CHECKLIST OF AMPHIPODS OF THE ITALIAN SEAS: BASELINE FOR MONITORING BIODIVERSITY

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Abstract: This preliminary study presents an updated checklist of amphipod crustaceans inhabiting Italian seas and provides valuable insights into their diversity, distribution, and ecological traits. By combining existing literature with unpublished data, we were able to record 500 species in Italian waters. The analyses revealed a significant increase in the number of amphipod species documented in the Country, primarily due to intensified research efforts and the introduction of non-native species. This study highlights the importance of ongoing monitoring and research to assess marine biodiversity. Future efforts should prioritize understudied groups, such as planktonic species, and those living in deep-sea marine environments.

Keywords: Amphipoda; Italian Checklist; Mediterranean Biodiversity

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Introduction

This study presents the preliminary data of the revised checklist of amphipods of the Italian seas as a contribution to a comprehensive analysis of species occurrence, which is essential for biodiversity assessment and monitoring activities.

The amphipods are an abundant and ecologically important component of the marine communities [6, 8]. They include species belonging to different trophic and ethological categories and play a pivotal role in the ecology of marine habitats [4, 7]. The amphipods are particularly sensitive to chemical and physical changes and respond relatively quickly to natural and anthropogenic stress factors [2, 6] therefore, they can be used as bioindicators for monitoring the marine environment.

In this context, the updating of species checklists can be considered a tool of fundamental importance to better understand the spatial and temporal evolution of the changes that biodiversity can undergo. Unfortunately, the amphipod fauna is often overlooked. A comprehensive study on the geographical distribution and ecology of the benthic amphipods of the Mediterranean Sea was edited by Sandro Ruffo between 1982 and 1998 aimed mostly at the taxonomic identification of species. It included about 450 species [9], while the information on pelagic amphipods came only from a few articles [3]. Later, in 2010, Ruffo focused on the Italian fauna and compiled the first checklist of marine amphipods, which included 457 species, both benthic and pelagic [10].

The aim of this work was to provide up-to-date information on the amphipod fauna of the Italian seas and to show whether it is representative of the Mediterranean Sea.

Materials and Methods

A review of the available literature was carried out. Unpublished data, including those from various surveys, were combined with the lists of scientific articles. The literature search was conducted through the tool "Advanced Search" of Google Scholar using the keywords "checklist"; "Italy"; "Italian"; "amphipod*"; "peracarid*"; "Crustacea*". To date, more than 100 papers have been consulted. In order to make a comparison with the records of the entire Mediterranean Sea, a similar search was conducted replacing the keyword 'Italian' with 'Mediterranean'. To date, more than 60 papers have been consulted with updated records from the Mediterranean region, outside Italian waters. A new update on the number of species in Italian waters and, concurrently, in the Mediterranean Sea has been obtained. The nomenclature of all species has been updated in accordance with the World Amphipoda Database [5]. A dataset was created for all the Mediterranean species, in which the amphipod species were assigned to different ecological and biogeographical traits, i.e. zoogeographical distribution, bathymetry and substrate preference.

Results

The project, which involved several institutions, produced preliminary results that updated the Italian checklist to 500 species, differently present in the various

biogeographical sectors (Figure 1); seven species were non-indigenous species (NIS), bringing the total number of NIS present in Italy to 11.

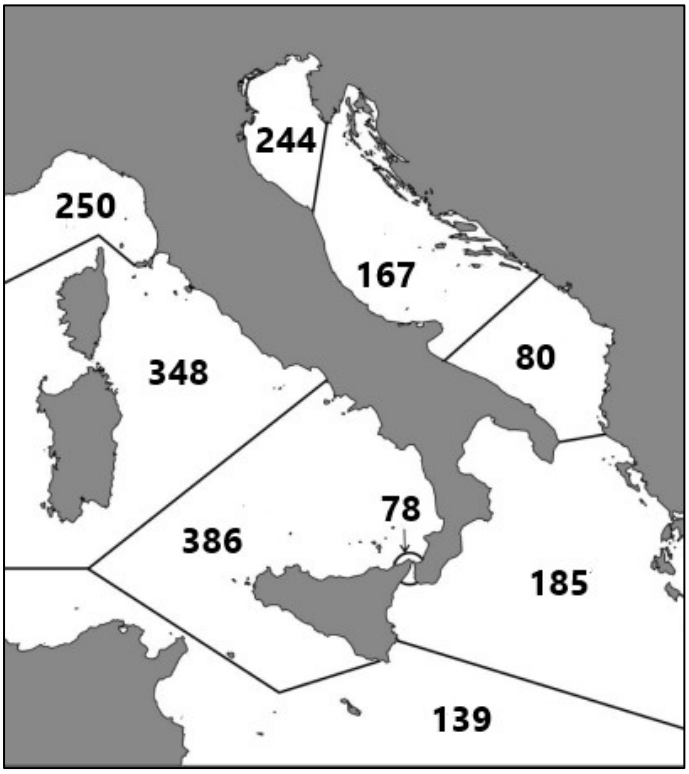

Figure 1 – Map of Italy representing the division of the Italian seas into nine biogeographic sectors. Numbers indicate species richness in the various sectors.

