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CONFIRMING THE OCCURRENCE OF THE NON-INDIGENOUS *PTERAGOGUS TRISPILUS* (ACTINOPTERYGII: LABRIDAE) IN MALTESE WATERS

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ABSTRACT

The comb wrasse Pteragogus trispilus *Randall, 2013, a species native to the Red Sea and a known Lessepsian migrant, is hereby reported for the second time from Maltese waters. The record is based on a single individual observed and photographed on 25 January 2025 in a Posidonia oceanica seagrass meadow settled on a sandy seabed at a depth of approximately 10 meters. This observation further supports the hypothesized local establishment in the Maltese waters and the ongoing range expansion of this species in the Mediterranean Sea.*

Key words: Lessepsian migrant, *Pteragogus trispilus*, Malta, second record, *Posidonia oceanica*, citizen science

CONFERMA DELLA PRESENZA DEL LABRIDE NON INDIGENO *PTERAGOGUS TRISPILUS* (ACTINOPTERYGII: LABRIDAE) NELLE ACQUE MALTESI

SINTESI

Il labride Pteragogus trispilus *Randall, 2013, nativo del Mar Rosso e considerato un migrante Lessepsiano, viene qui segnalato per la seconda volta nelle acque maltesi. La segnalazione è basata su un singolo individuo osservato e fotografato il 25 gennaio 2025 in una prateria di* Posidonia oceanica *su fondale sabbioso a circa 10 m di profondità. Questa osservazione dà sostegno all'ipotesi di un insediamento nelle acque maltesi e di una continua espansione della specie nel Mediterraneo.*

Parole chiave: migrante Lessepsiano, *Pteragogus trispilus*, Malta, seconda segnalazione, *Posidonia oceanica*, citizen science

INTRODUCTION

The occurrence of alien species introduced via the Suez Canal is one of the main concerns within the Mediterranean Sea (Galil, 2009). Therefore, continuous efforts have been made by regional scientists for the early detection of newly introduced species (Azzurro, 2010). Nevertheless, it is difficult for most researchers to monitor their occurrence, primarily due to the limited number of researchers in the field. For this reason, citizen science supported by social media has represented, for decades, a key source of records, with fishers and divers acting as principal contributors (Kousteni *et al.*, 2022). While many examples exist of alien species first being sighted through citizen science, these records have, to date, largely involved species that are highly distinct from indigenous, native fauna.

On the other hand, cryptic species - species that are difficult to distinguish from one another, where an untrained eye would fail to perceive any differences (De Groot *et al.*, 2020) - are also represented within non-indigenous species. As a result, many non-indigenous cryptic species may have already spread widely across the Mediterranean, remaining undetected to date as a result of erroneous identification.

The family Labridae includes a diverse group of reef-associated fishes, with 25 species recorded in the Mediterranean alone (Froese & Pauly, 2025), some of which are already difficult to distinguish, even for the expert eye. Concerning non-indigenous fish species of Red Sea/Indo-Pacific origin, only two species of Labridae have been reported in the Mediterranean so far: *Pteragogus trispilus* Randall, 2013, firstly recorded as *Pteragogus pelycus* Randall, 1981, in Haifa Bay, Israel, in 1991

