Final Evaluation Report

Your Details	
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Project Title	Ross Worm (Sabellaria spinulosa) Reefs in the Black Sea: Mapping and Conservation of a special habitat
Application ID	38077-2
Date of this Report	11 October 2023

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Determining and monitoring the distribution areas of the Sabellaria reef in Ordu province				The distribution of *Sabellaria* reef within the borders of Ordu province was determined and mapped at points where the reef covers large areas (Fig 1). *Sabellaria* colonies have been found in both natural rocky areas and artificial breakwaters. Separate small colonies have been observed at points where breakwaters are located. In natural rocky areas, colonies are spread over a wide area and their height above the sea floor is quite high. At some stations, the height of the reef reaches 63 cm (Table 1). Seasonal changes have also been observed in the structure of the reef. It was observed that some of the colonies dispersed and disintegrated after the summer season, when the wave impact increased considerably. This is typical for *Sabellaria* reefs, which show seasonal phases of growth and disintegration. Although this disintegration is negative for the reef, it has created hiding places for fish, crabs, etc., species that feed/live in the reef. An increase in the abundance of species within the reef was observed during dives in summer period.
Investigating the existence of Sabellaria reefs in areas outside Ordu province.				Important information has been obtained regarding the distribution of *Sabellaria*. In a study conducted by Kus and Kurt-Sahin (2016), although *Sabellaria* individuals (not the reef) were detected on the coast of Sinop province, no reef structure was found during dives at the same point. However, the fact that observations can be made in a limited area is not enough to say that there is no reef off the coast of Sinop province. Observations need to be

				made at more stations in this area. On the other hand, small *Sabellaria* colonies have been detected on the coasts of Trabzon province. Although this suggests that the distribution of *Sabellaria* is eastward from Ordu province, genetic analysis is required to determine this definitively.
Education in schools and meetings with stakeholders				Within the scope of the project, presentations were made in schools about both the *Sabellaria* reef and the marine ecosystem in general. During these presentations, samples of some sea creatures were shown to the students and general information was given. Meetings were held with diving schools operating in Ordu province and its surroundings, and information about the reef was shared. Also, posters and leaflets were left to inform those who came to dive. In addition, diving schools operating outside the Black Sea region were contacted and a communication network was created to obtain information in case the reef was observed on the Marmara and Aegean coasts. During the interviews with the fishermen, information about the reef was given and information was obtained from them about the points where they observed the reef. The points where fishermen observed the reef structure coincide with the areas where we observed the reef most densely during our work. Although they do not provide consistent information, according to the information we obtained from fishermen, the reef structure has been observed off the coast of Ordu for at least 5 years. Meetings were held with decision-making government institutions. During these meetings, information about the reef was shared and posters and leaflets were left. Among these meetings, especially the meeting with the Provincial Directorate of Environment, Urbanization and Climate Change was

				very beneficial. Since the reef is under protection, evaluations regarding this species will be included in the Environmental Impact Assessment Reports required for construction works to be carried out on the coasts from now on. This is very important in terms of protecting the species' habitat and preventing its destruction. If long-term monitoring of the reef can be achieved, it will pave the way for the creation of a marine protected area off the coast of Ordu.

2. Describe the three most important outcomes of your project.

(a) The most important outcome of this project is that scientific data of the *Sabellaria spinulosa* reef, a new record for the Black Sea, has been collected and shared with the scientific community. Measuring the parameters for the structure of the reef has formed a basis for further work. This will allow further research to determine whether the reef is developing or being damaged.

(b) The structure of the reef has been identified outside the borders of the Ordu province (e.g., in Trabzon). This is an important result in showing that the reef has a more widespread distribution on the Black Sea coast.

(c) The sharing of the project results with the decision-making state institutions has paved the way for the presence of this reef to be taken into account in future structural work on the coasts of the Ordu province. Thus, the first step has been taken to protect some of the areas where the *Sabellaria* reef has been identified.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The most important of the challenges faced during the project is that some areas where the reef has been identified are often wavy and turbid. This has resulted in limited time for diving and therefore extended working time. Although wind and wave forecasts were followed and diving times adjusted accordingly, some stations were visited more than expected due to sudden weather changes. The fact that the water is mostly turbid has negatively affected video and photographs, and hence the mapping of wider areas. The problem of turbidity was overcome by taking video and photographs more closely. However, this has made it more difficult to map larger areas.

