-222.
- CANO, G. — 1888. Crostacei raccolti dalla R. corvetta *Carraciolo* nel viaggio intorno al globo durante gli anni 1881-82-83-84. *Boll. Soc. Nat. Napoli*, ser. 1, 2: 161-184.
- CANO, G. — 1889. Crostacei brachiuri ed anomuri raccolti nel viaggio della «Vettor Pisani» intorno al globo. *Boll. Soc. Nat. Napoli*, ser. 1, 3: 169-268.
- CHACE, F.A. Jr. — 1939. Reports on the scientific results of the first Atlantic Expedition to the West Indies, under the joint auspices of the University Havana and Harvard University. Preliminary descriptions of one new genus and seventeen new species of decapod and stomatopod Crustacea. *Mem. Soc. Cubana Hist. Nat.* 13: 31-54.
- CROSNIER, A. & J. FOREST. — 1973. Les crevettes profondes de l'Atlantique oriental tropical. *Faune Tropicale*, 19:409 p.
- CUNNINGHAM, R.O. — 1871. Notes on the reptiles, Amphibia, fishes, Mollusca and Crustacea obtained during the voyage of H.M.S. «Nassau» in the years 1866-69. *Trans. Linn. Soc. London*. 27: 465-502.
- CUVIER, G. — 1833. *The Animal Kingdom arranged in conformity with its organization* 13: 1-540.
- CUVIER, G. — 1837. *Le Règne Animal distribué d'après son organisation pour servir de base à l'Histoire naturelle des animaux, et d'introduction à l'anatomie comparée*. Paris.
- DANA, J.D. — 1852. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. vol. 13 Crustacea, pt. 1: (viii), 1-685. vol. 14 Crustacea, pt. 2: (viii), 691-1618.
- DANA, J.D. — 1855. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. vol. 14 Crustacea, Atlas: 1-27. pls. 1-96.
- DAWSON, E.W. & J.C. YALDWYN. — 1971. Diagnosis of a new species of *Paralomis* (Crustacea, Anomura, Lithodidae) from New Zealand. *Rec. Dominion Mus.* 7: 51-54.
- DAWSON, E.W. & J.C. YALDWYN. — 1985. King crabs of the world or the world of king crabs: an overview of identity and distribution with illustrated diagnostic keys to the genera of the Lithodidae and to the species of *Lithodes*. *Proc. Int. King Crab Symp.* Anchorage. Alaska: 69-106.
- DESMAREST, A.G. — 1830. In L.A.G. Bosc. *Manuel de l'Histoire Naturelle des Crustacés, contenant leur moeurs*. Second édition, 1: 1-328; 2: 1-306. Paris.
- DOFLEIN, F. & H. BALLS. — 1912. Die Dekapoden und Stomatopoden der Hamburger Magalhaensischen Sammelreise 1892/93. *Jahrb. Hamb. Wiss. Anst.* vol. 29 (for 1911): 25-44.
- ELDREDGE, L.G. — 1976. Two new species of Lithodid (Anomura, Paguridea, Lithodidae) crabs from Guam. *Micronesica* 12: 309-315.
- FABRICIUS, J.C. — 1793. Entomologia, systematica, emendata et aucta. Classes, Ordines, Genera, Species adjunctis, Synonymis, Locis, Observationibus, Descriptionibus. vol. 2 pp. i-viii, 1-519.
- FAXON, W. — 1893. Reports on the dredging operations off the west coast of Central America to the Galapagos to the west coast of Mexico and in the Gulf of California - by the U.S. Fish Commission steamer «Albatross», during 1891. VI. Preliminary description of new species of Crustacea. *Bull. Mus. Comp. Zool. Harvard Coll.* 24: 149-220.
- FAXON, W. — 1895. Reports on the exploration off the west coast of Mexico, Central and South America, and the Galapagos Islands - by the U.S. Fish Commission steamer «Albatross» during 1891. XV. The stalked Crustacea. *Mem. Mus. Comp. Zool. Harvard Coll.* 18: 1-292. pls. A-H, J, K, 1-57.
- FILHOL, H. — 1884. Explorations sous-marines. Voyages du «Talisman». *La Nature* (Paris), 12, n.° 568: 326-330, fig. 1.