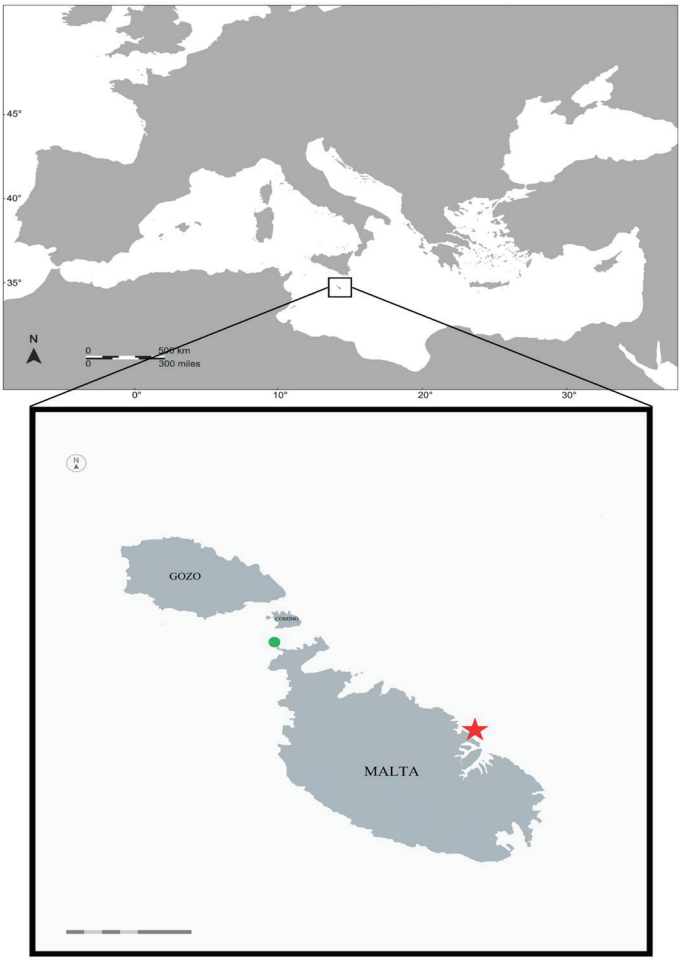


Fig. 1: Locations for the observations of *Pteragogus trispilus* ***in Maltese waters [green circle, previous record: Borg & Evans (2022); red star, present study].***
Sl. 1: Lokalitete, na katerih so opazovali primerke vrste *Pteragogus trispilus* ***v malteških vodah [zelen krog, prejšnji zapis: Borg & Evans (2022); rdeča zvezdica, pričujoča študija].***

(Golani & Sonin, 1992), and *Cheilinus lunulatus* (Forsskål, 1775), recorded for the first time in the waters of Gaza Strip, Palestine, in 2022 (Abd Rabou *et al*., 2022). The occurrence of a third NIS labrid, *Iniistius pavo* Valenciennes, 1840 has been excluded due to misidentification (Zenetos *et al*., 2018). Following Randall (2013), the subsequent published records of *P. pelycus* were reclassified as *P. trispilus*.

The native range of *P. trispilus* is the northern Red Sea (Randall, 2013; Golani & Fricke, 2018). After its introduction into the Mediterranean through the Suez Canal, this Lessepsian migrant has progressively expanded its distribution along the Mediterranean coasts and it is well established in the eastern Mediterranean along the coasts of Israel, Lebanon, Syria, Turkey, Cyprus, Greece, Egypt, and Libya (Azzurro *et al*., 2012, 2025; Golani *et al*., 2021). The species has reached the central part of the basin, having been recorded in Tunisia, in 2016 (Hamed *et al*., 2018) and in the Pelagie Islands, Sicilian Channel, Italy, in 2023 (Azzurro *et al*., 2025).

This species was first reported in the Maltese Islands by Borg & Evans (2022), through a photographic record made in the Cirkewwa Marine Park, located off the northernmost coast of the island. This initial record confirmed the occurrence of the species in Maltese waters but was insufficient to speculate on its establishment in the region. This record, together with the most recent one from Italy, inspired further investigation in Maltese waters through the "Spot the Alien" citizen science campaign, which resulted in the reception of a new photographic record from a local recreational diver.

This study reports the second sighting of *P. trispilus* in Malta, contributing to existing knowledge of the species' distribution in the region and reinforcing the importance of citizen science in monitoring the spread and establishment of new Lessepsian migrants within the Mediterranean.

MATERIAL AND METHODS

For non-experts, it is difficult to distinguish *P. trispilus* from other indigenous Labridae species, especially *Symphodus cinereus*. As mentioned above, the only known report of the species from Maltese waters to date was published in 2022 (Borg & Evans, 2022), with no additional records reported since.

Therefore, on the 17th of February 2025, a targeted Facebook post providing information on the species, accompanied by photographic references, was published on local diving and angling groups to actively elicit potential sightings of the species from local waters. In response, one of the authors (SB), a local recreational diver, submitted a report documenting a single specimen of *P. trispilus* observed during a SCUBA dive on 25 January 2025 at 35°55′9.85″N, 14°29′53.76″E, a site off Sliema, located off the eastern coast of the island of Malta, at a depth of 10 meters (Fig. 1), supported by both video and photographic evidence (Fig. 2; https://www.youtube.com/watch?v=LbHdBC5as7Y; https://www.youtube.com/watch?v=P_JZdbvWT1A). The two video clips hereby were uploaded on YouTube by one of the authors (AG), as they represent original footage.

The seabed at the observation site was characterized by reticulate *Posidonia oceanica* meadows interspersed with sandy patches. The individual was observed sheltering among the seagrass blades, a behaviour similar to that exhibited by many indigenous wrasse species. The water temperature at the time of the sighting was 17° C.

Since the individual was only filmed and photographed *in situ* by the recreational diver, it was not possible to collect the fish for further morphological or genetic analysis.

