



NOTES AND NEWS

ON THE OCCURRENCE OF *PENAEUS PULCHRICAUDATUS* (DECAPODA, DENDROBRANCHIATA, PENAEIDAE) IN THE CANARY ISLANDS, ITS SOUTHERNMOST LIMIT IN THE EASTERN ATLANTIC

BY

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Penaeus japonicus Spence Bate, 1888 (Decapoda, Penaeidae), the kuruma shrimp, was believed to have a wide geographical distribution throughout the Indo-West Pacific Ocean. This species was also assumed to have penetrated the eastern Mediterranean in 1924 (Balss, 1927) and subsequently spread along the Aegean Sea, the Ionian Sea, the Italian coasts and, in the eastern Atlantic, to northwest France, the English Channel and the Celtic Sea (Holthuis, 1980; Pérez Farfante & Kensley, 1997; Quigley et al., 2013; Fransen, 2014).

However, two morphologically similar chromatic patterns of *P. japonicus* were identified in the South China Sea (Tsoi et al., 2005). Both forms do not differ in other morphological characters or biometric parameters, but phylogenetic analyses revealed that the two forms are genetically distinct (Tsoi et al., 2005). After several subsequent phylogeographical studies of the species beyond the South China Sea, those preliminary results were verified using genetic information of specimens from the western Pacific, western Indian Ocean, Red Sea and the Mediterranean (Tsoi et al., 2014). The study by Tsoi et al. (2014) confirmed the phylogenetic relatedness of the two cryptic species (forms I — the typical —, and II), revised their taxonomic status, and reviewed their geographical distribution. The kuruma shrimp thus became a species complex consisting of two sister species: *Penaeus japonicus* and *Penaeus pulchricaudatus* Stebbing, 1914. As a consequence, *P. pulchricaudatus* was resurrected (previously considered as a synonym of *P. japonicus*) and fixed for the form II (Tsoi et al., 2014). These authors

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also concluded that the Mediterranean stock of *P. pulchricaudatus* was originated from the Red Sea population, supporting the Lessepsian migration hypothesis.

Regarding their general geographical ranges, *P. japonicus* is confined to the East China Sea (including Japan, its type-locality) and the northern South China Sea, while *P. pulchricaudatus* is widely distributed in the South China Sea, Australia, the western Indian Ocean, the Red Sea and the Mediterranean (Tsoi et al., 2014). Occurrences of the latter species in the eastern Atlantic are discussed in the systematic part of the present Note.

From the initial cataloguing of the decapod crustaceans of the Canary Islands by González (1995), the suborder Dendrobranchiata Spence Bate, 1888 has received increasing attention from carcinologists. Subsequently, d'Udekem d'Acoz (1999) included only two species of *Funchalia* Johnson, 1868 from the Canaries. Quiles et al. (2001) first recorded *Penaeopsis serrata* Spence Bate, 1881 from the Canaries based on documented data, and González & Quiles (2003) published an updated second checklist of the Canary decapods. Landeira & Fransen (2012) identified 29 species of mesopelagic shrimps from off the western islands of the Canary archipelago, including Dendrobranchiata and Caridea. Landeira & González (2018) added two more pelagic dendrobranchiate species: *Pelagopenaeus balboae* (Faxon, 1893) and *Phorcosergia wolffi* (Vereshchaka, 1994).

Since the late 1990s, local small-scale fisheries are targeting semi- and deep-water decapod resources with more or less specialized traps off the Canary Islands, mainly focussing on *Plesionika edwardsii* (Brandt, 1851) and other pandalid shrimps, as well as on three large crabs: *Cancer bellianus* Johnson, 1861, *Paromola cuvieri* (Risso, 1816) and *Chaceon affinis* (A. Milne-Edwards & Bouvier, 1894), and the aristeid *Aristaeopsis edwardsiana* (Johnson, 1868) (González et al., 2020). As a result of the growing deep-sea fishing activity in this archipelago, several dendrobranchiate prawns have been newly recorded for the carcinofauna of the Canaries. This is the case of the species recently reported for the first time in Canary Islands waters: *Parapenaeus longirostris* (Lucas, 1846) (González & Landeira, 2019) and *Aristeus varidens* Holthuis, 1952 (González-Lorenzo et al., 2021). Furthermore, in the last decade, some underwater professional photographers are providing carcinologists with nice pictures (and sometimes also specimens) of shallow-water penaeid species from the Canaries. This is the case of *Penaeus kerathurus* (Forskål, 1775) (González & Santana, 2014) and the penaeid species new to the Canaries reported herein.