- FILHOL, H. — 1885a. La vie au fond de mers. *La Nature* (Paris), 13, n.° 630: 55-58, figs. 1-3.
- FILHOL, H. — 1885. *La vie au fond des mers. Les explorations sous marines et les voyages du «Travailleur» et du «Talisman»*. pp. i-viii, 1-301, pls. 1-8.
- GARTH, J.S., J. HAIG & J.C. YALDWYN. — 1967. The decapod crustacea of the Royal Society Expedition to Southern Chile. *Trans. Roy. Soc. NZ Zool.* 8: 169-186.
- GUERIN-MENEVILLE, F.E. — 1829-1844. *Iconographie du règne animal de G. Cuvier, ou représentation d'après nature de l'une des espèces les plus remarquables, et souvent non figurées, de chaque genre d'animaux, avec un text descriptif mis au courant de la science: Ouvrage pouvant servir d'atlas à tous les traités de zoologie*. 450 pl., Crustacea: 36 pl., 48 pp. Paris.
- GUZMAN, L. & I. CAMPDONICO. — 1972. Fecundidad de la centolla *Lithodes antarctica* Jacquinot (Crustacea Decapoda, Anomura, Lithodidae). *Ans. Inst. Pat., Punta Arenas (Chile)* 3: 249-257.
- HAAN, W. de. — 1833-1850. *Ph. F. von Siebold's Fauna Japonica Crustacea*: 1-244, pls. 1-55, A-Q, 1-2.
- HAIG, J. — 1955. The Crustacea Anomura of Chile. *Rep. Lund Univ. Chile Exp.* 1948-1949, 20: 1-68.
- HAIG, J. — 1974. Observations on the lithodid crabs of Peru, with description of two new species. *Bull. So. Calif. Acad. Sci.* 73: 152-164.
- HALE, H.M. — 1941. Decapod Crustacea. *Rep. B.A.N.Z. Antarct. Res. Exped. 1929-1931*. 48: 257-285.

- HANSEN, H.J. — 1908. Crustacea Malacostraca. I. *Dan. In-golf. Exp.* 3; 1-120.
- HEEGAARD, P.A. — 1941. The zoology of east Greenland. *Medd. Groenland* 121; 1-72.
- HENDERSON, J.R. — 1888. Report on the Anomura collected by H.M.S. Challenger during the years 1873-76. *Rep. sci. Res. Voy. H.M.S. Challenger*, Zool. 27: i-vii, 1-221, pls. 1-21.
- HERBST, J.F.W. — 1782-1804. *Versuch einer Naturgeschichte der Krabben und Krebse nebst einer systematischen Beschreibung ihrer verschiedenen Arten*. vol. 1 (1782-1790), p. 1-274, text, fig. A, pl. 1-21. vol. 2 (1791-1796), p. i-viii, iii, iv, 1-225, pl. 22-46. vol. 3 (1799-1804), p. 1-66, pl. 47-50.
- HOLTHUIS, L.B. — 1950. Decapoda (K IX). A. Natantia, Macrura Reptantia, Anomura en Stomatopoda (K X). *Fauna van Nederland*, Leiden, 166 p.
- HOLTHUIS, L.B. — 1958. Proposed use of the Plenary Powers to validate the generic name «Maja» Lamarck, 1801 (Class Crustacea, Order Decapoda), and to designate a type species for this genus in harmony with current usage. *Ops. Decls. int. Comm. Zool. Nomencl.* 18(15): 257-272
- INGLE, R.W. & C. GARROD. Ornamentations changes associated with growth of Falkland Island populations of *Paralomis granulosa* (Jacquinot, 1842-1847). *Crustaceana* 52: 220-224.
- JACQUINOT, H. — 1842-1853. In Hombron y H. Jacquinot: *Voyage au pôle sud et dans l'Océanie sur les corvettes l'Astrolabe et la Zélée*. Atlas, Crustacea, pls. 1-9. Paris.
- JACQUINOT, H. — 1853. In H. Jacquinot y H. Lucas. *Voyage au pôle sud et dans l'Océanie sur les corvettes l'Astrolabe et la Zélée*. Zoologie, vol. 3, Crustacés: 1-107. Paris.
