THE FAMILY GERYONIDAE (DECAPODA, BRACHYURA) IN THE CANARY ISLANDS

BY

J. A. GONZÁLEZ[1]), J. I. SANTANA[1]) and V. FERNÁNDEZ-VERGAZ[2])

[1]) Instituto Canario de Ciencias Marinas, Gobierno de Canarias, P.O. Box 56, 35200 Telde (Las Palmas), Spain

[2]) Centro Oceanográfico de Canarias, Instituto Español de Oceanografía, P.O. Box 1373, 38120 Santa Cruz de Tenerife, Spain

ABSTRACT

An account of the species of the family Geryonidae recorded from the Canary Islands is given. *Chaceon maritae* and *Geryon trispinosus* are recorded for the first time from the Canaries. Whenever available, data on distribution, habitat, biometry, length/width and length/weight relationships, reproduction, other bioecological information, and fisheries of *Chaceon affinis*, an unexploited common species, are given.

RÉSUMÉ

Les espèces de la famille des Geryonidae présentes aux îles Canaries sont présentées. *Chaceon maritae* et *Geryon trispinosus* sont signalés pour la première fois de cette région. En ce qui concerne *Chaceon affinis*, espèce commune non exploitée, sont fournies les données disponibles sur la distribution, l'habitat, la biométrie, les relations longueur/largeur et longueur/poids, les autres informations bioécologiques et celles sur les pêcheries.

INTRODUCTION

The taxonomic status of the brachyuran family Geryonidae Colosi, 1923 and of the genera sometimes assigned to it, popularly known as deep-sea crabs or red crabs, has remained uncertain for a long time. Moreover, the identity of some of these species has remained a puzzle since they were described, e.g., Manning & Holthuis (1987) have recently shown that *Geryon trispinosus* (Herbst, 1803) is a senior synonym of *G. tridens* Krøyer, 1837.

This family was submitted to a major revision by Manning & Holthuis (1989), who also demonstrated that the Geryonidae are of almost world-wide distribution. As a result of this revision, most known species, including several recognised only recently, have been transferred to the new genus *Chaceon* Manning

& Holthuis, 1989, to which the authors assigned twenty one known species, typified by five anterolateral teeth on each side of the carapace. The genus *Geryon* Krøyer, 1837, was restricted by the authors to the two species *G. longipes* A. Milne Edwards, 1882 and *G. trispinosus*, both with only three anterolateral teeth. The new genus *Zariquieyon* Manning & Holthuis, 1989, containing a single species, *Z. inflatus* Manning & Holthuis, 1989, known only from the Mediterranean, is characterized by the swollen branchial regions that are lacking in *Chaceon* and *Geryon*.

Dawson & Webber (1991) have recently provided a systematic list with the name, depth range, and distribution of the species at present included in the Geryonidae. This list contains a total of twenty six species, twenty three of which are included in *Chaceon*.

In the Atlantic Ocean, there are eighteen species of Geryonidae of which only six (*C. quinquedens* (Smith, 1879), *C. fenneri* (Manning & Holthuis, 1984), *C. maritae* (Manning & Holthuis, 1981), *C. erytheiae* (Macpherson, 1984), *C. affinis* (A. Milne-Edwards & Bouvier, 1894) and *G. longipes* A. Milne-Edwards, 1881) support fisheries (cf. Allué & Macpherson, 1982; Macpherson, 1984; Manning & Holthuis, 1984; Elner, 1987; Holthuis, 1987; Melville-Smith, 1988) and have therefore attracted considerable commercial and scientific interest (cf. Attrill et al., 1990, 1991; Lindberg & Wenner, 1990). On the other hand, the unexploited species have received little attention.

Since 1985 about twelve fishing reconnaissance surveys in the deep waters of the Canary Islands have been carried out in order to obtain some basic biological information on the potential fishery resources.

Nowadays, Madeiran and Canarian scientists are working on projects that include the biology of *C. affinis* (A. Milne-Edwards & Bouvier, 1894). The Canarian project, "Biology of Canarian deep-sea species", is being supported by the Commission of the European Communities.

This paper presents an account of the species of the family Geryonidae recorded from the Canaries to date. Data on their abundance, distribution, habitat, biometry, reproduction, fisheries, and other ecological information are also given.

