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NORTHERNMOST RECORD OF *ARISTEUS VARIDENS* (DECAPODA, DENDROBRANCHIATA, ARISTEIDAE), WITH REMARKS ON THE FISHERY OF PENAEOIDS IN THE CANARY ISLANDS

BY

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The species composition of the superfamily Penaeoidea Rafinesque, 1815 and the fishing effort on aristeids (González et al., 2020) in waters off the Canary Islands have received increasing attention in recent years (González & Santana, 2014; Landeira & González, 2018; González & Landeira, 2019).

Here we report the first occurrence of the striped red shrimp, *Aristeus varidens* Holthuis, 1952 (Aristeidae) for the Canary Islands, based on two large adults recently caught off the island of Tenerife. The biogeographic composition of the Dendrobranchiata occurring in this region is discussed. This note also describes for the first time the small-scale fisheries addressed to penaeoids in this archipelago, reporting on their separate landing statistics.

The studied shrimps were obtained within the research framework of the EU Multi-Annual Programme (EU-MAP) for the Data Collection Framework (DCF). The sampling was performed on board the F/V "Rosario I", and took place on 3 December 2020 off the east coast of the island of Tenerife. Shrimps were caught as by-catch of the local fishery of the striped soldier shrimp *Plesionika edwardsii* (J. F. Brandt, 1851) with a single bottom shrimp-trap (Arrasate-López et al., 2012; González et al., 2020).

Striped red shrimps were sorted on board and preserved in 80% ethanol for their morphological analysis and final identification at the laboratory. Voucher specimens were labelled, curated, data-based and deposited in the marine fauna collections (CFM-IEOCA) of the 'Centro Oceanográfico de Canarias' (Casañas

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Machín & Pascual Alayón, 2020) (belonging to the Spanish Institute of Oceanography, IEO) hosted by GBIF-Spain (https://www.gbif.org/dataset/6d6e8d0a-de6f-4553-8d40-c9465c3fe10e).

The postorbital carapace length (pocl) was measured from the posterior margin of the orbit to the posterodorsal border of the carapace, excluding the rostrum (Landeira & Fransen, 2012; González & Landeira, 2019), and was measured with a digital calliper in millimetres. Sex of the specimens was recorded according to the presence of a petasma or thelycum. The systematic classification follows De Grave & Fransen (2011).

Separate data on the 2014-2019 time series of landings of aristeids were taken from the official website of the department for fisheries of the Canary Government (http://www.gobiernodecanarias.org/agp/sgt/temas/estadistica/pesca/index.html).

NORTHERNMOST RECORD AND FIRST FOR THE CANARY ISLANDS

Suborder DENDROBRANCHIATA Spence Bate, 1888
Superfamily PENAEOIDEA Rafinesque, 1815
Family ARISTEIDAE Wood-Mason, 1891 in Wood-Mason & Alcock, 1891
Genus *Aristeus* Duvernoy, 1840
Aristeus varidens Holthuis, 1952 (fig. 1)

Material examined. — Voucher code: GBIF-CFM-IEOCA 1295, two equally sized females (pocl. 30.1 mm). Collection data: E of Tenerife, off San Andrés, St. 6, 28°29′N 16°10′W, 329 m depth. Sampling gear: A bottom shrimp-trap baited with Atlantic chub mackerel (*Scomber colias* Gmelin, 1789) (Scombridae).

Remarks. — The specimens of striped red shrimp collected agree well with the descriptions and colour pattern given for the species in Lagardère (1981) and Fransen (2014). A comparison between Cape Verdean (González et al., 2017) and the present Canarian specimens has not revealed any morphological differences.

This is a tropical/subtropical eastern Atlantic species (González, 2018). Known from the southwestern coasts of the Western Sahara (Rio de Oro, 24°N), Senegal, Cape Verde Islands (González et al., 2017), Guinea, southward to Angola (Cabinda) and south-western Africa (Namibia, 18°S). Young individuals are found at depths of 300 m and below, down to 1134 m, while adults occur between 400 and 600 m, on muddy bottoms (Lagardère, 1981; Fransen, 2014). The specimens studied were caught at 329 m depth, and this apparently represents the shallowest record known for adults of this species.