- JONSTONUS, J. — 1650. *Historiae Naturalis de Exanguibus aquaticis Libri. IV.* p. 1-78, pls. 1-20.
- KENSLEY, B. — 1968. Deep sea Decapod Crustacea from west of Cape Point, South Africa. *Ann. S. Afr. Mus* 50: 283-323.
- KENSLEY, B. — 1977. The South African Museum's Meiring Naude cruises. Part 2. Crustacea, Decapoda, Anomura and Brachyura. *Ann. S. Afr. Mus* 72: 161-188.
- KENSLEY, B. — 1978. Decapod Crustaceans collected in Southern African waters by the Th. Mortenses Java-South Africa expedition (Crustacea, Decapoda). *Stens. trupia* 4: 249-261.
- KENSLEY, B. — 1980. Decapod and Isopod Crustaceans from the West Coast of Southern Africa, Including Seamounts Vema and Tripp. *Ann. S. Afr. Mus.* 83:13-32.
- KENSLEY, B. — 1981. On the zoogeography of Southern African Decapod Crustacea, with a distributional checklist of the species. *Smith. Contr. Zool.* 338: 1-64.
- LAGERBERG, T. — 1905. Anomura und Brachyura der schwedischen Südpolar-Expedition. Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition 1901-1903. Bd. 5, zoologie, Lief. 7, pp. 1-39, pl. 1. Stockholm.
- LAGERBERG, T. — 1908. Sveriges Decapoder. *Göteborgs Kungl. Vetenskaps. och Vitterhets-Samhälles.* 4th. Ser. XI. 117, pl. 5.
- LAMMARCK, J.B.P.A. de — 1818. *Histoire naturelle des animaux sans vertèbres présentant les caractères généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres et la citation des principales espèces qui s'y rapportent: précédée d'une introduction offrant la détermination des caractères essentielles de l'animal, sa distinction du végétal et des autres corps naturels, enfin l'exposition des principes fondamentaux de la zoologie.* 5, 612 p.
- LATREILLE, P.A. — 1806. *Genera Crustaceorum et Insectorum. Secundum ordinem naturalem in familiis disposita, iconibus exemplisque plurimis explicata.* I: i-xviii, 1-280.
- LATREILLE, P.A. — 1810. *Considérations générales sur l'ordre des animaux composant les classes des Crustacés, des Arachnides, et des Insectes, avec un tableau méthodologique de leurs genres, disposés en familles.* 444 p. Paris.
- LEACH, W.E. — 1814. Crustaceology. In: BREWSTER, D., *The Edinburg Encyclopedia*, vol. 7, pp. 383-437, pl. 221.
- LEACH, W.E. — 1815. A tabular View of the external Characters of Four Classes of Animals, wick Linné arranged under Insecta; with the Distribution of the Genera composing three of these Classes into Orders & c. and Descriptions of several New Genera and Species. *Trans. Linn. Soc. Lond.*, 11:306-400.
- LEACH, W. E. — 1815-1875. *Malacostraca Podophthalma Britanniae, or descriptions of such British species of the Linnean genus Cancer as have their eyes elevated on footstalks.* 124 pág. (unnumbered), pls. 1-45.
- LENZ, H. — 1902. Die Crustaceen der Sammlung Plate (Decapoda und Stomatopoda). *Zool. Jahrb. Suppl.*, 5: 731-772.
- LINNAEUS, C. — 1751. *Skånska Resa, på Höga Öfwerhetens Befallning förrättad År 1749. Med Rön och Anmärkningar uti Oeconomien, Naturalier, Antiquiteter, Seder, Lefnads - sätt*, pp. i-xiv, 1-434, text-figs., 1 map, pls. 1-6.
- LINNAEUS, C. — 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis* ed. 10, 1: iii + 824 p.
- LORENZEN, S., C. GALLARDO, C. JARA, E. CLASING, G. PEQUEÑO & C. MORENO. — 1979. *Mariscos y peces de importancia comercial en el sur de Chile.* Universidad Austral de Chile, 131 p.
- LUCAS, M. — 1840. *Histoire naturelle des Crustacés, des Arachnides et des Myriapodes.* 601 pp. Paris.