MATERIAL AND METHODS

The material examined or studied was collected by means of crustacean and fish benthic traps during the following surveys:

- "Canarias 85" cruise of the R/V "Taliarte" of the Instituto Canario de Ciencias Marinas (ICCM). Off all the islands of the Canarian archipelago, seafloors between 27 and 1025 m depth, June and July, 1985 (Santana et al., 1985; González et al., 1988; Lozano et al., 1992).

- "Gomera 9009" survey of the artisanal fishing boat "María Elena". To the S. of the island of La Gomera, 50-1100 m, September, 1990.
- "Canarias 9206" cruise of the R/V "Francisco de Paula Navarro" of the Instituto Español de Oceanografía (IEO). To the SW. of the island of Tenerife, 25-1500 m, May and June, 1992 (López Abellán et al., 1992).
- "TFMCBM/92" survey of the artisanal fishing boat "María Elena". To the S. of the island of La Gomera, 1100-1550 m, September, 1992.
- "Taliarte 9301" cruise of the R/V "Taliarte". To the SW. of Gran Canaria (January, 1993) and to the S. of Tenerife (February, 1993) islands, 140-935 m.
- "Gran Canaria 9307 (I)" survey of the artisanal fishing boat "Juan Ramón". To the SW. of the island of Gran Canaria, 650-865 m, July, 1993.
- "Taliarte 9401" cruise of the R/V "Taliarte". To the SE. of Fuerteventura (January, 1994) and to the W. of Gran Canaria (February, 1994) islands, 266-842 m.
- "Taliarte 9403" cruise of the R/V "Taliarte". To the E. of Gran Canaria, 250-627 m, March, 1994.

The following measurements were taken with calipers to the nearest mm: carapace length (CL), and carapace width (CW) including the lateral spine. The total weight (W) of each crab, generally from fresh material, was recorded using an electronic balance with an accuracy of 0.1 g. Sex and ovigerous condition (ov.) of the females were noted also.

Carapace length/width, carapace length/weight, and carapace width/weight relationships were calculated on separate sexes of *Chaceon affinis*.

For compiling data base, the dBASE Plus program was used, and the SPSS/PC+ program was used for data processing and calculating regressions.

Some of the specimens reported have been deposited in the collections of the ICCM (Telde, Gran Canaria), the IEO (Santa Cruz de Tenerife), the "Departamento de Biología Animal de la Universidad de La Laguna" (La Laguna, Tenerife) (ULLDBA), the "Museo Insular de Ciencias Naturales de Tenerife" (Santa Cruz de Tenerife) (MICNT), and the "Museo Canario" (Las Palmas de Gran Canaria) (MC).

RESULTS AND DISCUSSION

Chaceon affinis (A. Milne-Edwards & Bouvier, 1894) (fig. 1)

Canarian records:

Geryon maritae: Santana et al., 1985: 32-33, 38, 203 (photo 17); González et al., 1988: 28; Pérez Sánchez & Moreno, 1991: 153 (photo); Lozano et al., 1992: 203, 208, 211-212, 215 (photo 1), 217-218.

Geryon affinis: González et al., 1991: 20 (photo 15), 25.

Chaceon affinis: López Abellán et al., 1992: 20, 22, 26, 29, 31, 37, 46, 69-70, 72, 76, 78-79, 81-82, 98, 105, 177 (fig. 15); Hernández & Jiménez, 1993: 100, 107-108, 110-117, 187 (fig. 50).

Material examined. — "Canarias 85" material (3 ex.): SE. Fuerteventura, July 1985, rocky bottom: sta. 18 (6), off Barranco del Mal Nombre, 28°03.9′N 14°15.78′W, 730 m, 1 ♀; sta. 18 (7),