4. Describe the involvement of local communities and how they have benefitted from the project.

We can count the fishermen as the group that benefited from the project. In meetings with the fishermen, some of them said they had seen the reef before but had no knowledge of it. We gave them detailed information about the reef. It's been very useful for them to learn something they've seen before, but they don't know. Since the reef structure has a 'cemented sand in honeycomb shape', even if the fishermen have seen the reef structure or piece of it, they wouldn't know that a worm build it. Due to that, they showed interest to the different photos of reef and specimen in the poster and flyers.

Another group that had benefited significantly was the students. It was spectacular for them to learn something new about marine life. It was quite exciting for them to see the presentations as well as some of the marine specimens. Especially for the younger age children who don't have any chance to explore underwater, seeing some marine species in real life was very good experience for them.

Besides, we also informed the local people we met during the dives about the marine ecosystem and how to protect it.

5. Are there any plans to continue this work?

We definitely want to continue this work. Because there are unanswered questions about the presence of the reef in the Black Sea. The first is the detection of the reef's spread direction (from east to west or vice versa). This requires sampling and genetic analysis of each detected reef. In addition, it is necessary to determine the presence of eggs and larvae in the water column and to determine the areas they can reach by particle transport analysis. This would make it predictable where else in the Black Sea the reef could be found.

Another issue here is the affinity of the reef-forming individuals with the Mediterranean and Atlantic populations. The results of previous genetic analysis have shown the greatest resemblance to the population of *Sabellaria* on the Italian coast. However, it has not been compared with the populations on the coast of United Kingdom, where the reef has the highest spread and the point of origin. Bilateral co-operations and joint work are planned for this purpose. After the pre-print version of our article was published, scientists in Italy reached out to us and the first steps for joint work were taken. Joint work with both the UK and Italy would contribute to an understanding of the species' bio-ecology, as well as the assessment of conservation strategies.

6. How do you plan to share the results of your work with others?

The result of the project is about to being published as a scientific paper in Marine Biodiversity journal (SCI-E, Impact Factor: 1.6). Besides, new papers and reports are in the process of being prepared. Also, news from local and national media will reach wider audiences.

7. Looking ahead, what do you feel are the important next steps?

The next important step is to identify the direction and origin of the reef's spread. Thus, it will be possible to predict in which other areas of the Black Sea the reef may be found. This data will also contribute to the assessment of conservation strategies for the reef in the whole Black Sea basin. At the same time, it is known that the *Sabellaria* reef is in competition with species such as mussels and oysters for both area and nutrition (Cunningham et al. 1984; Pohler 2004). It is important to establish a competitive relationship between the alien *Crassostrea gigas*, which has begun to spread rapidly in the Black Sea in recent years, and the *Sabellaria* reef.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

The Rufford logo was used in all visual and printed materials produced under the project (t-shirts, posters, flyers, presentations, etc.). At the same time, the scientific article states that the project is supported by The Rufford Foundation.

9. Provide a full list of all the members of your team and their role in the project.

Cemil Sağlam: He took part in all dives. He has helped in the measurement of reef parameters and in the mapping. He made a presentation in the education activities carried out in schools. Contributed to the preparation of the article for publication. He participated in meetings with state institutions.

Mustafa Remzi Gül: During the scuba dives, he helped in preparation works on the shore. During the preparation of the article for publication, he contributed to both data evaluation and writing. He took part in interviews with fishermen.

Yeşim Demir Sağlam: She contributed to the preparation of educational materials and education activities in schools. She helped in preparation stages before dives. She contributed to laboratory studies.

10. Any other comments?

I want to thank The Rufford Foundation, particularly Jane Raymond, for her patience and understanding regarding the difficulties that arose in this project.

