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Short Communication

# Mapping Seahorses Along the Spanish Coasts: Preliminary Insights from Citizen Science

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## Abstract

Seahorses are vulnerable due to habitat loss, overfishing, and pollution. Understanding their distribution is crucial for conservation. Citizen Science (CS) initiatives offer valuable tools for collecting large-scale data of marine species, including seahorses. This study used citizen science data to investigate seahorse distribution along the Spanish coast, including Balearic and Canary Islands. Data from the CS platform Observadores del Mar were analyzed for seahorse occurrence. We identified significant gaps in coverage, particularly in the Cantabrian littoral and some Mediterranean areas. The presence of three species were confirmed: *H. algiricus* (only present in Canary Islands), *H. hippocampus*, and *H. guttulatus* (absent in Canary Islands). Notably, our study revealed a lower abundance of *H. hippocampus* compared to *H. guttulatus*, especially in the Mediterranean. We also observed a preference for sandy areas and deeper depths in *H. hippocampus*. Due to the extremely limited observations of *H. algiricus*, we are unable to provide ecological information at this time. This study highlights

a) The value of CS in understanding seahorse distribution and informing future conservation initiatives, and

b) The need for targeted conservation efforts in areas with scarce seahorse observations.

**Keywords:** *Hippocampus*; Seahorse; Distribution; Spain; Citizen science; Conservation

**Abbreviations:** CS: Citizen Science, GIS: Geographic Information System, IUCN: International Union for Conservation of Nature, OdM: Observadores del Mar

## Introduction

Seahorses (*Hippocampus* spp.) are charismatic fish with unique morphological adaptations. Their vulnerability to habitat loss, overfishing, and pollution has made them a focus of conservation efforts worldwide [10,1]. Unfortunately, due to a lack of sufficient data, numerous species are still categorized as Data Deficient by the IUCN. Understanding seahorse distribution is crucial for effective management and protection. CS initiatives are valuable tools for collecting large-scale data on species [2-4], including seahorses [5-7]. We used CS data to investigate the occurrence of seahorses along the Spanish coast, including the Balearic and Canary Islands. We provide preliminary insights into the spatial patterns of seahorse distribution. Our findings will contribute to a better understanding of seahorse ecology and inform conservation efforts in these regions.

## Materials and Methods

We used Citizen Science (CS) data (period 2006-2023) from the Observadores del Mar (OdM) platform to examine seahorse distribution along the Spanish coast, including the Balearic and Canary Islands. The observations were validated by expert review. ArcGIS 10.8 software [8] was employed for mapping.

## Results and Discussion

A total of 767 observations were analysed, including *H. algiricus* Kaup, 1856 (n=629), *H. hippocampus* (n=137), and *H. guttulatus* Cuvier, 1829 (n=1) (Figure 1). The data analysis revealed a significant disparity in observational coverage across different regions of the Spanish coast (Figure 2). The Cantabrian Arc and some parts of the Mediterranean coast were identified as areas with limited data. The species *H. guttulatus* was more abundant than *H. hippocampus*, particularly in the Mediterranean (Table 1). This pattern is consistent across European coastal regions [9-12]. Although both species often co-occur, *H. guttulatus* prefers shallower complex habitats that are sheltered from strong currents [11]. Nearly half of all observations (42.1% for *H. hippocampus*; 47.7% for *H. guttulatus*) were recorded at depths between 6 and 10m. Beyond 15m, the number of observations decreased significantly (12.4% and 10.1%, respectively). At depths greater than 30m, only a single individual of *H. hippocampus* was observed (38m), in a sandy area devoid of vegetation. The presence of *H. hippocampus* (27.3%) in the shallowest zone (0-5 meters) was almost double that of *H. guttulatus* (14.6%). Considering the habitat types (sandy, rocky, seagrass meadow-macroalgae, and others) available for selection on the OdM platform, *H. hippocampus* showed a greater preference for sandy bottoms (44.8% of total observations) compared to *H. guttulatus* (37.9%) and a lower preference for seagrass meadows (17.1% in *H. hippocampus* and 28.2% in *H. guttulatus*). When assessing the number of specimens in relation to depth and habitat type, a higher relative occurrence of *H. hippocampus* was noted in sandy areas over seagrass meadows and at greater depths, compared to *H. guttulatus* (Figure 3). Beyond 10 meters, the presence of specimens decreased considerably, with a greater preference for rocky areas.