Here we report the first occurrence of *P. pulchricaudatus* for the Canary Islands, based on an individual recently caught by the second author off the island of Gran Canaria. The studied specimen was accidentally discovered, in situ photographed and collected by hand. Then, it was photographed freshly caught and preserved in 80% ethanol for morphological analysis and identification at the laboratory. The

voucher specimen was labelled, curated, data-based and deposited in the ICCM study collection at the University of Las Palmas de Gran Canaria (Gran Canaria, Canary Islands).

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 specimen was determined according to the presence of a petasma or thelycum. The systematic classification follows De Grave & Fransen (2011) updated by Tsoi et al. (2014).

Suborder DENDROBRANCHIATA Spence Bate, 1888

Superfamily PENAEOIDEA Rafinesque, 1815

Family PENAEIDAE Rafinesque, 1815

Genus *Penaeus* Fabricius, 1798

***Penaeus pulchricaudatus* Stebbing, 1914 (fig. 1)**

Material examined.— Voucher code: ICCM519, one adult female (pocl 43 mm). Collection data: south-western Gran Canaria, off Castillo del Romeral, 27°47'54.3"N 15°27'33.5"W, 1.5 m depth, large intertidal pool with fine sandy-muddy substrate, 2 March 2021. Two individuals observed, but only one collected.

Remarks.— The specimen collected agrees well with the descriptions and colour patterns given for the species in Stebbing (1914) and Tsoi et al. (2014).

Apart from the general distribution of *P. pulchricaudatus* given by Tsoi et al. (2014), in the western Pacific, this species has been reported from the South China Sea and Australia. In the western Indian Ocean it is known from the eastern coast of South Africa (its type-locality: Cape Colony; Stebbing, 1914) and, generally as *P. japonicus*, at least from Mozambique, Madagascar, Reunion, Tanzania, Mauritius, Kenya, Somalia, Eritrea and the Red Sea (Holthuis, 1980; Pérez Farfante & Kensley, 1997; Fransen, 2014; Tsoi et al., 2014; WoRMS, 2021a). In the Mediterranean, *P. pulchricaudatus* has been reported from both the eastern and western basins, occurring in the Levantine Sea to the Balearic Sea, Spain (Fransen, 2014; WoRMS, 2021b). In the eastern Atlantic, as *P. japonicus*, it has been reported from the Celtic Sea, the English Channel, northwest France and off southwest Spain near Cadiz (Quigley et al., 2013; Fransen, 2014; WoRMS, 2021a); probably also occurring off northwest Africa (Fransen, 2014).

It inhabits shelf areas from the coastline to 90 m depth, most abundant between the shoreline and 50 m depth, occurring on sandy or sandy-mud bottoms (Holthuis, 1980; Fransen, 2014). Adults are predominantly active at night, burying in the substrate at daytime (Fransen, 2014).

Size: Maximum total length: 20 cm (males), 30 cm (females), commonly between 11 and 20 cm (Holthuis, 1980; Fransen, 2014). The studied specimen measured 17.5 cm in total length.



Fig. 1. *Penaeus pulchricaudatus* Stebbing, 1914 from off the Canary Islands (ICCM519, female, pool 43 mm). Top, lateral view of the freshly caught shrimp; bottom, dorso-lateral view of the shrimp in the wild.

The present finding represents the southernmost record (27°47'N) of the species in the eastern Atlantic Ocean. Furthermore, this is the first record of *P. pulchricaudatus* for the Canary Islands, and also their first record for the Webbnisia marine ecoregion (i.e., Madeira-Salvage-Canaries, see Freitas et al., 2019) and for the Macaronesia marine ecoregion (i.e., Azores-Madeira-Canaries sensu Spalding et al., 2007).

The occurrence of *P. pulchricaudatus* in Canary Islands waters can be interpreted as a natural range expansion of the African continental populations or from further north. A second explanatory hypothesis for the presence of this species in the Canary archipelago would be its introduction due to anthropogenic causes (for instance, ship's ballast water). In this regard, it is known that this shrimp tolerates handling and long-distance transportation (ASEAN, 1978), and also the fact that the Canary Islands are in a geographic area with heavy maritime traffic.

The checklist of the Dendrobranchiata from the Canary Islands currently consists of a total of 52 species (González, 2018; Landeira & González, 2018; González & Landeira, 2019; González-Lorenzo et al., 2021), including the present record of *P. pulchricaudatus*. Biogeographically, 26 species have a circumtropical distribution, 11 are amphi-Atlantic with warm affinity, four are amphi-Atlantic of wide distribution, four are eastern Atlantic species of warm-temperate affinity, four are restricted to the tropical/subtropical eastern Atlantic, whilst four (*P. pulchricaudatus* included) are distributed more globally.