- MACPHERSON, E. — 1982. A new species of *Paralomis* (Crustacea; Anomura) from the Southeastern Atlantic. *Crustaceana* 43: 142-146.
- MACPHERSON, E. — 1983. Crustáceos Decápodos capturados en las costas de Namibia. *Res. Exp. Cient.* 11: 3-79.
- MACPHERSON, E. — 1984. Crustáceos Decápodos del Banco Valdivia. *Res. Exp. Cient.* 12: 39-105.
- MACPHERSON, E. — 1988. Three new species of *Paralomis* (Crustacea, Decapoda, Anomura, Lithodidae) from the Pacific and Antarctic oceans. *Zool. Scripta* 17: 69-75.
- MAKAROV, V.V. — 1934. Eine neue Gattung der Familie Lithodidae aus dem Japanischen Meer. *Zoolog. Anzeiger* 108: 9-10.
- MAKAROV, V.V. — 1962 (1938). *Fauna of U.S.S.R. Crustacea.* vol. IX, 3: 1-283, pls. I-IV. (transl. from the Russian, Izdatel'stvo Akademii Nauk SSR, Moscow, 1983, Leningrad).
- MATTHIOLI, P.A. — 1560. *Commentarii secundo aucti, in libros sex Dioscoridis de medica materia. Acc. Apologia adversus Amathum Lusitanum.* Venice, Off. Valgrisianna, 776 p.
- MELVILLE-SMITH, R. — 1982. A brief exploitation of the stone crab, *Lithodes murrayi* (Henderson) off South West Africa, 1979/1980. *Fishery Bull. S. Afr.* 16: 45-55.
- MIERS, E.J. — 1881. Account of the zoological collections made during the survey of H.M.S. «Alert» in the straits of Magellan and the coast of Patagonia. Crustacea. *Proc. Zool. Soc. London.* 1881: 61-79.
- MILNE EDWARDS, A. — 1884. L'expédition du «Talisman» faite dans l'océan Atlantique. *Bull. held. Ass. scient. France*, ser. 2.8: 157-179.
- MILNE EDWARDS, A. — 1891. Crustacés. *Mission scientifique du Cap Horn* 1882-1883, vol. 6, Zool. pt. 2, pp. 1-54, pls. 1-7.
- MILNE EDWARDS, A. & E.L. BOUVIER. — 1894a. *Neolithodes*, genre nouveau de la sous-famille des Lithodines. *Bull. soc. zool. France*, 19:
- MILNE EDWARDS, A. & E. L. BOUVIER. — 1894b. Brachyures et Anomures. In: Crustacés provenant des campagnes du yacht l'Hirondelle (1886, 1887, 1888), Première Partie. *Rés. Camp. Sci. Monaco.* 7: 1-112, pls. 1-11.

- MILNE EDWARDS, A. & E. L. BOUVIER. — 1900. Brachyures et Anomures. In: *Crustacés Décapodes, première partie. Exp. Sci. Travailleur et Talisman pendant les Années 1880, 1881, 1882, 1883.* 396 pp., pls. 1-32.
- MILNE EDWARDS, H. — 1837. *Histoire naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux.* vol. 2, 532 pp. Atlas (1834, 1837, 1840), 32 pp., pls. 1-14, 14 bis, 15-25, 25 bis, 26-42. Paris.
- MILNE EDWARDS, H. & H. LUCAS. — 1841. Description des Crustacés nouveau ou peu connu. *Arch. Mus. Hist. Nat. Paris* II: 463-473, pls. 24-27.
- MILNE EDWARDS, H. & H. LUCAS. — 1842-1844. In: A. d'Orbigny. *Voyage dans l'Amérique meridionale.* vol. 6, pt. 1: 1-39; Atlas, vol. 9, pls. 1-17, Paris.
- MIQUEL, J.C., P.M. ARNAUD & T. DO-CHI. — 1985. Population structure and migration of the stone crab *Lithodes murrayi* in the Crozet Islands, Subantarctic Indian Ocean. *Mar. Biol.* 89: 263-270.
- MOLINA, G.I. — 1782. *Saggio sulla storia naturale del Chili.* 1-367. Bologna.