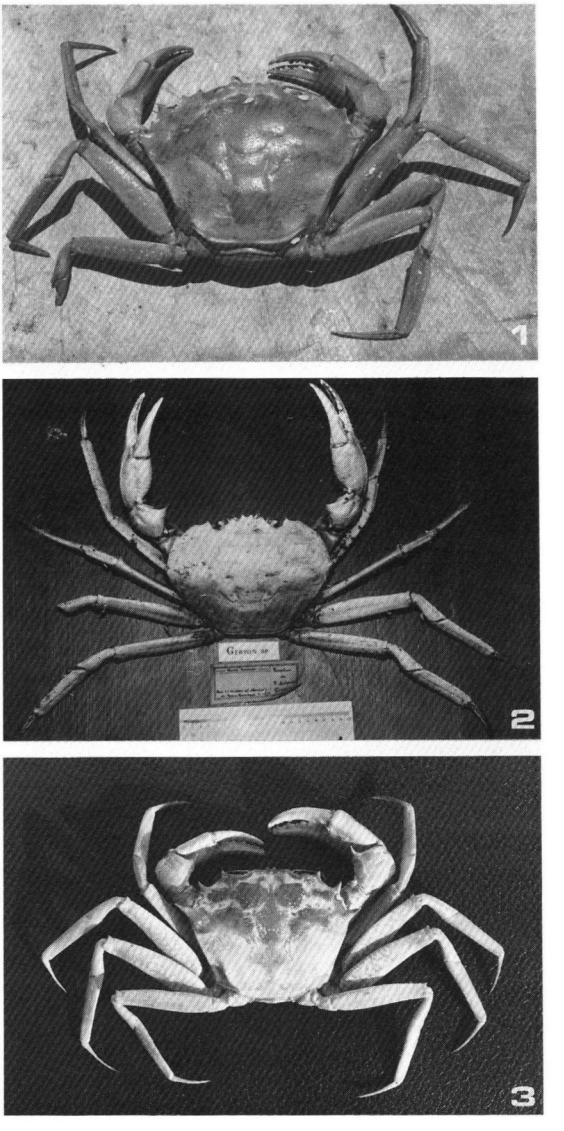

Fig. 1-3. 1, *Chaceon affinis* (A. Milne Edwards & Bouvier, 1894), ♀ ov., 92 mm CL, 120 mm CW, 323 g W, S. of La Gomera, off Playa de Santiago, 823 m (ICCM). 2, *Chaceon maritae* (Manning & Holthuis, 1981), ♂, 160 mm CL, 203 mm CW, 40 miles to the NE. of Gran Canaria, 3000-3500 m (from Santaella, 1973). 3, *Geryon trispinosus* (Herbst, 1803), ♂, 51 mm CL, 78 mm CW, 107 g W, SW. of Gran Canaria, off Playa de Mogán, 650-700 m (ICCM).

off Barranco del Mal Nombre, 28°04.25'N 14°15.3'W, 615 m, 1 ♀; sta. 26 (5), off Gran Tarajal, 28°09.09'N 14°01.85'W, 607 m, 1 ♂ (MICNT).

"Gomera 9009" material (6 ex.): sta. 135, between Punta El Becerro and Punta El Espino, 823 m, 3 ♂ and 3 ♀ (1 ov.) (ULLDBA).

"Taliarte 9301" material (272 ex.): SW. Gran Canaria (156 ex.): sta. 2, between 27°39.2'N 15°42'W and 27°39.4'N 15°42.3'W, 563-620 m, 18 ♂ and 10 ♀ (7 ov.); sta. 3, 27°38.6'N 15°42.3'W, 740 m, 9 ♂; sta. 4, between 27°38.4'N 15°42.3'W and 27°39.5'N 15°42.3'W, 820-830 m, 8 ♂ and 1 ♀; sta. 8, between 27°39.3'N 15°44.4'W and 27°38.6'N 15°44'W, 640-700 m, 15 ♂ and 9 ♀ ov.; sta. 9, between 27°38.4'N 15°44.6'W and 27°38.3'N 15°44.7'W, 900-970 m, 5 ♂ and 5 ♀ (2 ov.); sta. 11, between 27°39'N 15°43.3'W and 27°39.5'N 15°44.1'W, 580-610 m, 46 ♂ and 4 ♀ ov.; sta. 21, between 27°40.6'N 15°47.3'W and 27°40.6'N 15°47.25'W, 610-686 m, 8 ♂ and 4 ♀ (1 ov.); sta. 22, between 27°40.5'N 15°47.3'W and 27°40.5'N 15°47.3'W, 830-850 m, 1 ♂ and 1 ♀; sta. 29, between 27°45.3'N 15°50.3'W and 27°45.3'N 15°50.3'W, 575-620 m, 2 ♂; sta. 30, between 27°44.4'N 15°50'W and 27°44.4'N 15°50'W, 700-750 m, 6 ♂ and 4 ♀ (1 ov.); S. Tenerife (116 ex.): sta. 38, between 28°02'N 16°31.8'W and 28°02'N 16°31.8'W, 600-640 m, 10 ♂ and 3 ♀ (1 ov.); sta. 39, between 27°59.5'N 16°32.2'W and 27°59.4'N 16°32.6'W, 840-1000 m, 24 ♂ and 31 ♀ (20 ov.); sta. 40, between 28°00'N 16°33'W and 27°59.9'N 16°33.5'W, 690-850 m, 3 ♂; sta. 45, between 27°59.85'N 16°34'W and 27°58.8'N 16°34.9'W, 653-700 m, 25 ♂ and 20 ♀ (14 ov.) (ICCM, IEO).

