

Preliminary results on the distribution extension of five data-limited fish species in the eastern Mediterranean Sea

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Introduction:

The biodiversity of the Mediterranean Sea is rapidly changing due to anthropogenic activity and the recent increase of sea surface temperature. Citizen science is escalating as an important contributor for the inventory of rare and non-native species. Major gaps exist regarding species assemblages in deep waters (Danovaro et al. 2010), particularly of rare species, due to fragmented research, scarcity of observations, and difficulties in investigating it. In this study we present five new records of rare native fish species from the eastern Mediterranean Sea: *Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817), *Ranzania laevis* (Pennant, 1776), *Dalatias licha* (Bonnaterre, 1788), *Lophotus lacepede* (Giorna, 1809) and *Sudis hyalina* (Rafinesque, 1810).

Tools & Method:

The data, presented are derived from two citizen science projects

1. Is it Alien to you? Share it!!!
2. M.E.C.O. project

These two projects numbers more than 10000 members on their Facebook groups up to date, and were created for expanding the scientific knowledge and promoting citizen science.

Observers in both projects are requested to provide the photo of the specimen and information on the size (length and/or weight), the depth, the number of observed specimens, the exact location, the date and the type of observation (Table 1). Only confirmed observations are recorded in their database either through photo-identification or in-situ validation.

Table 1: the species occurrences and the information about capture along with morphometric data

ID	species	coordinates	TL	date	observer
1	<i>A. alexandrina</i>	34.665670, 33.055400	-	14/12/2017	Recreational Fisher
2	<i>A. alexandrina</i>	34.592893, 32.722270	-	29/11/2010	Recreational Fisher
3	<i>A. alexandrina</i>	34.981681, 34.003417	15cm	11/9/2018	Spear-fisher
4	<i>A. alexandrina</i>	34.726467, 33.336034	22cm	16/3/2017	Underwater Photographer
5	<i>A. alexandrina</i>	36.895517, 27.288586	50cm	1/7/2016	Recreational Fisher
6	<i>A. alexandrina</i>	34.726271, 33.337485	45cm	4/2/2015	Recreational Fisher
7	<i>A. alexandrina</i>	34.671017, 33.044275	45cm	30/5/2015	Recreational Fisher
8	<i>A. alexandrina</i>	35.008363, 34.063443	6,5cm	9/11/2018	Scuba Diver
9	<i>A. alexandrina</i>	35.013500, 34.037400	10cm	20/11/2012	Underwater photographer
10	<i>A. alexandrina</i>	35.013500, 34.037400	10cm	20/11/2012	Underwater photographer
11	<i>R. laevis</i>	39.446139, 24.079667	53cm	21/12/2014	Surface longline
12	<i>D. licha</i>	36.7738, 26.0439	150cm	5/11/2016	Demersal longline
13	<i>L. lacepede</i>	39.059076, 23.569742	160cm	3/3/2017	Demersal longline
14	<i>L. lacepede</i>	39.037141, 23.665093	140cm	9/3/2017	Demersal longline
15	<i>L. lacepede</i>	36.377600, 25.595700	60cm	1/1/2016	Demersal longline
16	<i>L. lacepede</i>	39.889917, 23.804250	100cm	6/10/2017	Swordfish longline
17	<i>L. lacepede</i>	35.582773, 23.491417	140cm	1/11/2018	Professional Fisher
18	<i>S. hyalina</i>	35.861500, 30.108900	-	6/11/2016	Demersal longline
19	<i>S. hyalina</i>	34.546100, 32.949000	30cm	17/8/2017	Boat based recreational fishing
20	<i>S. hyalina</i>	35.522455, 24.015418	-	1/1/2014	Longline
21	<i>S. hyalina</i>	35.228723, 32.866968	40cm	21/7/2018	Recreational Fisher

Results:

In total, 21 new occurrences were recorded filling an important knowledge gap for the distribution of these species, signifying the important role of citizen participation as a contributor to extended knowledge on marine biodiversity.

These records suggest that the **Alexandria pompano** (Figure 1D) has now become a frequent species in the Eastern Mediterranean Sea, and particularly in Cyprus. The **Slender sunfish** (Figure 1A) is a pelagic-oceanic species found circumglobally in tropical and temperate seas, however, reports from the Eastern basin scarce. The **Kitefin shark** (Figure 1C) is one of the largest deep-sea sharks occurring in the Mediterranean Sea at depths between 200-900m, where it can be considered as one of the top predators. It is a regular, though uncommon, species in the western part of the basin (Ragonese et al. 2013), whereas its presence in the eastern Mediterranean Sea has been historically considered as very scarce.