- MOLINA, G.I. — 1810. *Saggio sulla storia naturale del Chili. Seconda edizione, accresciuta e arricchita di una nuova carta geografica e del ritratto dell'autore.* v + 308 p. Bologna.
- NICOLET, H. — 1849. Crustáceos. In: Gay, C., *Historia física y política de Chile según documentos adquiridos en esta república durante doce años de residencia en ella y publicada bajo los auspicios del supremo gobierno.* Zool., vol. 3, pp. 115-318, pls. 1-4.
- OLIVIER, M. — 1791. *Encyclopedie méthodique. Histoire Naturelle Insectes.* VI: 24-31.
- O'RIORDAN, C.E. — 1968. Second Irish record of stone crab, *Lithodes maia* (L.). *Irish Nat. Jour* 16: 106-107.
- ORLOV, YU. I. & B.G. IVANOV. — 1978. On the introduction of the Kamchatka king crab *Paralithodes camtschatica* (Decapoda: Astomura: Lithodidae) into the Barents Sea. *Mar. Biol.* 48: 373-375.
- ORTMANN, E.E. — 1892. Die Decapoden-Krebse des Strassburger Museums, IV. Thiel. Die Abtheilungen Galatheidea und Paguridea. *Zool. Jahrb. Syst.* 6: 241-326, pls. 11-12.
- ORTMANN, E.E. — 1898. Crustacea, Zweite Hälfte: Malacostraca. In: Brown, H.G., *Klassen und Ordnungen des Thier-Reichs, Band 5, Abtheilung II, Gliederfussler: Arthropoda.* pp. 1121-1168.
- ORTMANN, E.E. — 1911. Crustacea of Southern Patagonia. *Repts. of the Princeton University Expeditions to Patagonia, 1896-1899*, vol. 3, Zool., pt. 6, pp. 635-667, pl. 48. Princeton (N.J.) & Stuttgart.
- PARKER, R.B. — 1964. Zoogeography and ecology of some macro-invertebrates, particularly mollusks, in the Gulf of California and the continental slope off Mexico. *Vidensk. Medd. Dansk. Naturh. Foren.* 126: 1-178.
- PENNANT, T. — 1777. Crustacea. Mollusca. Testacea. In: PENNANT, T., *British Zoology*, ed. 4, vol. 4, pp. i-viii, 1-136, pls. 1-93.
- PERRIER, E. — 1886. *Les explorations sous-marines.* Hachette Paris: I-IV, 1-352.
- PHILIPPI, R.A. — 1867. Comentario crítico sobre los animales descritos por Molina. *Anales Univ. Chile* 29: 775-802.
- PORTER, C.E. — 1903. Carcinología Chilena. I. Observaciones sobre los Lithodidae. *Rev. Chilena Hist. Nat.* 7: 257-267.
- RATHBUN, M.J. — 1910. The stalk-eyed Crustacea of Peru and the adjacent coast. *Proc. U.S. Nat. Mus.* 38: 531-620, pls. 36-56.
- RATHBUN, M.J. — 1929. *Canadian Atlantic fauna. 10. Arthropoda. 10 m. Decapoda.* Biological Board of Canada. Atlantic Biol. Sta., St. Andrews, N.B., 1-38.
- RETAMAL, M.A. — 1973. Contribución al conocimiento de los Decápodos de la región magallánica. *Gayana* 29: 1-24.
- RETAMAL, M.A. — 1974. Contribución al conocimiento de los Crustáceos Decápodos de la región magallánica. *Gayana* 31: 1-23.
- RETAMAL, M.A. — 1977. Los crustáceos decápodos chilenos de importancia económica. *Gayana* 39: 1-50.
- RETAMAL, M.A. — 1981. Catálogo ilustrado de los crustáceos decápodos de Chile. *Gayana* 44: 1-110.
- REVUELTA, A.G. & V.H. ANDRADE. — 1978. Nueva localidad para *Lithodes murrayi* Henderson en el Pacífico Sud Oriental (Crustacea, Decapoda, Anomura, Lithodidae). *Not. Mens. Mus. Nac. Hist. Nat. (Chile)*. 22: 3-4.