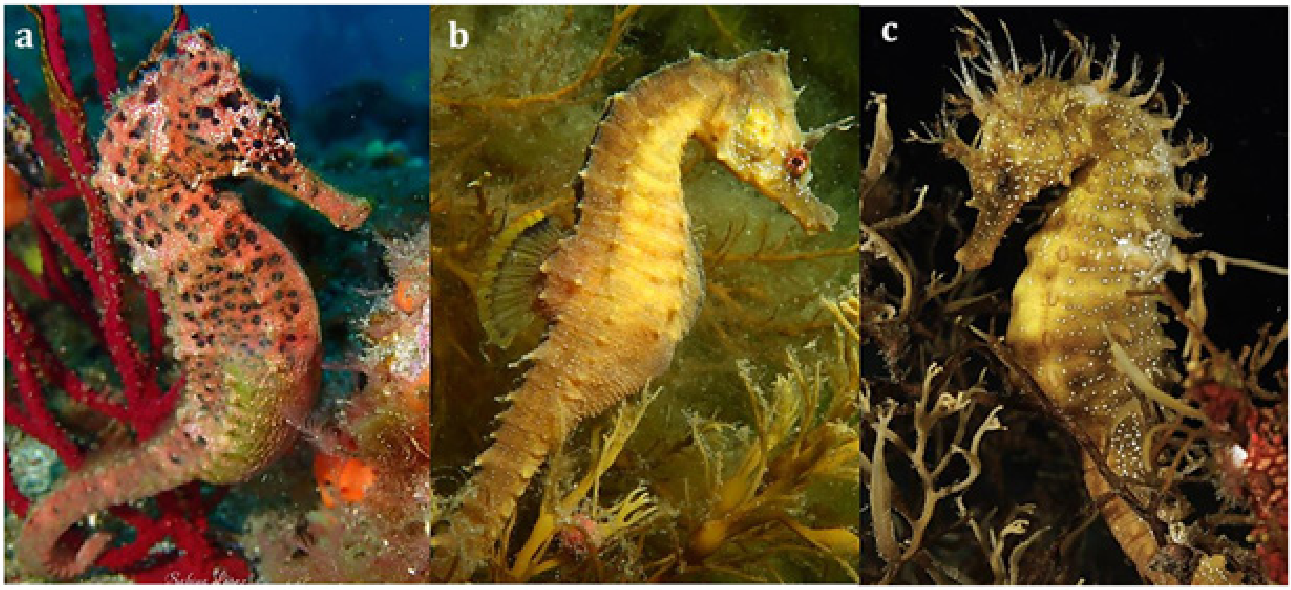


**Figure 1:** Species on the Spanish coasts:
a) *H. algiricus* (male) ©Sabina López
b) *H. hippocampus* (male) ©Fernando Quintela
c) *H. guttulatus* (female) ©Xaime Beiro

**Table 1:** Seahorse observations grouped by geographical region.

| Region | *H. algiricus* | *H. hippocampus* | *H. guttulatus* | Total |
|---|---|---|---|---|
| Peninsular Mediterranean | 0 | 91 | 216 | 307 |
| Balearic Islands | 0 | 7 | 103 | 110 |
| Peninsular Atlantic | 0 | 26 | 310 | 336 |
| Canary Islands | 1 | 13 | 0 | 14 |
| Total | 1 | 137 | 629 | 767 |

 

