

## The Indo-Pacific brachyuran *Charybdis (Gonioinfradens) paucidentatus* (A. Milne-Edwards, 1861) (Brachyura, Portunidae) in the Cyclades, Aegean Sea

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**Abstract:** The occurrence of the alien *Charybdis (Gonioinfradens) paucidentatus* is reported from Santorini Island after repeated underwater surveys carried out in 2014-2015. The findings constitute the first record of an Indo-Pacific brachyuran in the south-central Aegean Sea, showing the successful expansion of this portunid recently introduced into the eastern Mediterranean Sea.

**Key words:** Alien, Portunidae, *Charybdis (Gonioinfradens) paucidentatus*, Aegean Sea, East Mediterranean

Portunidae is the most successful family in the colonization of the Mediterranean coasts (Brockerhoff and McLay, 2008). In fact, among the 54 Brachyura listed by Galil et al. (2015), 14 species belong to the former family with 6 species in the genus *Charybdis*. In the Mediterranean Sea, *Charybdis (Gonioinfradens) paucidentatus* (A. Milne-Edwards, 1861) was recorded for the first time from Rhodes Island, Aegean Sea, Greece (Corsini-Foka et al., 2010), where invasive properties have been observed (Corsini-Foka et al., 2014), followed by a record from the Kaş-Kekova Specially Protected Area, Antalya, Levantine Sea, Turkey (Karhan and Yokes, 2012).

Within the period of April to October 2014 and September 2015, during professional scuba diving surveys of the hard bottoms of Caldera Beach and Palia Kameni, Santorini, Cyclades, South Aegean Sea (36°21.68'N, 025°24.27'E and 36°24.02'N, 025°22.88'E) performed by one of the authors (VK), several individuals of *C. (G.) paucidentatus* were photographed with a Canon PowerShot G12 camera. For the purposes of the present report, only one photograph is presented (Figure). The identification was based on the descriptions of Apel and Spiridonov (1998) and Corsini-Foka et al. (2010), and comparison with archived photographic material of the species.

The distinguishing characters clearly seen in the Figure are: median and submedian front teeth truncated; lateral

teeth triangular with rounded tips and separated from the previous by a deeper groove. Carapace anterolaterally armed with 4 large teeth; no spine on the posterior border of the merus of the chelipeds. Carapace reddish-brown dorsally with sparse darker shades. Chelipeds reddish externally, yellow-orange internally, with dark brown fingers. Walking legs reddish with yellow bands. Tips of anterolateral teeth, spines of chelipeds and merus of the fifth pereopod dark brown, preceded by a whitish band.

The presence of only four large anterolateral teeth distinguish this *Charybdis (Gonioinfradens)* from the other subgenera retained in *Charybdis* (Crosnier, 1962; Apel and Spiridonov, 1998), namely *Charybdis*, *Goniohellenus*, *Gonioneptunus*, and *Goniosupradens*. To date, five species have been recorded in the Mediterranean Sea from the above four subgenera, all alien to the basin, and all bearing six anterolateral teeth: *Charybdis (Charybdis) feriata* (Linnaeus, 1758), *Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867), *Charybdis (Charybdis) japonica* (A. Milne-Edwards, 1861), *Charybdis (Charybdis) lucifera* (Fabricius, 1798), and *Charybdis (Goniohellenus) longicollis* Leene, 1938 (Galil et al., 2015).

The red swimming crab occurs in the Red Sea, the Persian Gulf and Gulf of Oman, the eastern African coasts and Madagascar, the western Indian Ocean islands, Australia, New Caledonia, French Polynesia, and as far north as Hawaii and Japan; it prefers hard substrate to

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**Figure.** A specimen of *Charybdis (Gonioinfradens) paucidentatus* from Santorini Island, central Aegean Sea.

depths reaching 200 m and it attains maximum carapace length of 6.4 cm and maximum carapace width of 5.8 cm (Corsini-Foka et al., 2010, and references therein).

The expansion of the *C. (G.) paucidentatus* population has already been documented since 2013 north to Rhodes, on the small island of Pserimos, near Kalymnos Island (southeastern Aegean Sea), where it is considered established (Zenetos et al., 2017). This alien species is herein reported for the first time from Santorini Island, south-central Aegean Sea, where it appears to be established. The means of range expansion of this alien from the eastern coasts of the basin may be natural dispersion and/or it may be mediated by shipping or other maritime activities. The closest marina to the sighting areas is Vlichada (36°20.17'N, 25°26.07'E).

Following Bakır et al. (2014), Ateş et al. (2016), and ELNAIS (<http://elnais.hcmr.gr/>), the majority of alien brachyurans in the Aegean Sea, mainly those of Indo-Pacific origin, are generally concentrated along the southeastern coasts. The environmental conditions in the North Aegean Sea, in particular the northern and northwest regions, appear rather adverse to the introduction and establishment of alien species of Indo-Pacific and/or Red Sea origin compared to the southern and northeastern sectors of the basin (Corsini-Foka and

Sarlis, 2016). Concerning alien brachyurans recorded to date in the North Aegean Sea, the admittedly short list includes crabs of Atlantic origin, *Callinectes sapidus* Rathbun, 1896 (Northwest and Northeast Aegean, Gönülal and Güreşen, 2014; Zenetos et al., 2015; Perdikaris et al., 2016) and *Percnon gibbesi* (H. Milne Edwards, 1853) (Northeast Aegean, Chios Island, Katsanevakis et al., 2010; Zenetos et al., 2015), while three Indo-Pacific crabs have been recorded from the northeastern coasts of the basin, namely *Ixa monodi* (Holthuis and Gottlieb, 1956) from Saros Bay (Artüz, 2007a), *Eurycarcinus integrifrons* De Man, 1879 from İzmir Bay (Doğan et al., 2016), and *Pilumnus hirsutus* (De Haan, 1835) from Saros and İzmir bays (Kocataş and Katağan 2003; Ateş C, 2016, personal communication). Furthermore, the Indo-Pacific *Coleusia signata* Paulson, 1875 has been found in the Marmara Sea (Artüz, 2007b). Although the southern Aegean waters are more suitable for thermophile species, including subtropical and tropical aliens, compared to the northern sector of the basin (Papaconstantinou, 2014), no Indo-Pacific crabs have been reported to date in the central and western parts. The only alien brachyurans occurring in the area are the Atlantic-originating *C. sapidus* and *P. gibbesi* and the less frequent *Calappa pelii* (Herklots, 1851) (<http://elnais.hcmr.gr/>).

Therefore, the finding of *C. (G.) paucidentatus* reported in the present work is quite unique, not only because it is the first record of an Indo-Pacific alien brachyuran in the central Aegean, but also because it is the first documentation of an exotic crab spreading from the eastern Aegean coasts to the west. This finding on one hand confirms the invasive character of another portunid in the Mediterranean waters, as already predicted by Corsini-Foka et al. (2014), and, on the other hand, shows that the contribution of citizen scientists is essential in monitoring dispersion of marine invaders in the highly diversified habitats of the basin (Zenetos et al., 2013).

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