- SAINT-LAURENT, M. de — 1985. Remarques sur la distribution des Crustacés Décapodes: 469-478. In: L. Laubier and Cl. Monniot (eds.) *Peuplements profonds du Golfe de Gascogne.* Ed. IFREMER, 630 p.
- SAKAI, T. — 1971. Illustrations of 15 species of crabs of the family Lithodidae, two of which are new to science. *Res. Crust.* 4, 5: 1-49, pls. 1-21.
- SAKAI, T. — 1976. *Crabs of Japan and the Adjacent Seas.* (3 vol.). 1, English Text, xxix + 773 pp. 2, Figures, pp. 1-16; pl. 1-251. 3. Japanese Text, 461 pp. Tokyo: Kodansha Ltd.
- SAKAI, T. — 1978. Decapod Crustacea from the Emperor Seamount Chain. *Res. Crust.* 8 (Supl.): 1-39.
- SAKAI, T. — 1980. New species of crabs of the families Lithodidae and Calappidae. *Res. Crust.* 10: 1-11.
- SAMOUELLE, G. — 1819. *The entomologist's useful compendium, or an introduction to the knowledge of British Insects.* 496 pp. London.
- SCELZO, M.A. — 1973. Lista de los Crustáceos Decápodos Anomura obtenidos en 1966 por la expedición «Walter Herwig» en el Atlántico Sur y depositados en las colecciones del Instituto de Biología Marina. *Physis*, ser. A. 32: 161-174.
- SCELZO, M.A. & E.E. BOSCHI — 1973. Aportes al conocimiento de la distribución geográfica de los Crustáceos Decápodos Anomura del Atlántico Sudoccidental frente a las costas argentinas. *Trab. V Congr. Latinoam. Zool.* 1:204-216.
- SCHALFEEW, P. — 1892. Carcinologische Bemerkungen aus dem Zoologischen Museum der Kaiserlichen Akademie der Wissenschaften. *Bull. Acad. Sci. - Pétersb.* 35: 331-342.
- SCHELLENBERG, A. — 1928. Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebensweise. 10. *Kresbstiere oder Crustacea. II. Decapoda, Zehnfüßer.* Gustav Fisher, Jena. 146 pp.
- SCHMITT, W.L. — 1921. The Marine Decapod Crustacea of California. *Univ. Calif. Publ. Zool.* 23: 1-470.
- SEBA, A. — 1759. *Locupletissimi rerum naturalium thesauri accurata descriptio et iconibus artificiosissimis expressio per universam physices historiam* 3: 1-212, pls. 1-116. Amsterdam.
- SELBIE, C.M. — 1921. The Decapoda Reptantia of the coasts of Ireland. Part. II. Paguridea. *Fisheries, Ireland, Scientific Inv.* 1921, 1: 1-68, pls. 9.
- SHERBON, C.D. & B.B. WOODWARD. — 1934. Notes on the dates of publications of the Natural History portions of some French Voyages. Part I. «Amérique meridionale»; «Indes Orientales»; «Pole Sud» (Astrolabe and Zélée); «la Bonite»; «La Coquille» and «L'Uranie» et «Physicienne». *Ann. Mag. nat. Hist.* 90, ser. 7, vol. 7: 388-392.
- SMITH, S.I. — 1879. The stalk-eyed crustaceans of the Atlantic coast of North America, north of Cape Cod. *Trans. Connecticut Acad. Arts & Sci.* 5: 27-136, pls. 12.
- SMITH, S.I. — 1882. Report on the Crustacea. Part I. Decapoda. Reports on the results of dredging, under the supervision of Alexander Agassiz, on the east coast of the United States, during the summer of 1880, by the U.S. Coast Survey Steamer «Blake». *Bull. Mus. comp. Zool. Harvard.* 10: 1-108.
- SMITH, S.I. — 1883. Preliminary report on the Brachyura

- and Anomura dredged in deep water off the south coast of New England by the United States Fish Commission in 1880, 1881 and 1882. *Proc. U.S. Nat. Mus.* 6: 1-57, pls. 6.
- SMITH, S.I. — 1884 a. Report on the Decapod Crustacea of the Albatross dredgings off the east coast of the United States in 1883. *Rep. U.S. Comm. Fish.* 10: 345-426.
