

A PROPOSAL FOR A UNIFORM TERMINOLOGY ON BIOINVASIONS FOR MEDITERRANEAN MARINE SCIENTISTS

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Abstract

A consensual set of definitions regarding bioinvasions is essential in order to facilitate discourse among the science, policy and management communities dealing with the issue. Considering both the extent of the impact and the mode of entry of an alien species into a new environment, some definitions are being proposed as an operative tool for marine scientists working in the Mediterranean Sea.

Key words: biological invasions, definitions

The advent and spread of alien species in the Mediterranean has been repeatedly discussed in various forums over the past three decades, and it has been widely perceived that the littoral and infralittoral biota of the Mediterranean Sea is undergoing a rapid and profound change (1-5). The rapidly expanding study of marine bioinvasions raised awareness and concern of governmental and regulatory bodies as well as the public, and resulted in a glut of specialized terms. The words used to describe non-native species vary among scientific disciplines, linguistic and national borders, and frequently constitute synonyms, partial synonyms and neologisms that hinder communication. Confronted with a plethora of unsettled and overlapping terms for alien organisms, we have sought to clarify the terminology for Mediterranean marine scientists. Our goal is to compile clear and brief definitions for terms needed by students, researchers, and policy and management personnel interested or concerned about invasions in the marine environment. We have combed the literature for the new terminology generated by recent initiatives, including the proposed new IUCN categories defining the status of alien species¹.

Our view of native species and their natural ranges and, *inter alia*, of alien species, is largely dependent on scientific knowledge of the taxa in a certain geographic region. In the Mediterranean Sea, for instance, a number of extensive biological surveys and identifications were conducted after 1950, thus allowing a reasonable measure of confidence in separating the alien from the native biota, and reducing the cases of cryptogenic species to earlier possible introductions. A notable exception are the Red Sea taxa, where 1920 was chosen as a cut-off date, because the Cambridge expedition to the Suez canal furnished a body of valuable scientific data (4).

In defining the terms we deliberately made a distinction between the scale and impact of the alien populations on the native ecosystem, and their mode of entry. From our studies of alien organisms in the Mediterranean Sea, we have noted that some are known only from chance collections of non-breeding individuals, other from breeding populations that remain for decades in low numbers, whereas in some cases we have witnessed rapid population growth and high impact upon the ecosystem and risk to humans. Accordingly we have ordered our definitions in a nested hierarchy of increasing order of the alien's population size and impact. As to mode of entry, we have made a distinction between introduction, which is wholly derived from human actions, and range expansion, which can result from natural phenomena or from both natural and human-induced environmental changes. Introduction is further divided into primary and secondary introduction and each of these can be intentional or unintentional. Secondary introduction could also result naturally.

In the course of our classification effort, we are aware that nature is a continuum and not easily divided into objective units, we therefore aim to produce a pragmatical tool in order to facilitate the exchange of ideas among the scientists of the many countries bordering the Mediterranean Sea. Moreover, the dynamics of invasion and of research progress mean that organisms may be recognised as fitting in different categories according to the spatial and temporal setting of their observation.

Terms and definitions

- Native : an organism occurring within its known or consensual range (as documented in scientific publications).
- Alien : an organism, inclusive of parts, gametes or propagules that may survive and subsequently reproduce, occurring outside of its known or consensual range (as documented in scientific publications). It includes established aliens, invasive aliens, nuisance aliens in increasing order of population expansion and impact. (Synonymous terms: non-native, non-indigenous, allochthonous, foreign, exotic, immigrant).
- Established alien : an alien organism that is reproducing in the wild and has established a permanent population outside its natural range.
- Invasive alien : an alien organism whose population has undergone an exponential growth stage and may threaten the diversity or abundance of native species and the ecological stability of the impacted ecosystem.
- Nuisance alien : an alien organism that poses a risk to the well-being of humans.

As to mode of entry:

- Expanding alien : an alien organism that has extended its range as a result of changing environmental conditions (e.g. temperature, current regime) or by chance events, such as the attachment to drifting objects and phoresy.
- Introduced alien : an organism occurring outside its native range as a consequence of intentional or unintentional human action.
- Intentional introduction : the deliberate transfer of alien organisms.
- Unintentional introduction : the unintentional transfer of alien organisms through shipping, aquaculture, canals, research etc.
- Secondary introduction : a dispersal of an alien organism beyond its primary location of introduction; secondary introduction could be intentional, unintentional, or by natural means.

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