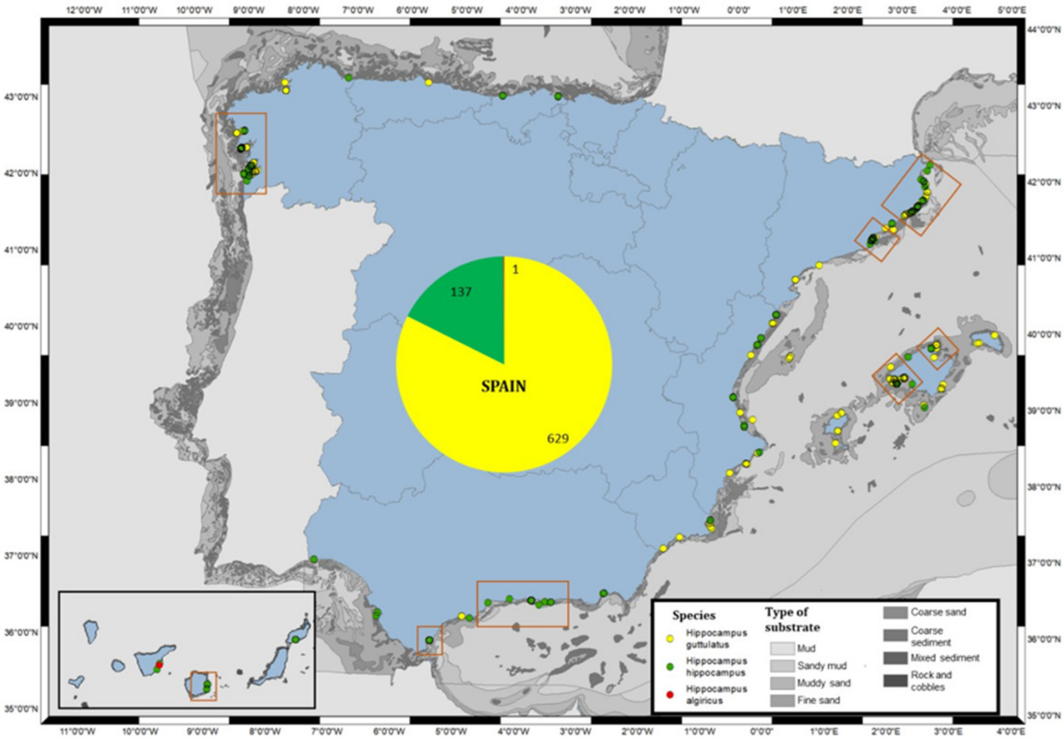


**Figure 2:** Occurrence of seahorse species along the Spanish coast (Source: OdM). Substrate data (standardized EUNIS format) from EMODNET. Red squares indicate key seahorse hotspots. Base map: Service of the National Geographic Information Center

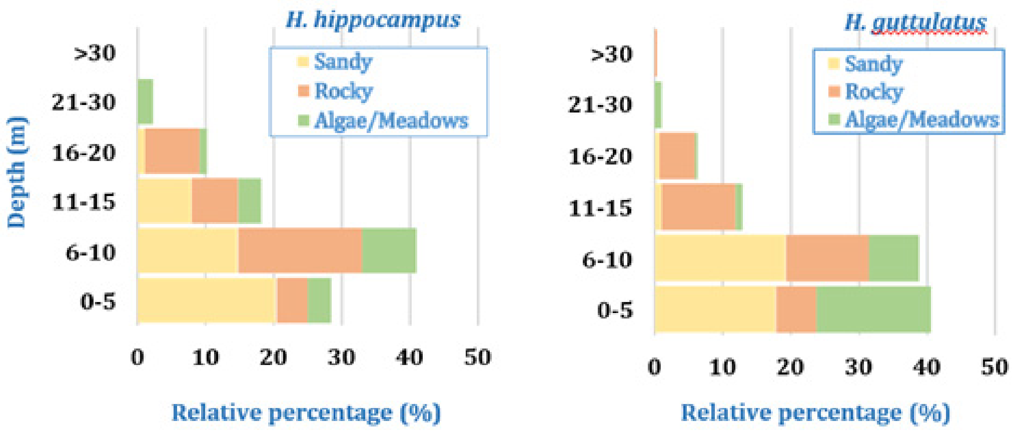


**Figure 3:** Percentage distribution of seahorse specimens across habitat types, categorized by depth range.

## Conclusion

The data provided valuable information on the spatial patterns of seahorse occurrence and identified areas with limited information. Hence, the study demonstrates the effectiveness of CS in contributing to marine conservation research and informing future conservation initiatives for the long-term survival of seahorses. However, the limited availability of CS data restricted the scope of this study. Besides this, while CS data has greatly enhanced our ability to collect population data, it comes with certain limitations. For seahorse observations made by scuba divers, depth is a significant constraint, as most dives do not go deeper than 15-20 meters, with only rare exceptions reaching 30 meters. Consequently, populations at greater depths are often overlooked. To expand the database and gain a more comprehensive understanding of seahorse distribution, we must actively engage the public and encourage their involvement in data collection, especially in understudied regions. Additionally, a recent study on the distribution of seahorses in the Gulf of Cadiz and nearby areas [13] highlighted the need for an inclusive approach engaging a diverse range of contributors (e.g., other CS portals, fishermen, and fisheries/oceanographic campaigns) to generate additional data.

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## Conflict of interest

All authors declare that they have no conflicts of interest.

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