- SMITH, S.I. — 1884b. Crustacea of the Albatross dredgings in 1883. *Amer. Jour. Sci.* 28: 53-56.
- SMITH, S.I. — 1886. Report on the Decapod Crustacea of the Albatross dredgings off the east coast of the United States during summer and autumn of 1884. *Rep. U.S. Comm. Fish.* 13: 1-101, pls. 20.
- SOLAR, E. del — 1972. Adenda al catálogo de Crustáceos del Perú. *Inf. n.º 38. IMARPE.* Callao, Perú. 21 p.
- SOLAR, E. del — 1981. Lithodidae, nueva familia de cangrejos gigantes en el Perú. *Bol. de Lima* 14: 16 pp.
- SQUIRES, H.J. — 1965. Decapod crustaceans of Newfoundland, Labrador and the Canadian eastern Arctic. *Fish. Res. Canada, Manuscript Rep. Ser. (Biol.)* 810, 212 p.
- SQUIRES, H.J. — 1970. Decapod Crustaceans of Newfoundland, Labrador and the Canadian eastern Arctic. *Fish. Res. Canada, Manuscript Rep. Ser. (Biol.)* 810: 212 pp.
- STEBBING, T.R.R. — 1900. On some Crustaceans from the Falkland Islands collected by Mr. Rupert Vallengin. *Proc. Zool. Soc. London.* 1900: 517-568, pls. XXXVI-XXXIX.
- STEBBING, T.R.R. — 1905. South African Crustacea. Part. 3. *Mar. Invest. S. Afr.* IV: 21-123, pls. 10.
- STEBBING, T.R.R. — 1910. General Catalogue of South African Crustacea. Part V of S.A. Crustacea, for the Marine Investigations in South Africa. *Ann. S. Afr. Mus.* VI: 281-593, pls. XV-XXII.
- STEBBING, T.R.R. — 1914. Stalk-eyed Crustacea Malacostraca of the Scottish National Antarctic Expedition. *Trans. Roy. Soc. Edinburgh* 50, n.º 9: 253-307, pls. 23-32.
- STEPHENSEN, K. — 1912. Report on the Malacostraca, Pycnogonida and some Entomostraca collected by the Danmark Expedition to North-East Greenland. *Medd. Gronland* 45: 503-630, pls. 39-43.
- STEPHENSEN, K. — 1935. Crustacea Decapoda. The Godhaab Expedition, 1928. *Meddelelser om Gronland* 80: 1-94.
- STIMPSON, W. — 1857. The Crustacea and Echinodermata of the Pacific shores of North America. *Journ. Boston Soc. Nat. Hist.* 6, 1-92. pl. 18-23.
- STIMPSON, W. — 1858. Prodromus descriptionis animalium everthebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro, Ringgold et Johanne Rodgers ducibus, observavit et descripsit. Pars VII. Crustacea Anomura. *Proc. Acad. Nat. Sci. Philadelphia* 7: 225-252.
- STIMPSON, W. — 1859. Notes on North American Crustacea, 1. *Ann. Lyceum Nat. Hist. New York.* 7 (1962): 49-93 (1-47), pls. 1.
- STUARDO, J. & I. SOLIS. — 1963. Biometría y observaciones generales sobre la biología de *Lithodes antarcticus* Jacquinot. *Gayana* 11: 3-49.
- TAKEDA, M. — 1974. On three species of the Lithodidae (Crustacea, Anomura) from the central Pacific. *Bull. Nat. Sci. Mus. Tokyo.* 17: 205-214.
- TAKEDA, M. — 1985. A new species of *Paralomis*, the Crab-shaped Anomura (Crustacea, Decapoda), from the Kyushu-Palau Submarine Ridge. *Bull. Nat. Sci. Mus. Tokyo, Ser. A,* 11: 137-140.
- TAKEDA, M. — 1986. In Nakamura, I., I. Inada, M. Takeda & H. Hatanaka. — Important fishes trawled off Pa-
- tagonia. *Japan Marine Resource Research Center.* Tokyo. 369 pp.
- TAKEDA, M. and H. HATANAKA. — 1984. Records of Decapod Crustaceans from the Southwestern Atlantic collected by the Japanese Fisheries Research Trawlers. *Bull. Nat. Sci. Mus. Tokyo.* Ser. A, 10: 7-24.
