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Rapid expansion of a Lessepsian migrant crab, *Gonioinfradens giardi* (Crustacea, Brachyura, Portunidae), in the Ionian Sea: New records and early evidence of establishment

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Abstract

The portunid crab, *Gonioinfradens giardi* (Nobili, 1905), native to the Red Sea and the Indian Ocean, is one of the recent alien decapods expanding in the Mediterranean Sea. Following the first confirmed Italian record from Portopalo di Capo Passero in November 2025, here we documented 11 additional specimens collected between November 2025 and January 2026 from the Ionian coast of Sicily. These repeated occurrences over a short time period and within a relatively small area strongly suggest that the species is no longer an occasional arrival, but at an early phase of local establishment in the central Mediterranean. These records represent the species' westernmost occurrence and highlight the need for targeted monitoring of alien portunids in the Mediterranean.

Keywords

biological invasion, range expansion, non-indigenous species, coastal ecosystems, marine monitoring

Introduction

With more than 17 000 recorded species, the Mediterranean Sea represents nearly 7% of the planet's marine biota and is widely recognized as a global hotspot of marine biodiversity (Coll et al. 2010). The sea's biota is undergoing profound transformation as a result of multiple human-driven pressures (Keck et al. 2025). In the past half-century, it has experienced an unprecedented influx of non-indigenous species (NIS), mainly occasioned by climate warming, intensified maritime traffic, and the continuous ingress through the Suez Canal (Zenetos and Galanidi 2020). The spread of non-indigenous species has emerged as a key indicator of ecological imbalance and biodiversity decline (Katsanevakis et al. 2014, 2020; Tiralongo et al. 2020).

Invasive alien species are now widely recognized among the primary threats to the structure, integrity and functioning of Mediterranean marine ecosystems (Coll et al. 2010; Mouillot et al. 2011; Tsirintanis et al. 2022).

An important group of such alien species are Lessepsian migrants, entering the Mediterranean via the Suez Canal. Among decapod crustaceans, portunid crabs have shown particularly rapid and successful expansion, with several species becoming established and exerting ecological and socio-economic impacts (Shaiek et al. 2021; Tiralongo et al. 2024).

Gonioinfradens giardi (Nobili, 1905), a portunid crab native to the Red Sea and Arabian Sea, was long confused with *Gonioinfradens paucidentatus* (Milne-Edwards, 1861) until its taxonomic revalidation by Galil et al. (2018). Since then, the species has been reported from the Aegean, Ionian, and Levantine basins, showing clear invasive traits from early stages of colonization (Corsini-Foka et al. 2010, 2015; Kondylatos et al. 2020; Orfanidis et al. 2021). In November 2025, the first record of *G. giardi* from Italian waters was documented at Portopalo di Capo Passero (southeastern Sicily), representing the westernmost occurrence of the species in the Mediterranean (Tiralongo and Leotta 2026). That finding raised the question of whether the record represented an isolated introduction or the beginning of a broader establishment process. The present study addresses this question by reporting eleven additional captures of *G. giardi* from the Ionian coast of Sicily during the period between November 2025 and January 2026. The objectives of the presently reported study were to:

- Update the species' distribution in the Central Mediterranean,
- assess the early signals of establishment, and
- discuss potential ecological and economic implications.

Materials and methods

Between November 2025 and January 2026, eleven (*N* = 11) specimens of *Gonioinfradens giardi* were collected from the Ionian coast of Sicily, within the sector between Catania (37.54639°N, 15.17410°E) and Portopalo of Capo Passero (36.69326°N, 15.14161°E) (Fig. 1). Specimens were obtained through collaboration with local fishers using standard artisanal fishing gears (i.e., trammel nets targeting common cuttlefish, *Sepia officinalis* Linnaeus, 1758). When possible and when specimens were not heavily damaged, the following information was recorded for each specimen: data of capture, geographical coordinates, depth, fishing gear, carapace width (CW), carapace length (CL), and sex (Table 1). The carapace measurements were taken with a caliper accurate to within a millimeter. Specimens were identified following the diagnostic characters of *G. giardi* described by Corsini-Foka et al. (2010) and Galil et al. (2018), including the presence of four prominent anterolateral teeth, cheliped morphology and color pattern (Fig. 2). Voucher specimens were preserved in alcohol and deposited in the zoological collection of Ente Fauna Marina Mediterranea (codes #EFMM181225; #EFMM231225, and #EFMM090126).

Results and Discussion

The haul of a dozen individuals within a 2-month period by local fishers indicates the species is likely undergoing rapid establishment along the Ionian coast of Sicily, the westernmost presence of *Gonioinfradens giardi* in the Mediterranean Sea.