RESULTS

Despite the continuous movement of the individual and the absence of artificial illumination, the observed fish was identified by carefully examining the characteristic features of *P. trispilus* visible in the video footage and photographs obtained. In particular, our identification was based on the description provided by Randall (2013) and supported by other publications such as that of Ibrahim *et al*. (2019), focusing on features like the dorsal profile of head, the eye pupil rimmed with orange and the rest of iris having seven spoke-like dark lines, a vertical white streak to each side of the posterior edge of preopercle, a lateral line with black dots and dashes and white dots and finally the presence of a round black spot surrounded by a white ring on the operculum (Fig. 2). Also, three black spots anteriorly on the dorsal fin, one on each of the first three membranes, not visible in the photographic material, were observed during diving.

DISCUSSION

The occurrence of *P. trispilus* in Malta aligns with the documented westward spread of Lessepsian migrants across the Mediterranean following their first entry into the basin. Similar records from Greece, Turkey, and Italy suggest that the species is gradually adapting to new environments within the region.

The location of this recent sighting (Sliema) lies on the opposite side of the island from the previously-documented Maltese record of the species, suggesting that the species is probably under-reported from Maltese waters. Its cryptic appearance may have facilitated its unnoticed spread, as it is likely to be misidentified or overlooked by untrained observers (Kirsch *et al*., 2018).

This finding also raises new ecological concerns. Given the ecological importance of *Posidonia oceanica* meadows as key habitats within the Mediterranean, the potential impacts of *P. trispilus* on local fish communities should be further investigated in the Maltese area, as underlined for the nearby Tunisian region by Hamed *et al*. (2018). In particular, monitoring efforts should assess whether *P. trispilus* has already become established in Maltese waters and whether it may be interacting ecologically with native wrasse species through mechanisms such as competition or niche partitioning. For example, on Rhodes Island, one of the regions of the eastern Mediterranean most affected by biological invasions (Corsini-Foka *et al*., 2015) and invaded at an early stage by *P. trispilus*, this seagrass resident is present in fishery activities since 2002 (Corsini-Foka & Kondylatos, 2015) and its abundance indicates a rearrangement of fish assemblages in *P. oceanica* meadows (Kalogirou *et al*., 2010; Kondylatos *et al*., 2023). In samples collected from *P. oceanica* meadows carried out using the boat-seine method, among labrids, *P. trispilus* ranked second in terms of density after the Mediterranean rainbow wrasse *Coris julis* (L.), followed by the native labrids *Symphodus ocellatus* (Forsskål) and *Symphodus rostratus* (Bloch) (Kalogirou *et al*., 2010). Furthermore, using the same fishing method, *P. trispilus* showed a high frequency of occurrence, while, among alien fish, a not-negligible density was observed after the invasive *Siganus rivulatus*, *Fistularia commersonii*, *Parupeneus forsskali* and *Siganus luridus* (Kondylatos *et al*., 2023).

The sighting described in this note represents the second confirmed record of *P. trispilus* in Maltese waters, indicating a further extension of the species' known distribution. Although a single additional sighting of a species within an invaded area does not constitute definitive evidence of establishment of the same species, the continued sighting of the species at spatially disparate locations within the invaded area does hint at a further dispersal of the species within the same area.

The strategic location of the Maltese archipelago within the central Mediterranean, along the western-most margins of the Ionian Sea and at the nexus between the western and eastern basins, is probably one of the main drivers behind the high fish biodiversity recorded from the waters around the islands, given the sheer density of shopping traffic and the occurrence of a number of important hydrodynamic phenomena around the same islands. Borg *et al*. (2023) record a total of 412 confirmed fish species from Maltese waters, which represents more than half of all the fish species known from the Mediterranean Basin, with more than 10% (42 species) of the species confirmed for Maltese waters being either range expanding, non-indigenous or cryptogenic. Several studies (e.g. Bartolo *et al*., 2021) have in fact highlighted the importance of the Maltese Islands as an outpost for the monitoring of non-native species in the Mediterranean, given their geographic location within the south-east corner of the Strait of Sicily. A number of studies (e.g. Massi et al., 2021), have in fact postulated the biogeographic role played by the Strait of Sicily in moderating, as