- TAKEDA, M., K. HIRAMOTO & Y. SUZUKI. — 1984. Additional material of *Paralomis cristata* Takeda et Ohta (Crustacea, Decapoda) from Suruga Bay, Japan. *Bull. Biogeogr. Soc. Japan* 39: 27-31.
- TAKEDA, M. & S. MIYAKE. — 1980. A new species of *Paralomis* (Crustacea, Anomura) from the East China Sea. *Annot. Zool. Jap.* 53: 42-45.
- TAKEDA, M. & S. OHTA. — 1979. A new species of the Lithodidae (Crustacea, Anomura) from the Suruga Bay, Central Japan. *Bull. Nat. Sci. Mus. Tokyo Ser. A,* 5: 195-200, pls. 3.
- TAKEDA, M. & T. OKUTANI. — 1983. Crustaceans and Mollusks trawled off Suriname and French Guiana. *Japan Marine Fish. Resource Research Center.* Tokyo. 354 pp.
- TARGIONI TOZZETI, A. — 1872 a. Catalogo di Crostacei Podotalmi Brachiuri e Anomuri raccolti nel viaggio di circumnavigazioni della fregata italiana Magenta. *Boll. Soc. Ent. Ital.* 4: 389-399.
- TARGIONI TOZZETI, A. — 1872 b. Catalogo di Crostacei Podotalmi Brachiuri e Anomuri raccolti nel viaggio di circumnavigazioni della fregata italiana Magenta. *Atti. Soc. Ital. Sci. Nat.* 15: 460-471.
- TARGIONI TOZZETI, A. — 1877. Zoologia del viaggio intorno al globo della R. pirocovetta Magenta durante gli ann. 1865-68. Vol. I. Crostacei Brachiuri e Anomuri. pp. 1-257, pls. 1-13. *R. Inst. di Studi Superiori, Sezioni di Sci. Fisiche e Naturali.* Firenze.
- TILESUS, W.G. — 1815. De cancris camtschaticis, Oniscis, Entomostracis et Cancellus marinis microscopicis noctiluculentibus cum tabulis IV aenaeis et appendice adnexode Acaris et Ricinis camtschaticis. *Mém. Acad. Scien. St. Pétersbourg* 5.
- VINUESA, J.H. — 1984. Sistema reproductor, ciclo y madurez gonadal de la centolla (*Lithodes antarcticus*) del canal Beagle. *INVEST. CONIC. 441:* 73-95.
- VINUESA, J.H., L. FERRARI & R.J. LOMBARDO — 1985. Effect of temperature and salinity on larval development of southern king crab (*Lithodes antarcticus*). *Mar. Biol.* 85: 83-87.
- WHITE, A. — 1847. *List of the specimens of Crustacea in the collections of the British Museum* pp. (viii) + 143. London.
- WAITE, A. — 1848. Description of *Echidnocerus cibarius*, a new species and subgenus of Crustacea. *Proc. Zool. Soc. London,* 1848, part 16, p. 47, pls. 2-3.
- WHITE, A. — 1856. Some remarks on Crustacea of the genus *Lithodes* with a brief description of a species apparently hitherto unrecorded. *Proc. Zool. Soc. London.* 1856: 132-135, pl. 42.
- WILLIAMS, A.B. — 1984. *Shrimps, Lobsters and Crabs of the Atlantic coast of the Eastern United States, Maine to Florida.* Smithsonian Inst. Press., pp. 550.
- YALDWYN, J.C. & E.W. DAWSON. — 1970. The stone crab *Lithodes murrayi* Henderson: the first New Zealand record. *Rec. Dominion Mus* 6: 275-284.
- ZARENKOV, A. — 1970. Crustacean Decapoda collected by the Soviet Antarctic Expeditions in the Antarctic and Antiboreal regions: 153-201, 23 figs., 4 pl. In: Andriyashhev, A.P. & P.V. Ushakov (eds.). *Biological Reports of the Soviet Antarctic Expedition* (1955-1958). Vol. 4. Israel Progr. Scient. Translations. Jerusalem. No. 5659.