"Gran Canaria 9307 (I)" material (34 ex.): sta. 1, between 27°42.5'N 15°48.6'W and 27°42.4'N 15°49.1'W, 700-727 m, 5 ♂ and 3 ♀; sta. 2, between 27°42.4'N 15°48.5'W and 27°42.4'N 15°49.3'W, 650-700 m, 1 ♂ and 1 ♀; sta. 3, between 27°43.1'N 15°48.3'W and 27°42.5'N 15°49.4'W, 700-800 m, 1 ♀; sta. 4, between 27°42.4'N 15°49.3'W, 800-831 m, 2 ♂ and 9 ♀; sta. 5, between 27°42.6'N 15°49.3'W and 27°42.6'N 15°49.2'W, 680-700 m, 7 ♂ and 3 ♀; sta. 7, between 27°42.3'N 15°49.3'W and 27°42.4'N 15°49.4'W, 830-865 m, 1 ♂ and 1 ♀ (ICCM, IEO).

"Taliarte 9401" material (41 ex.): W. Gran Canaria, rocky and muddy bottom: sta. 21, between 28°09.3'N 15°51.4'W and 28°09.8'N 15°51.2'W, 603-693 m, 7 ♂; sta. 22, between 28°10'N 15°51.5'W and 28°10.4'N 15°51.4'W, 690-783 m, 9 ♂ and 2 ♀; sta. 29, between 27°52.4'N 15°56.5'W and 27°52.6'N 15°56.4'W, 583-600 m, 4 ♂ and 3 ♀ (1 ov.); sta. 30, between 27°52.7'N 15°56.8'W and 28°52.6'N 15°56.8'W, 670-707 m, 12 ♂ and 6 ♀ (2 ov.) (ICCM, IEO).

"Taliarte 9403" material (4 ex.): sta. 1, 27°59.2'N 15°18.45'W, 610-636 m, 4 ♂ (ICCM).

"Canarias 9206" material (52 ex., 74-161 CL, 28.12 kg total W) (June, 1992): sta. 28, between 28°09'N 16°51'W and 28°09'N 16°51'W, 566-663 m, 1 ex.; sta. 30, 28°09'N 16°51'W, 652-795 m, 6 ex.; sta. 31, between 28°09'N 16°51'W and 28°10'N 16°51'W, 756-846 m, 7 ex.; sta. 33, between 28°10'N 16°52'W and 28°09'N 16°52'W, 1020-1040 m, 14 ex.; sta. 39, between 28°06'N 16°49'W and 28°05'N 16°48'W, 811-1017 m, 2 ex.; sta. 45, between 28°05'N 16°48'W and 28°05'N 16°48'W, 690-714 m, 5 ex.; sta. 46, 28°05'N 16°48'W, 533 m, 11 ex.; sta. 54, 28°03'N 16°46'W, 1000 m, 1 ex.; sta. 55, 28°03'N 16°46'W, 970 m, 5 ex. (IEO).

"TFMCBM/92" material (6 ex.): between the port of Playa de Santiago and Bahía de Ereses: sta. 1 (1200 m), sta. 4 (1100 m) and sta. 5 (1350 m), 3 ♀; sta. 1 (1200 m) and sta. 8 (1250 m), 3 ♂ (MICNT).

Distribution and depth range. — Northeastern Atlantic from near Iceland, off SW. Norway, Faroe Islands, NW. of Scotland, N. and NW. of Spain (Sánchez & Olaso, 1985) to Azores, Madeira and Cape Verde Islands, between 130 and 2047 m (Dawson & Webber, 1991). Also in the Canary Islands, from 533 to 1350 m. The results of the fishing survey in Canarian waters since 1968 prove that this species does not occur above 500 m depth in this archipelago.

Abundance and habitat. — Common, on muddy and rocky bottom of the insular slopes. Some catches at about 650 m with fine mud and hexactinellid sponges.