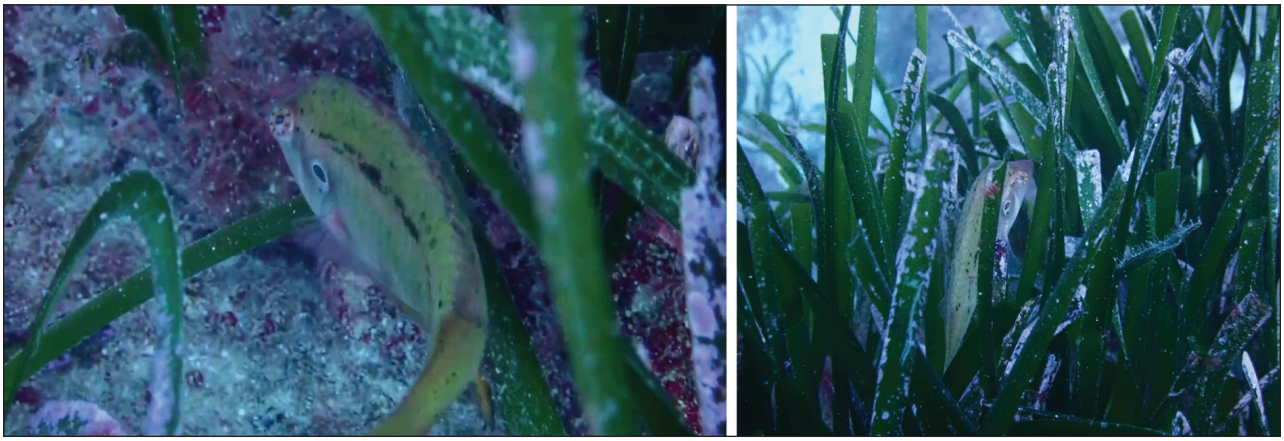


Fig. 2: *Pteragogus trispilus* ***dwelling among the blades of*** *Posidonia oceanica* ***seagrass off Sliema, island of Malta (January 2025; photos by Sarah Baumann).***
Sl. 2: *Pteragogus trispilus****, ki živi med listi morske trave*** *Posidonia oceanica* ***pri Sliemi, otok Malta (januar 2025; foto: Sarah Baumann).***



Fig. 3: *Pteragogus tripsilus* ***photographed within a brown algal assemblage at Mgarr ix-Xini, island of Gozo (May 2025; photo by DiveGozo).***
Sl. 3: *Pteragogus tripsilus* ***slikan med rjavimi algami v Mgarr ix-Xini na otoku Gozo (maj 2025; slika: DiveGozo).***

a 'semi-permeable barrier', the passage of species from the eastern basin of the Mediterranean into the western half.

The present finding supplements the first record of *P. trispilus* from Malta described by Borg & Evans (2022), further contributing to the growing checklist of marine fishes reported for the Maltese archipelago (Borg *et al.*, 2023), where a total of fourteen Lessepsian fishes have been recorded, after the recent addition of *Lagocephalus guentheri* Miranda Ribeiro, 1915 (Deidun *et al.*, 2024).

Furthermore, through this work, we wish to highlight the crucial role played by citizen science in the monitoring of marine alien species. However, effective citizen science relies on the constant engagement by a local researcher, who can provide knowledge, training, and feedback (Toomey *et al.*, 2025). This collaborative approach not only enhances the quality of species records but also contributes to raising a new generation of ocean-literate citizens, fostering a greater awareness and stewardship of marine biodiversity.

REMARK

On 25th of May 2025, after the acceptance of the present note, a local SCUBA diving club (DiveGozo - https://www.divegozo.co.uk) posted on its social media pages a photo of a fish belonging to an unkown species taken at a depth of approx. 10 m from a brown algal assemblage at Mgarr ix-Xini off the southern shores of the island of Gozo (36.019297°N, 14.273136°E). The fish (Fig. 3) was identified as *P. trispilus*.

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POTRDITEV POJAVLJANJA TUJERODNE USTNAČE VRSTE *PTERAGOGUS TRISPILUS* (ACTINOPTERYGII: LABRIDAE) ZNOTRAJ MALTEŠKIH VODA

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POVZETEK

Avtorji poročajo o drugem zapisu o pojavljanju vrste Pteragogus trispilus *Randall, 2013, ki izvira iz Rdečega morja in je znana lesepska selivka, v malteških vodah. Zapis o pojavljanju temelji na enem posamezniku, opaženem in fotografiranem 25. januarja 2025 na morskem travniku pozejdonke* Posidonia oceanica*, ki se nahaja na peščenem morskem dnu na globini približno 10 metrov. Ta ugotovitev dodatno podpira domnevno lokalno naselitev in stalno širitev areala te vrste v malteških vodah in Sredozemskem morju.*

Ključne besede: lesepska selivka, *Pteragogus trispilus*, Malta, drugi zapis o pojavljanju, *Posidonia oceanica*, občanska znanost

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