Fig. 1. *Aristeus varidens* Holthuis, 1952 from off the Canary Islands (GBIF-CFM-IEOCA 1295, female, pocl 30.1 mm). Lateral view: top, freshly caught; and, bottom, preserved in alcohol.

The maximum trawl yields are obtained at night, suggesting that the species may dig into the substrate by day. Its life span is about 2 years and reproduction begins at the end of the cold season. It feeds on crustaceans, fishes and polychaetes. The maximum total length reported is up to 12 cm (males) and 20 cm (females) (Lagardère, 1981; Fransen, 2014). The six females reported from the Cape Verde Islands measured between 27.6 and 31.3 mm pocl (González et al., 2017), and the studied specimens up to 30.1 mm pocl.

This observation represents the northernmost record (28°29′N) of the species in the eastern Atlantic Ocean. Moreover, this is the first record of *A. varidens* and indeed of the genus for the Canary Islands, and also their first record for the Webbnesia marine ecoregion (Madeira-Salvage-Canaries) (Freitas et al., 2019) and for the Macaronesia marine ecoregion (Azores-Madeira-Salvage-Canaries) (Spalding et al., 2007). The occurrence of *A. varidens* in the Cape Verde (González et al., 2017) and Canary Islands can be interpreted as a natural expansion of the African continental populations.

The checklist of the Dendrobranchiata from the Canary Islands currently consists of a total of 50 species (Landeira & González, 2018; González & Landeira, 2019), to which *A. varidens* is now added. Biogeographically, 26 species have a circumtropical distribution, 11 are amphi-Atlantic of warm affinity, four are amphi-Atlantic of wide distribution, four are eastern Atlantic species of warm-temperate affinity, four (*A. varidens* included) are restricted to the tropical/subtropical eastern Atlantic, whilst three are distributed worldwide.

FISHING ON DEEP-WATER CRUSTACEANS AND LANDINGS OF PENAEOIDS IN THE CANARIES

As a consequence of recent research results on semi- and deep-water resources off the Canary Islands, local fishermen began fishing with bottom and semi-floating shrimp traps in the late 1990s and early 2000s (Arrasate-López et al., 2012; Pajuelo et al., 2015; González et al., 2020). These shrimp-traps mainly focus on *Plesionika edwardsii* between 200 and 400 m depth (Arrasate-López et al., 2012; González et al., 2016). For about ten years, a few fishermen have set their bottom traps at greater depths (400-1000 m), in search of other commercial pandalids (*Plesionika* spp. and *Heterocarpu*s spp.) (Tuset et al., 2009), aristeids, and large deep-water crabs (*Cancer bellianus* J. Y. Johnson, 1861, *Paromola cuvieri* (Risso, 1816) and *Chaceon affinis* (A. Milne-Edwards & Bouvier, 1894)) (see Quiles et al., 2001; Triay-Portella et al., 2014, 2017; Biscoito et al., 2015).

Catches of penaeoids with shrimp-traps in the region can be summarized as follow: (a) *Parapenaeus longirostris* (Lucas, 1846) is being caught in small quantities in the fishery focused on the pandalid *P. edwardsii* in the West of Lanzarote at 200-350 m depth (González & Landeira, 2019); (b) *Aristaeomorpha foliacea* (Risso, 1827) (at 200-550 m) and, in much higher quantities, *Aristaeopsis edwardsiana* (J. Y. Johnson, 1868) (at 450-1000 m) are being targeted, together with large crabs, in several sectors of the eastern and central islands of the archipelago; and (c) *A. varidens* is now known to appear together with other pandalids around 330 m depth off Tenerife.

As a result of increased fishing depth, Canarian fishermen (undoubtedly attracted by the higher prices obtained) have progressively sought moderate catches of aristeids (especially *A. edwardsiana*) in increasing sectors of the NW and E of Gran Canaria, W of Lanzarote and E of Tenerife. Mean landings of aristeids (mainly A. *edwardsiana*) from the Canary Islands' small-scale fisheries for the period 2007-2019 reached 1 ton per year. These catches may seem relatively small, but in the context of an artisanal fishery these gourmet products are being sold fresh at record prices of between 65 and 160 euro per kg.