Colour. — Red, red-greenish or greenish.

Biometric observations. — Males: CL: range = 53-148 mm, mean = 109.942 mm (N = 236, SD = 19.811), CW: range = 69-196.5 mm, mean = 137.447 mm (N = 236, SD = 23.239), and W: range = 65-1613.6 g, mean = 666.820 g (N = 235, SD = 355.804). Females: CL: range = 47.3-180 mm, mean = 100.705 mm (N = 124, SD = 16.097), CW: range = 64.7-163 mm, mean = 124.410 mm (N = 124, SD = 16.240), and W: range = 48.6-1040 g, mean = 453.192 g (N = 125, SD = 185.562). Length/width relationships. $CW = 15.153570 + 1.112342 \times CL$ (N = 236, r = 0.949) (in males); $CW = 33.934360 + 0.898413 \times CL$ (N = 124, r = 0.891) (in females). Length/weight relationships. $W = 2.333 \times 10^{(-4)} \times CL^{(3.136278)}$ (N = 235, r = 0.930) and $W = 3.637 \times 10^{(-5)} \times CW^{(3.370825)}$ (N = 235, r = 0.927) (both in males); $W = 2.025 \times 10^{(-3)} \times CL^{(2.657118)}$ (N = 124, r = 0.893) and $W = 6.731 \times 10^{(-5)} \times CW^{(3.245476)}$ (N = 124, r = 0.793) (both in females).

Reproduction. — Ovigerous females observed in January, February, September, and also in October ("Canarias 9310" cruise).

Sex-ratio. — The examined sample comprises 65% males (N = 236) and 35% females (N = 125). The male : female sex-ratio was 1.89 : 1.

Ecology. — Several barnacles (*Poecilasma* cf. *kaempferi*, according to Darwin, 1851) were always present as epizoites on the carapace and on walking legs. Other Cirripedia (*Sacculina* sp.) were also occasionally observed as parasites on the abdomen-carapace area.

Fisheries. — *C. affinis* is trapped in some local fishing grounds such as that to the W. of Galicia (NW. Spain) (Sánchez & Olaso, 1985), where it provides excellent economic results, due to the wide acceptance of this product, which in the local markets is sold whole under the name of "king crab". In the Canaries, this species is practically unknown to the fishermen, since its fishery has not been developed. The average catch obtained from the above stations is about 5 kg of crab per trap per day. The exact size of the area occupied at present by *C. affinis* in the Canarian region is unknown and in treating its population as a virgin fishery source, the yield figures reflect an accumulated biomass which, in the begining at least, should decrease as fisheries begin to develop. The potential interest in these fisheries is caused by the relatively large size of the crabs, their resistance to air exposure, the quality of their meat, and their relative abundance.

Chaceon maritae (Manning & Holthuis, 1981) (fig. 2)

Canarian records:

Geryon quinquedens: Santaella, 1973: 453-456, fig. 149 (photo) (unpublished).

Material examined. — None.

Distribution and depth range. — Atlantic Ocean (west and southern Africa); Ivory Coast, Congo, Angola, Namibia, South Africa, between 100 and 1000 m depth (Le Loeuff et al., 1978; Melville-Smith, 1987; Manning & Holthuis, 1989; Dawson & Webber, 1991); also northwards to the Canary Islands (Santaella, 1973).

Colour. — From orange to brown (Allué & Macpherson, 1982) (as *Geryon maritae*).

Biology. — See Le Loeuff et al. (1978), Beyers & Wilke (1980) and Allué & Macpherson (1982) (as *Geryon quinquedens*).

Fisheries. — See Melville-Smith (1987) (as *Geryon maritae*).

Remarks. — Santaella (1973) studied 1 ♂ (160 CL, 203 CW), deposited in the Museo Canario in 1936, indicating his reservations with regard to the correctness of the entry, because the depth of origin was shown to be between 3000 and 3500 m, 40 miles to the NE. of Gran Canaria. It being impossible to gather the material for re-examination, identification of the subject was only possible by means of the excellent photo of same taken by Santaella (1973), which we attempt to reproduce here, and by the work of Ingle (1985). The characteristics which we are able to be verified are: breadth of orbit (measured from inner to outer orbital tooth), slightly less than width of frontal margin; length/breadth ratio of merus of pereiopod 5, slightly more than 4.75; length/breadth ratio of propodus of pereiopod 5, near to 5; and length/breadth of third maxilliped merus, longer than broad.

