UPDATING OF THE CIESM WEBSITE - ATLAS OF EXOTIC SPECIES IN THE MEDITERRANEAN: MACROPHYTES
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Abstract
An update of the CIESM website of exotic macrophytes introduced into the Mediterranean Sea is proposed. A list of 19 new exotic taxa has been drawn up, and among them 7 invasive or potentially invasive taxa. Overall, 129 taxa of exotic macrophytes have been recorded in the Mediterranean Sea.

Introduction
The Mediterranean distribution of 110 exotic marine macrophytes is presented on the CIESM website (1). To highlight any recent change in the flow of species introductions and to identify any new macrophyte likely to significantly change the composition and function of Mediterranean assemblages, we analysed the inventories of exotic species and publications on this subject available since 2009 (2-5).

Materials and Methods
For each species, we considered: D: the date of introduction (ante- or post-2009), R: the native region, Dist.: the Mediterranean distribution, V: the putative vector(s)/pathway(s) of introduction and S: the status in the recipient area(s), i.e. Casual if only one record, or Established, if several records in space and/or in time. A given species can have several putative vectors/pathways of introduction.

Results and Discussion
A total of 19 taxa (7 Chorobionta, 7 Rhodobionta and 5 Ochrobionta) have been listed (Table I) but only 4 of them, namely \textit{Ascophyllum nodosum}, \textit{Hypnea flexiculata}, \textit{Solieria sp.} and \textit{Ulva californica}, were reported after 2009, attesting the apparent absence of recent increase in the rate of species introduction. The major putative vector/pathway of recent introductions is shellfish transfer (9 taxa), mainly in the aquaculture sites of the North-Western Basin and the Northern Adriatic Sea, followed by the Suez Canal (5 taxa), mainly in the Eastern and Central Basins, shipping (5 taxa), and the aquarium trade (1 taxa). The major donor region is the Indo-Pacific Ocean (13 taxa), in relation with the two major vectors/pathways of introduction, followed by the Atlantic Ocean (6 taxa). The majority of taxa are established (12 established versus 7 casual), and 7 are invasive, namely \textit{Caulerpa taxifolia var. distichophylla}, \textit{Chry诺nephos lewisi}, \textit{Codium arabicum}, \textit{C. parvulum} and \textit{Graciaria vermiculophylla}, or potentially invasive, namely \textit{Solieria sp.} and \textit{Ulva californica}. However, we must not forget that the apparent absence of recent increase in the introduction rate can be merely an artefact due to the weakness or the unbalanced effort of investigations in certain regions. The species introductions through shellfish transfers have been thoroughly studied in the North-Western Basin and the Adriatic Sea but the small Lessesian migrants remain poorly known. It is the same situation for the exotic marine flora of the southern Mediterranean coasts. An in-depth study of the marine flora of the Middle-East and the North Africa would probably increase the number of exotic macrophytes occurring in the Mediterranean Sea and the proportion of Indo-Pacific species arriving in the Mediterranean Sea through the Suez Canal. However, the possibility that the number of introduced macrophytes is reaching a plateau cannot be excluded as suggested by (6).

Overall 129 taxa of exotic macrophytes were recorded in the Mediterranean Sea.

References