References:

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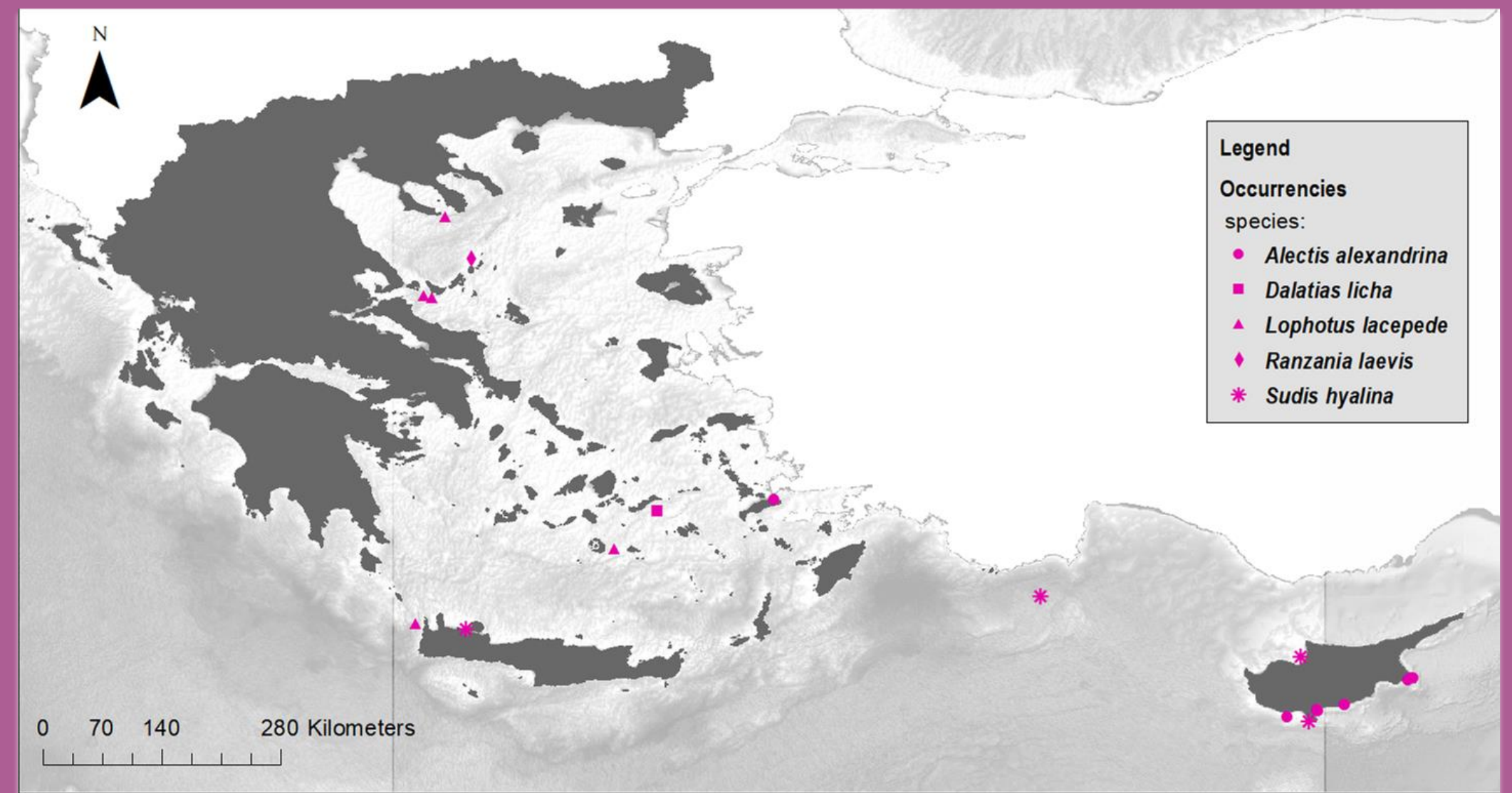


Figure 1: the species occurrences, in the Aegean and Levantine sea, data from Greece and Cyprus

The **Crested oarfish** is a large bathypelagic species that is remarkably sporadic in the whole Mediterranean Sea. Similarly to most of the deep-sea fishes, it is a more regular and frequent species in the western Mediterranean Sea, whereas it has been rarely reported in the eastern part of the basin. Currently, only four published records are known, all from the Aegean Sea. Finally, **S. hyalina** (Figure 1B) is a large, rare bathypelagic fish with circumglobally distribution. Although it is considered regular in the western part of the Mediterranean basin, only five documented records of the species exist from the eastern Mediterranean basin (Türker et al., 2017).