The total number of Mediterranean amphipods recorded in this first revision was 646 (Figure 2), including the Italian species.

Species richness is illustrated by categorising the Italian seas into the nine biogeographical sectors [1] (Figure 1), and the Mediterranean Sea into the two sub-basins (western and eastern) (Figure 2). Regarding Italy, 352 records reported species in sectors where they had not previously been recorded.

The update of the Italian checklist has contributed to expanding our knowledge of the entire Mediterranean fauna, which currently counts 581 species in the western basin and 525 in the eastern basin.

In order to obtain a complete overview of the amphipod fauna in the Mediterranean region, a dataset was created including information on ecological and biogeographical traits. The Mediterranean endemic species were 205; the Atlanto-Mediterranean species 277; the cosmopolitan species 149; the NIS 15 (Figure 3).

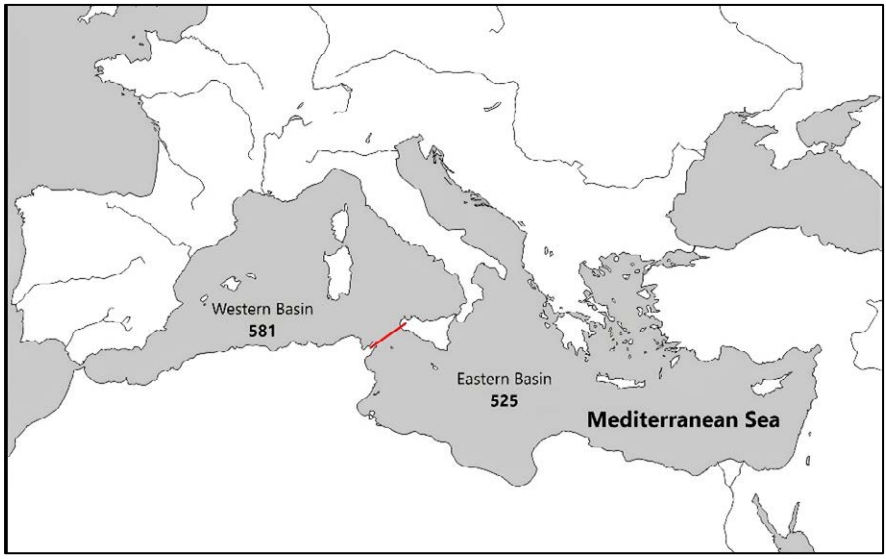

Figure 2 – Map representing the Mediterranean Sea divided into two sub-basins (western and eastern). Numbers indicate species richness in the two sub-basins.

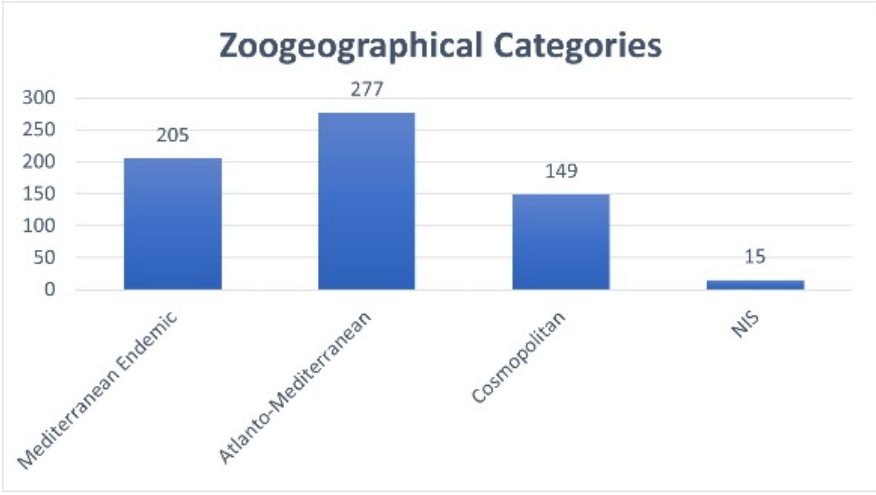

Figure 3 – The Mediterranean amphipod species assigned to categories according to zoogeographical distribution.

In terms of bathymetric categories, the supralittoral species (semi-terrestrial amphipods) were represented by 2 %; mesolittoral species by 11 %; infralittoral species by 35 %; circalittoral species by 28 %; bathyal species by 17 %; abyssal species by 3 % and species with no information by 4 % (Figure 4).