Geryon trispinosus (Herbst, 1803) (fig. 3)

Canarian records:

This is the first record of the species in the Canary Islands.

Material examined. — "Gran Canaria 9307 (I)" material (1 ex.): SW. Gran Canaria: sta. 2, off Playa de Mogán, between 27°42.4'N 15°48.5'W and 27°42.4'N 15°49.3'W, 650-700 m, benthic trap, 1 ♂, 51 CL, 78 CW, 107 W (ICCM).

Distribution and depth range. — Northeastern Atlantic, from Norway and northern North Sea to Kattegat, west of British Isles to ca. 48°N, Bay of Biscay, Morocco, and the Mediterranean, between 600 and 1370 m (García-Raso et al., 1987, as *G. tridens*; Dawson & Webber, 1991). Also in the Canary Islands, which at this time represent the southern limit of the area of distribution.

ACKNOWLEDGEMENTS

We wish to thank our colleagues, Mr. P. Pascual Alayón, Prof. Dr. I. J. Lozano (both from the University of La Laguna), Dr. E. Balguerías (Instituto Español de Oceanografía), and Mr. V. M. Tuset (Instituto Canario de Ciencias Marinas) for help in several ways. We also thank Prof. Dr. L. B. Holthuis for critically reading the manuscript.

REFERENCES

ALLUÉ, C. & E. MACPHERSON, 1982. Biología y pesca de las especies comerciales del Atlántico Sudoriental. II. Inf. Técn. Inst. Inv. Pesq., Barcelona, **99-100**: 1-40.

ATTRILL, M. J., R. G. HARTNOLL & A. L. RICE, 1991. Aspects of the biology of the deep-sea crab *Geryon trispinosus* from the Porcupine Seabight. Journ. Mar. Biol. Assoc. U.K., **71** (2): 311-328.

ATTRILL, M. J., R. G. HARTNOLL, A. L. RICE & M. H. THURSTON, 1990. A depth-related distribution of the red crab, *Geryon trispinosus* (Herbst) (= *G. tridens* Krøyer): indications of vertical migration. Prog. Oceanog., **24**: 197-206.

BEYERS, C. J. & C. G. WILKE, 1980. Quantitative stock survey and some biological and morphometric characteristics of the deep-sea red crab, *Geryon quinquedens*, off South West Africa. Fish. Bull. South Africa, **13**: 9-20.

DARWIN, C., 1851. A monograph on the subclass Cirripedia. 1. Lepadidae. (Ray Society, London).

DAWSON, E. W. & W. R. WEBBER, 1991. The deep-sea red crab *Chaceon* ("*Geryon*"): a guide to information and a reference list of the family Geryonidae. Misc. ser. natl. Mus. New Zealand, **24**: 1-83.

ELNER, R. W., 1987. Mating behaviour of the deep-sea red crab, *Geryon quinquedens* Smith (Decapoda, Brachyura, Geryonidae). Crustaceana, **52** (2): 194-201.

GARCÍA-RASO, J. E., E. GONZÁLEZ-GURRIARÁN & F. SARDÀ, 1987. Estudio comparativo de la fauna de crustáceos decápodos braquiuros de tres áreas de la Península Ibérica (Galicia, Málaga y Cataluña). Inv. Pesq. Barcelona, **51** (Supl. 1): 43-55.

GONZÁLEZ, J. A., I. J. LOZANO, M. A. CALDENTEY, J. I. SANTANA, J. A. GÓMEZ & R. CASTILLO, 1988. Resultados de la campaña de prospección pesquera CANARIAS 85. Inf. Téc. Inst. Esp. Oceanogr., **57**: 1-93.

GONZÁLEZ, J. A., J. I. SANTANA & J. CARRILLO, 1991. La Sección de Pesquerías del Centro de Tecnología Pesquera de Gran Canaria: Actividad investigadora entre 1978 y 1990. Memorandum del Centro de Tecnología Pesquera (Pesquerías). Cabildo Insular de Gran Canaria (ed.), Telde (Las Palmas): 1-36.

HERNÁNDEZ, F. & S. JIMÉNEZ, 1993. Campaña TFMCBM/92 (Gomera). Informe Técnico del Departamento de Biología Marina del Museo de Ciencias Naturales de Tenerife, **4**: 1-90.