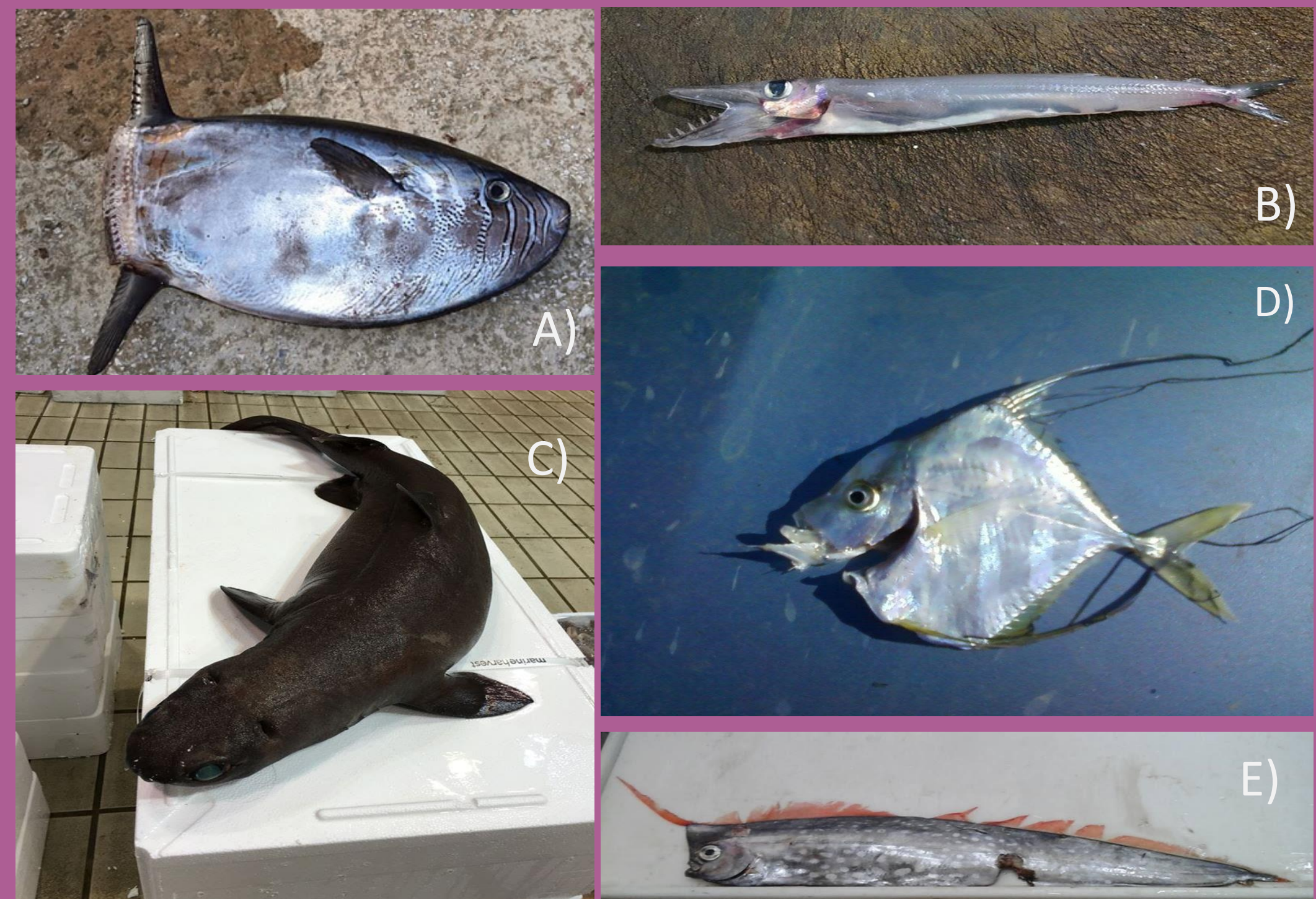


Figure 2: Some of the specimens' photos that were collected through the program "Is it Alien to you? Share it!!!" A) *Ranzania laevis*, B) *Sudis hyalina*, C) *Dalatias licha*, D) *Alectis alexandrina*, E) *Lophotus lacepede*.

Conclusion:

Rare species are often considered poorly informative from the ecological point of view, chiefly because of their sporadic occurrence in marine environments; however, spatial and temporal variations in the distribution of rare species might work as a hint for climate and environmental change and for this reason it is important to keep note of such records. Until recently, the scarce communication between researchers and citizens entailed the loss of a part of available information on these species; while the recent increase in the use of social networks allows a quicker and more stable communication, that can result in an increase of records on rare and alien species and better monitoring of the distribution. Finally, we hope that when more data are collected, we can possibly identify geographic patterns for these rare species, and their habitat.