References

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Kuş S, Kurt Şahin G (2016) Temporal Changes in the Polychaeta (Annelida) Community Associated with Cystoseira Beds of Sinop Peninsula (Southern Black Sea). Turk J Fish Aquat Sc 16: 61-68. https://doi.org/10.4194/1303-2712-v16_1_07

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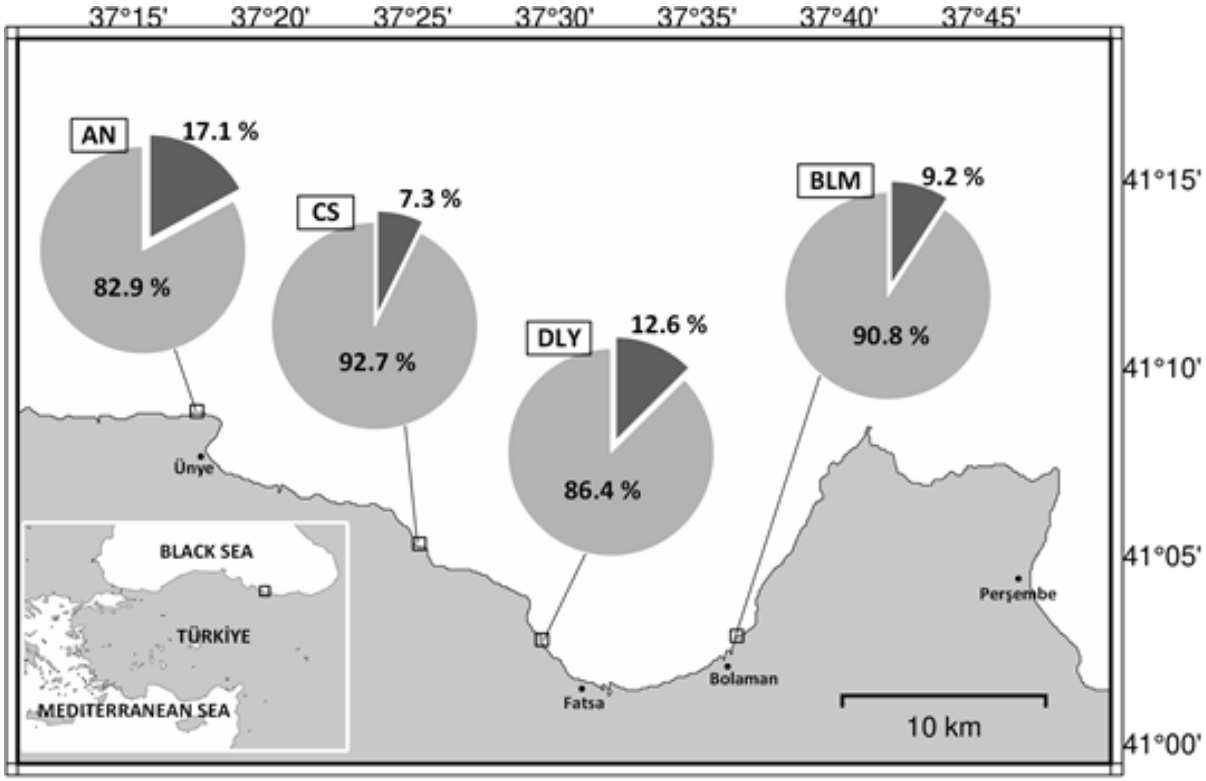

Fig.1 Map shows the location of the stations and the coverage area of *S. spinulosa* reef. Dark colour in the pie chart indicates the percentage of reef coverage in the surveyed area (100x100 meter).

Table 1 Descriptive statistics of the height, number, and diameter of the tubes in the colonies from different stations sampled in Ordu, Türkiye.