HOLTHUIS, L. B., 1987. Vrais Crabes. In: W. FISCHER, M. L. BAUCHOT & M. SCHNEIDER (eds.), Fiches FAO d'identification des espèces pour les besoins de la pêche. (Révision 1). Méditerranée et mer Noire. Zone de pêche 37, **1**: 321-368. (FAO/CEE, Rome).

INGLE, R. W., 1985. *Geryon gordonae* sp. nov. (Decapoda, Brachyura, Geryonidae) from the northeastern Atlantic Ocean. Crustaceana, **48** (1): 88-98.

LE LOEUFF, P., P. CAYRE & A. INTÈS, 1978. Étude du crabe rouge profond, *Geryon quinquedens*, en Côte d'Ivoire. II. Élements de biologie et d'écologie avec référence aux résultats obtenus au Congo. Doc. Scient. Centre Rech. Oceanogr. Abidjan, **9** (2): 17-65.

LINDBERG, W. J. & E. K. WENNER (eds.), 1990. Geryonid crabs and associated continental slope fauna: a research workshop report. South Carolina Sea Grant Consortium, Florida Sea Grant College Program Technical Paper, **58**: 1–61.

LÓPEZ ABELLÁN, L. J., M. T. GARCÍA SANTAMARÍA & E. BALGUERÍAS GUERRA, 1992. Resultados de la campaña experimental de pesca realizada en aguas del sur de la isla de Tenerife "Canarias 9206". Instituto Español de Oceanografía. Centro Oceanográfico de Canarias. Santa Cruz de Tenerife: 1-117.

LOZANO, I. J., M. A. CALDENTEY, J. I. SANTANA & J. A. GONZÁLEZ, 1992. Crustáceos y peces capturados en una campaña de prospección en aguas profundas de Canarias. In: J. J. BACALLADO & J. BARQUÍN (eds.), Actas del V Simposio Ibérico de Estudio del Bentos Marino, **2**: 203-208. (La Laguna, Tenerife).

MACPHERSON, E., 1984. Crustáceos decápodos del Banco Valdivia (Atlántico sudoriental). Res. Exped. cient. (Supl. Inv. Pesq.), Barcelona, **12**: 39-105.

MANNING, R. B. & L. B. HOLTHUIS, 1984. *Geryon fenneri*, a new deep-water crab from Florida (Crustacea: Decapoda: Geryonidae). Proc. biol. Soc. Washington, **97** (3): 666-673.

— — & — —, 1987. The status of *Geryon trispinosus* (Herbst) (Geryonidae). Inv. Pesq. Barcelona, **51** (Supl. 1): 57-62.

— — & — —, 1989. Two new genera and nine new species of geryonid crabs (Crustacea, Decapoda, Geryonidae). Proc. biol. Soc. Washington, **102** (1): 50-77.

MELVILLE-SMITH, R., 1987. The reproductive biology of *Geryon maritae* (Decapoda, Brachyura) off South West Africa/Namibia. Crustaceana, **53** (3): 259-275.

— —, 1988. The commercial fishery for and population dynamics of red crab *Geryon maritae* off South West Africa, 1976-1986. South African Journ. mar. Sci., **6**: 79-95.

PÉREZ SÁNCHEZ, J. M. & E. MORENO, 1991. Invertebrados marinos de Canarias: 1-335. (Cabildo Insular de Gran Canaria, Las Palmas de Gran Canaria).

SÁNCHEZ, F. & I. OLASO, 1985. Presencia de *Geryon affinis* Milne-Edwards y Bouvier, 1894, en el golfo de Vizcaya (Decapoda: Brachyura). Bol. Inst. Español Oceanogr., **2** (1): 155-157.

SANTAELLA, E., 1973. Estudio de los Crustáceos Decápodos (excepto Peneidea) del archipiélago canario, con especial referencia a las especies de la Sección Brachyura. Tesis Doctoral. Facultad de Ciencias, Universidad de La Laguna: 1-654.

SANTANA, J. I., J. A. GONZÁLEZ, I. J. LOZANO, M. A. CALDENTEY, F. LOZANO SOLDEVILLA, J. A. GÓMEZ & R. CASTILLO, 1985. Informe preliminar sobre las pescas con nasas y palangres realizadas a bordo del buque "Taliarte" durante Junio y Julio de 1985: 1-208. (Dirección General de Pesca del Gobierno de Canarias, Las Palmas de Gran Canaria).

Received for publication 24 November 1994.