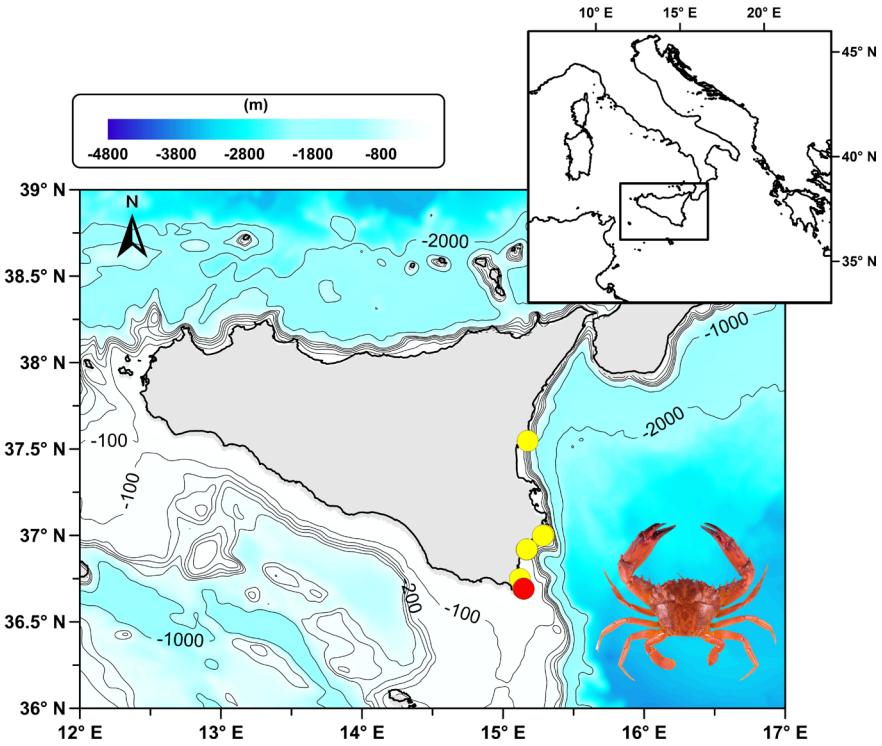

Figure 1. Distribution map of *Gonioinfradens giardi*; new records along the Ionian coast of Sicily are shown in yellow (circles), while the red circle indicates the first published record (see Table 1 for details).

Table 1. Summary of records of *Gonioinfradens giardi* collected using trammel nets along the Ionian coast of Sicily between November 2025 and January 2026 (no ovigerous females were found).

Date	*N*	Location	Coordinates	Depth [m]	Habitat	CW [mm]	CL [mm]	Sex
13 Nov 2025*	1	Portopalo	36.69089°N, 15.14572°E	13	Rocky	36	27	F
28 Nov 2025	1	Marzamemi	36.74800°N, 15.11902°E	10	Sandy	Damaged	Damaged	M
2 Dec 2025	2	Siracusa	37.00254°N, 15.28898°E	15	Rocky	40 and 37	30 and 28	M
18 Dec 2025	1	Siracusa	36.99899°N, 15.28087°E	9	Mixed	Damaged	Damaged	–
19 Dec 2025	1	Catania	37.54639°N, 15.17410°E	12	Mixed	55	39	M
23 Dec 2025**	1	Avola	36.91933°N, 15.17108°E	18	Rocky	59	42	M
29 Dec 2025	1	Portopalo	36.69326°N, 15.14161°E	16	Rocky	38	29	F
29 Dec 2025	2	Avola	36.91812°N, 15.16697°E	8	Mixed	58 and 50	41 and 37	M
9 Jan 2026	2	Avola	36.91988°N, 15.16923°E	13	Rocky	55 and 51	40 and 38	M and F

CW, carapace width; CL, carapace length; *first published record for Italian waters; **specimen depicted in Fig. 2.

Figure 2. Specimen of *Gonioinfradens giardi* collected along the Ionian coast of Sicily on 23 December 2025, delivered by local fishers and preserved in the zoological collection of the Ente Fauna Marina Mediterranea (see Table 1 for other details).

The new records substantially strengthen the biogeographic significance of the first Italian report. The short temporal gap between captures and their spatial coherence strongly support the hypothesis of local population establishment in the Central Mediterranean. Such early establishment patterns are consistent with the species' high ecological plasticity and with the broader trend of thermophilic portunids expanding westwards under current climatic conditions (Karachle et al. 2016; Froglia et al. 2024).

The Ionian Sea, characterized by increasing sea surface temperatures and intense maritime traffic, appears particularly susceptible to these processes (Leotta et al. 2025). The potential ecological implications of the expansion of *G. giardi* remain largely speculative. Although the species may interact with native benthic communities, there are currently no specific data on its feeding ecology, trophic role, or competitive behavior with native portunids. Therefore, any effects on benthic invertebrate populations or local trophic networks should be considered hypothetical at this stage. From a fisheries perspective, unlike larger and more aggressive portunids such as *Callinectes sapidus* Rathbun, 1896 and *Portunus segnis* (Forskål, 1775), which are known to interfere with trammel net fisheries, *G. giardi* is smaller in size and its direct or indirect economic impacts on small-scale coastal fisheries are presently unknown. Although impacts remain unquantified at

present, the observed pattern mirrors early stages of invasion documented for other successful portunids in the Mediterranean. The discovery of eleven additional specimens of *G. giardi* within weeks of the first Italian record provides compelling evidence that the species is rapidly expanding and likely establishing in the Ionian Sea of Sicily. This region should be prioritized for long-term monitoring, early impact assessment and integration of fishers' observations through citizen science networks.

In addition, the rapid detection of multiple individuals over a short period highlights the effectiveness of close collaboration between researchers and local fishing communities. Fishers operate continuously across a wide range of coastal habitats and therefore represent a crucial early-warning system for the detection of emerging non-indigenous species (Al Mabruk et al. 2021; Michail et al. 2024). Their involvement increases spatial and temporal resolution of observations, as well as facilitates the timely identification of potentially invasive taxa before they become widely established. Integrating citizen science with formal scientific monitoring frameworks can substantially improve our capacity to track biological invasions, anticipate ecological impacts, and design adaptive management strategies in the face of ongoing environmental change.

Conclusion

The observed temporal and spatial coherence of *G. giardi*, combined with the species' ecological plasticity and the current trend of westward expansion of thermophilic portunids under warming conditions, strongly suggest that further geographic spread and a progressive increase in local abundance are highly probable in the near future.

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