		AN	CS	DLY	BLM
-Elevation (tube height) (cm)	N	10	8	14	10
	Min	12	4.5	8	2.2
	Max	63	9.2	21.5	7.8
	Mean	35.4	6.3	16.5	6.4
	Std. error	5.326	0.592	1.115	0.549
Number of tubes in m^2	N	3	3	3	3
	Min	45,437	26,205	25,396	35,505
	Max	70,371	36,194	80,236	46,644
	Sum	184,214	92,401	177,272	120,998
	Mean	61,405	30,800	59,091	40,333
	Std. error	8,004	2,911	17,029	3,300
Tube diameter (mm)	N	114	94	75	103
	Min	0.96	0.79	0.89	0.69
	Max	2.22	2.05	2.17	1.88
	Mean	1.47	1.33	1.38	1.13
	Std. error	0.027	0.033	0.034	0.021

Fig. 2 Meeting with the owner of the Ordu Diving School. In addition to giving information, posters and leaflets were left to inform those who came to dive.

Fig. 3 Meeting with the Provincial Directorate of Environment, Urbanization and Climate Change.

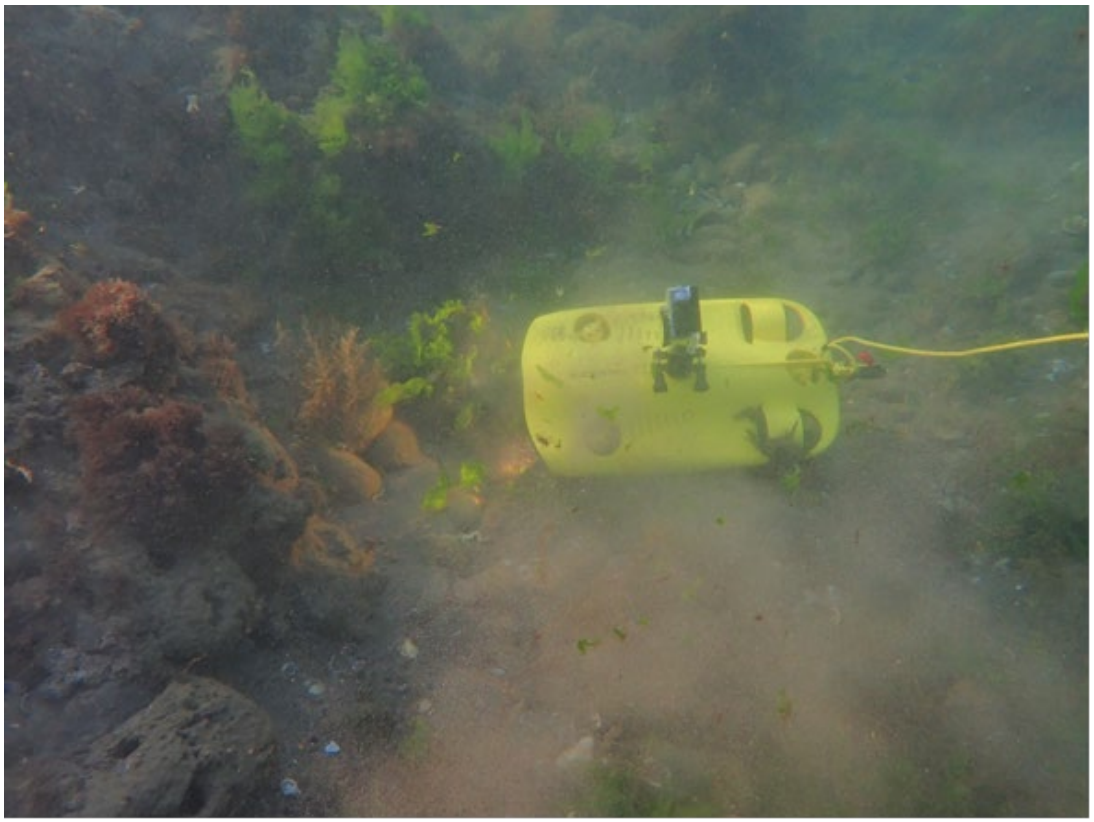

Fig. 4 Underwater drone

Fig. 5 Interviews with the fishermen. Posters were hung at a visible point in the area where the fishing shelters are located, and brochures were distributed.