



# NIS from Gibraltar; the Disregarded Side of the Biologic Invasion of the Mediterranean Sea

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**Received Date:** August 05, 2019; **Published Date:** August 09, 2019

## Editorial

From the exit of the eminent publication [1] celebrating the one hundred years of Suez Canal opening, the attention of Mediterranean Biologists has been focused on the so called Lessepsian migration, which allowed the extension of the geographic distribution of species from Red to Mediterranean Sea [2]. The Suez Canal connects two relatively related sea basins (north Red Sea and Levant Basin of the Mediterranean) and the so called Lessepsian migration is typically unbalanced, being characterized by the arrive in the Mediterranean of more species than those (anti-Lessepsian) extending their geographic distribution in the opposite way. This fact produces an increase of the Eastern Mediterranean species richness and, contemporaneously, an increase of ecological and economic problems for coastal Countries.

This invasion of Red Sea species is under study from 50 years and monitored in detail. A Lessepsian Province has been proposed and defined in the Levant neritic waters, and geographic distributions of “invaders” are updated periodically, with records of Lessepsian species which recently arrived in the central Mediterranean basin (Ionian Sea). The presence of tropical fauna into the Mediterranean, however, has to be considered in a frame which contains also species (ante-Lessepsian) deriving from Tethys ancestors (survived to the Messinian drying

up of the basin, from 7 to 5 million years ago), and tropical Atlantic species entering from the Gibraltar strait. Due the geographic collocation of Gibraltar (about 36° N) and the Suez canal (32° N at its Mediterranean extremity), the entrance of tropical species from Red Sea has been favored. Many species, however, are today encouraged to widespread in the Mediterranean also by the increasing of average temperature and the general climate warming. This last phenomenon could be responsible of the entrance of new tropical actors also from the Gibraltar strait.

The large amount of Lessepsian species (about 60% of the total Mediterranean invaders) and the high percentage of species additionally introduced by aquaculture, shipping or trade activities, distracted the attention of the biogeographers from the Gibraltar strait. The ongoing climate warming, however, could favor a northwards shift of the geographic distribution of the tropical Atlantic fauna, allowing them to reach the Gibraltar strait, which is the entrance door for the Mediterranean. Reports of Atlantic species, or northwards shift of subtropical species already present in the southern Mediterranean, are an evident consequence of this ongoing process.

This new entrance flow has to be considered by Biogeographers in the frame of the Non Indigenous Species (NIS) management, and in the frame of the Marine Strategy Directive of EU. In fact, notwithstanding the definition of NIS collocates the phenomenon under the human responsibility, and the Atlantic – Gibraltar way could be not considered under this definition, the arrival of NISs is somehow alterative of ecological equilibriums and deserve our attention. However, to tell the truth, we cannot exclude that even the climate change can be considered as a consequence of human activities, although in a not individuated percentage of responsibilities.

## References

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