REFERENCES

- ASEAN [ASSOCIATION OF SOUTHEAST ASIAN NATIONS], 1978. Manual on pond culture of penaeid shrimps. (UNDP: FAO). Available at: <http://www.fao.org/docrep/field/003/ac006e/ac006e00.htm>.
- BALSS, H., 1927. Berichte über die Crustacea Decapoda (Natantia und Anomura). Zoological results of the Cambridge expedition to the Suez Canal, 1924, XIV. Trans. Zool. Soc. Lond., **22**: 221-230.
- 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.
- D'UDEKEM D'ACÓZ, C., 1999. Inventaire et distribution des Crustacés Décapodes de l'Atlantique nord-oriental, de la Méditerranée et des eaux continentales adjacentes au nord de 25°N. Patrim. Nat., **40**: i-x, 1-383.
- FRANSEN, C. H. J. M., 2014. Shrimps and prawns. In: K. E. CARPENTER & N. DE ANGELIS (eds.), FAO species identification guide for fishery purposes: the living marine resources of the eastern central Atlantic, **1**, introduction, crustaceans, chitons and cephalopods: 37-196. (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., 1995. Catálogo de los Crustáceos Decápodos de las islas Canarias: 1-282. (Publicaciones Turquesa, Santa Cruz de Tenerife).
- 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. A. QUILES, 2003. Phylum Arthropoda, orden Decapoda. In: L. MORO, J. L. MARTÍN, M. J. GARRIDO & I. IZQUIERDO (eds.). *Lista de Especies Marinas de Canarias (Algas, Hongos, Plantas y Animales)*: 74-80, 214-215. (Gobierno de Canarias & Gesplan S.A., La Laguna, Tenerife).
- 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-LORENZO, G., B. SOTILLO & J. A. GONZÁLEZ, 2021. Northernmost record of *Aristeus varidens* (Decapoda, Dendrobranchiata, Aristeidae), with remarks on the fishery of penaeoids in the Canary Islands. *Crustaceana*, **94**(6): 765-771.
- HOLTHUIS, L. B., 1980. *FAO species catalogue, 1. Shrimps and prawns of the world. An annotated catalogue of species of interest to fisheries.* *FAO Fish. Synop.*, **125**(1): 1-271.
- 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.
- PÉREZ FARFANTE, I. & B. KENSLEY, 1997. Penaeoid and sergestoid shrimps and prawns of the world: keys and diagnoses for the families and genera. *Mém. Mus. natn. Hist. nat., Paris*, **175**: 1-233.
- QUIGLEY, D. T. G., D. HERDSON & K. FLANNERY, 2013. Occurrence of the Kuruma prawn *Marsupenaeus japonicus* (Spence Bate, 1888) in the Celtic Sea, English Channel, and north-west France. *BioInvasions Rec.*, **2**: 57-61.
- QUILES, J. A., J. A. GONZÁLEZ & J. I. SANTANA, 2001. Dendrobranchiata y Caridea nuevos o poco conocidos para las Islas Canarias (Crustacea, Decapoda). *Bol. Inst. Esp. Oceanog.*, **17**(1-2): 7-13.
- 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.
- STEBBING, T. R. R., 1914. South African Crustacea (part VII of S.A. Crustacea, for the Marine Investigations in South Africa). *Ann. S. Afr. Mus.*, **15**: 1-55, pls. I-XII.
- TSOI, K. H., K. Y. MA, T. H. WU, S. T. FENNESSY, K. H. CHU & T. Y. CHAN, 2014. Verification of the cryptic species *Penaeus pulchricaudatus* in the commercially important Kuruma shrimp *P. japonicus* (Decapoda: Penaeidae) using molecular taxonomy. *Invertebr. Syst.*, **28**(5): 476-490.

- TSOI, K. H., Z. Y. WANG & K. H. CHU, 2005. Genetic divergence between two morphologically similar varieties of the Kuruma shrimp *Penaeus japonicus*. *Mar. Biol.*, **147**: 367-379.
- WORMS EDITORIAL BOARD, 2021a. *Penaeus japonicus* Spence Bate, 1888. Accessed at: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=210371> on 2021-03-06.
- WORMS EDITORIAL BOARD, 2021b. *Penaeus pulchricaudatus* Stebbing, 1914. Accessed at: <http://www.marinespecies.org/aphia.php?p=taxdetails&id=584983> on 2021-03-09.