The amphipod species were also categorised according to their general substrate preferences: vegetal substrates (both algae and marine phanerogams), soft bottom, hard bottom, artificial substrates (fouling). Vegetal substrates accounted for 28 %, soft bottoms for 44 %, hard bottoms for 17 %, artificial substrates for 4 % and the species for which no information was available for 7% (Figure 5).

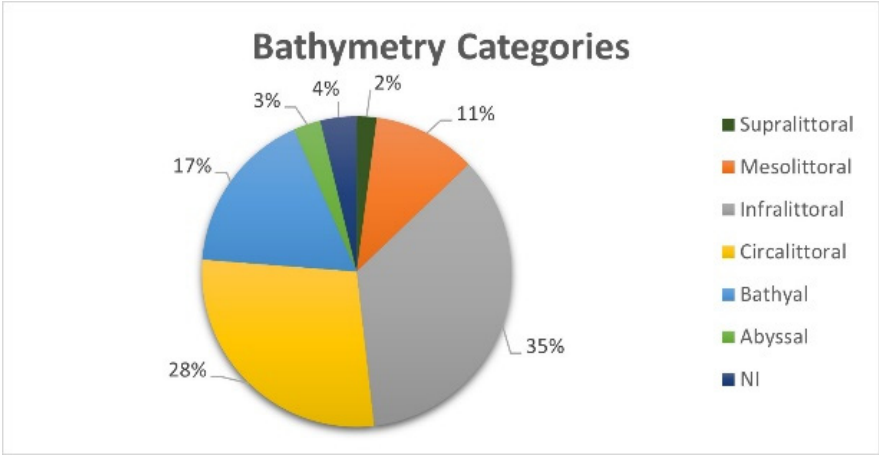

Figure 4 – Percentage of the Mediterranean amphipod species assigned to categories based on bathymetry.

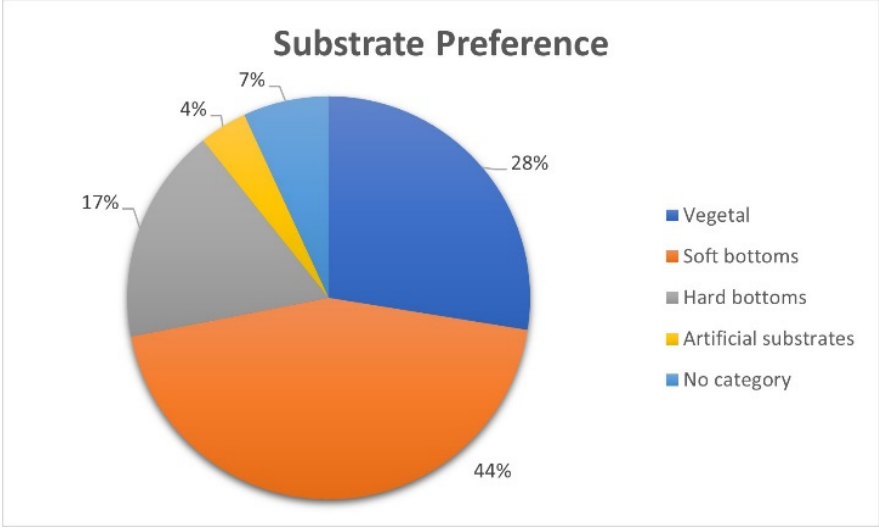

Figure 5 – Percentage of the Mediterranean amphipod species assigned to categories according to substrate preference.

In terms of bathymetric categories, the supralittoral species (semi-terrestrial amphipods) were represented by 2 %; mesolittoral species by 11 %; infralittoral species by 35 %; circalittoral species by 28 %; bathyal species by 17 %; abyssal species by 3 % and species with no information by 4 % (Figure 4).

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Discussion

This preliminary study provides a comprehensive and up to date overview of the diversity and distribution of amphipod crustaceans in the Italian seas. The analysis revealed that the number of amphipod species recorded in Italy has increased considerably.

Updating the checklists is an important step towards a better understanding of marine biodiversity in the Italian seas and in the Mediterranean in general.

Thorough knowledge of this taxon is essential for assessing the state of marine ecosystems, as amphipods are sensitive indicators of environmental conditions and can be used to monitor the impact of human activities on marine ecosystems; for biodiversity management, as the identification of endemic and threatened species can guide conservation and management strategies for marine biodiversity and for a better understanding of ecological processes; the study of amphipods can provide valuable information on ecological processes that occur in marine ecosystems, as they are an important link between primary producers and higher-order consumers, and are an ecologically important group contributing to nutrient cycling.

In conclusion, the species included in the checklist of Italian seas, which represent 76.7 % of the species present in the Mediterranean Sea, indicate that the Italian seas play a central role in the amphipod diversity of the Mediterranean Sea. Nevertheless, further sampling and monitoring efforts are advisable, especially for planktonic species for which there are very few new records, for parasitic amphipod species and for species living in extreme marine environments.

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