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REFERENCES

ARRASATE-LÓPEZ, M., V. M. TUSET, J. I. SANTANA, A. GARCÍA-MEDEROS, O. AYZA & J. A. GONZÁLEZ, 2012. Fishing methods for sustainable shrimp fisheries in the Canary Islands (north-west Africa). Afr. J. mar. Sci., **34**(3): 331-339.

BISCOITO, M., M. FREITAS, J. G. PAJUELO, R. TRIAY-PORTELLA, J. I. SANTANA, A. L. COSTA, J. DELGADO & J. A. GONZÁLEZ, 2015. Sex-structure, depth distribution, intermoult period and reproductive pattern of the deep-sea red crab *Chaceon affinis* (Brachyura, Geryonidae) in two populations in the north-eastern Atlantic. Deep-Sea Res. I, **95**: 99-114.

CASAÑAS MACHÍN, I. & P. J. PASCUAL ALAYÓN, 2020. Colección de fauna marina del Centro Oceanográfico de Canarias. Versión 1.7. (Instituto Español de Oceanografía-Centro Oceanográfico de Canarias). (Occurrence dataset. Accessed via GBIF.org Feb. 2021.) DOI:10.15468/tgkcv6.

DE GRAVE, S. & C. H. J. M. FRANSEN, 2011. Carideorum catalogus: the recent species of the dendrobranchiate, stenopodidean, procarididean and caridean shrimps (Crustacea: Decapoda). Zool. Med. Leiden, **85**(9): 195-589.

FRANSEN, C. H. J. M., 2014. Shrimps and prawns. In: K. E. CARPENTER & N. DE ANGELIS (eds.), The living marine resources of the Eastern Central Atlantic, **1**, Introduction, crustaceans, chitons and cephalopods: 37-196. (FAO Species Identification Guide for Fishery Purposes, FAO, Rome).

FREITAS, R., M. ROMEIRAS, L. SILVA, R. CORDEIRO, P. MADEIRA, J. A. GONZÁLEZ, P. WIRTZ, J. M. FALCÓN, A. BRITO, S. R. FLOETER, P. AFONSO, F. PORTEIRO, M. A. VIERA-RODRÍGUEZ, A. I. NETO, R. HAROUN, J. N. M. FARMINHÃO, A. C. REBELO, L. BAPTISTA, C. S. MELO, A. MARTÍNEZ, J. NÚÑEZ, B. BERNING, M. E. JOHNSON & S. P. ÁVILA, 2019. Restructuring of the 'Macaronesia' biogeographic unit: a marine multitaxon biogeographical approach. Scient. Rep., **9**: e15792.

GONZÁLEZ, J. A., 2018. Checklists of Crustacea Decapoda from the Canary and Cape Verde islands, with an assessment of Macaronesian and Cape Verde biogeographic marine ecoregions. Zootaxa, **4413**(3): 401-448.

GONZÁLEZ, J. A., G. GONZÁLEZ-LORENZO, G. TEJERA, R. ARENAS-RUIZ, J. G. PAJUELO & J. M. LORENZO, 2020. Artisanal fisheries in the Canary Islands (eastern-central Atlantic): description, analysis of their economic contribution, current threats, and strategic actions for sustainable development. Acta Ichthyol. Piscat., **50**(3): 269-289.

GONZÁLEZ, J. A. & J. M. LANDEIRA, 2019. On the presence of the deep-water rose shrimp *Parapenaeus longirostris* (Decapoda, Dendrobranchiata, Penaeidae) off the Canary Islands. Crustaceana, **92**(8): 1015-1019.

GONZÁLEZ, J. A., J. G. PAJUELO, R. TRIAY-PORTELLA, R. RUIZ-DÍAZ, J. DELGADO, A. R. GÓIS & A. MARTINS, 2016. Latitudinal patterns in the life-history traits of three isolated Atlantic populations of the deep-water shrimp *Plesionika edwardsii* (Decapoda, Pandalidae). Deep-Sea Res. I, **117**: 28-38.

GONZÁLEZ, J. A. & J. I. SANTANA, 2014. The family Penaeidae from the Canary Islands (northeastern Atlantic), with first record of *Penaeus kerathurus*. Bol. Mus. Hist. Nat. Funchal, **64**(338): 29-34.

GONZÁLEZ, J. A., R. TRIAY-PORTELLA, J. I. SANTANA, S. CORREIA, C. MONTEIRO & A. MARTINS, 2017. Three new decapods (Aristeidae, Chirostylidae, Pandalidae) from the Cape Verde Islands (NE Atlantic). Crustaceana, **90**(3): 349-358.

LAGARDÈRE, J. P., 1981. Shrimps and prawns. In: W. FISCHER, G. BIANCHI & W. B. SCOTT (eds.), Eastern central Atlantic; fishing areas 34, 47 (in part). FAO Species Identification Sheets for Fishery Purposes, **5**. (Canada Funds-in-Trust; Department of Fisheries and Oceans Canada, Ottawa, by arrangement with the FAO of the UN, Rome).

LANDEIRA, J. M. & C. H. J. M. FRANSEN, 2012. New data on the mesopelagic shrimp community of the Canary Islands region. Crustaceana, **85**(4-5): 385-414.

LANDEIRA, J. M. & J. A. GONZÁLEZ, 2018. First record of *Pelagopenaeus balboae* and *Sergia wolffi* (Decapoda, Dendrobranchiata) from the Canary Islands, with an annotated checklist of the Dendrobranchiata in the area. Crustaceana, **91**(3): 379-387.

PAJUELO, J. G., R. TRIAY-PORTELLA, J. I. SANTANA & J. A. GONZÁLEZ, 2015. The community of deep-sea decapod crustaceans between 175 and 2600 m in submarine canyons of a volcanic oceanic island (central-eastern Atlantic). Deep-Sea Res. I, **105**: 83-95.

QUILES, J. A., V. RICO, V. M. TUSET, J. I. SANTANA & J. A. GONZÁLEZ, 2001. Notes on the biology of *Cancer bellianus* (Brachyura, Cancridae) around the Canary Islands. In: J. P. M. PAULA, A. A. V. FLORES & C. H. J. M. FRANSEN (eds.), Advances in decapod crustacean research. Hydrobiologia, **449**: 193-199.

SPALDING, M. D., H. E. FOX, G. R. ALLEN, N. DAVIDSON, Z. A. FERDAÑA, M. FINLAYSON, B. S. HALPERN, M. A. JORGE, A. LOMBANA, S. A. LOURIE, K. D. MARTIN, E. MCMANUS, J. MOLNAR, C. A. RECCHIA & J. ROBERTSON, 2007. Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. BioScience, **57**: 573-583.

TRIAY-PORTELLA, R., J. A. GONZÁLEZ, J. I. SANTANA, V. GARCÍA-MARTÍN, M. ROMERO, S. JIMÉNEZ-MARTÍN, D. HERNÁNDEZ-CASTRO & J. G. PAJUELO, 2014. Reproductive pattern and egg development of the deep-sea crab *Paromola cuvieri* (Brachyura, Homolidae) around the Canary Islands (NE Atlantic). Deep-Sea Res. I, **85**: 1-14.

TRIAY-PORTELLA, R., J. G. PAJUELO & J. A. GONZÁLEZ, 2017. Spatio-temporal variation in biomass of the deep-sea red crab *Chaceon affinis* in Gran Canaria island (Canary Islands, eastern-central Atlantic). Mar. Ecol., **38**(5): 1-14.

TUSET, V. M., J. A. PÉREZ-PEÑALVO, J. DELGADO, M. R. PINHO, J. I. SANTANA, M. BISCOITO, J. A. GONZÁLEZ & D. CARVALHO, 2009. Biology of the deep-water shrimp *Heterocarpus ensifer* (Caridea: Pandalidae) off the Canary, Madeira and the Azores islands (northeastern Atlantic). J. Crust. Biol., **29**(4): 507-515.

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