Final Evaluation Report

Your Details	
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Project Title	An overlooked habitat: Importance of estuaries for elasmobranchs
Application ID	39220-B
Date of this Report	25.06.2024

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
Questionnaires with fishers		X		Except Köyceğiz, Dalyan lagoon system (due to fishers changing profession and quitting commercial fisheries) questionnaires were conducted successfully. In addition to study areas (Enez, Homa, Köyceğiz and Adana lagoon systems) almost all fisheries ports were visited between Enez- Izmir and some areas along the Mediterranean coasts of Türkiye where there was a freshwater output close by.
Analyzing questionnaire outputs and participate in fishing operations			X	All questionnaires were analysed, and several fishing trips (trawl, longline and gillnets) were observed.
Satellite images and meteorological data relations		X		Due to delay of meteorological data from the Turkish State Meteorological Service only some of the data was analysed in the final reporting period. According to preliminary results trials with satellite images have started. Further analyses will be conducted. But according to already analysed part there is a relationship with species distribution.
Meetings with stakeholders			X	Two nationwide expert meetings where a national action plan was drafted, and one nationwide online meeting (led by TUDAV) were conducted. Also, meetings were conducted with fisheries

				cooperative to present our preliminary results. Additionally, part of the results was presented and the results of the project will be presented in symposium and workshop.

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

a). 3 major meetings: Two nationwide expert-only meetings were conducted with the participation of seven elasmobranch academics, a marine consultancy agency and an NGO, and one online meeting (led by TUDAV's-TURKISH MARINE RESEARCH FOUNDATION) were conducted. Expert meeting as well as the nationwide one were the first including not just academics but other groups that are active or interested in elasmobranch conservation such as NGOs, students, dive centres, fishers and interested citizens with the total participation up to 50 people.

b). National Action Plan: As the objective of the expert meeting, a national action plan was drafted. In this action plan threats against sharks, batoids and chimaeras were examined and identified separately with the intensity of the effect. Later suggested actions were identified according to threats with a timescale on their urgency. As last part recommendations and other activities which are needed were listed.

c). Promising preliminary results on questionnaires, satellite images and meteorological data relations and identified possible nursery areas:
Questionnaires and possible nursery areas A total of 20 locations (three main lagoon areas and 17 other locations) were visited (Figure 1). Species utilising visited areas are listed in Table 1. According to the questionnaires seven sharks and 11 batoids utilise lagoon habitats. There were reports of juvenile individual (around 1 m or less which is close to length at birth) thresher shark, blue shark and sandbar shark. In terms of batoids, bull ray, common stingray, spiny butterfly, common eagle ray, Lusitanian cownose ray and guitarfish species use these areas for breeding and as a nursery area. To generalise, some viviparous batoid species use lagoon habitats for reproduction purposes. In case of sharks, viviparous large bodied species (listed above) utilise lagoons as feeding and nursery grounds for their young.

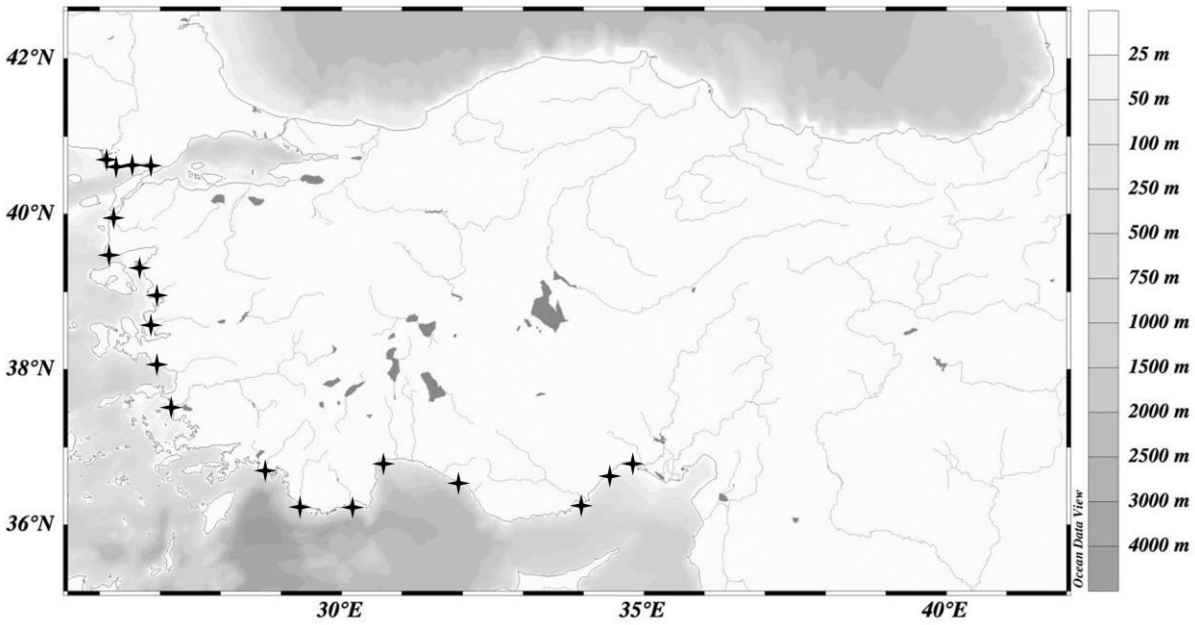

Figure 1. Map of freshwater outputs and all the locations which were visited. Black stars show all the locations that were visited.

Table 1. List of species utilising lagoon habitats.

Group	**Species**	**English name**
Sharks	*Alopias* sp.	Thresher sharks
	Carcharhinus plumbeus	Sandbar shark
	Isurus oxyrinchus	Shortfin mako Shark
	Mustelus mustelus	Smooth hound Shark
	Prionace glauca	Blue shark
	Scyliorhinus canicula	Spotted cat shark
	Squatina sp.	Angelsharks
Batoids	*Aetomylaeus bovinus*	Bull ray
	Dasyatis pastinaca	Common stingray
	Dasyatis marmorata	Marbled stingray
	Gymnura altavela	Spiny butterfly
	Mobula mobular	Spinetail devil ray
	Myliobatis aquilla	Common eagle ray
	Raja asterias	Starry skate
	Raja clavata	Thornback skate
	Raja radula	Rough skate
	Glaucostegus cemiculus	Blackchin guitarfish
	Rhinobatos rhinobatos	Common guitarfish
	Rhinoptera marginata	Lusitanian cownose ray
	Torpedo sp.	Torpedo rays

According to questionnaires, the elasmobranchs are mainly present in summer and intensely caught for 2 months, but they first start to be seen in March in the east where there is a 15-day delay towards the west and a month towards the north. According to questionnaires, sharks and pelagic batoids are caught mainly by longlines and demersal batoids are caught mainly by nets operating. The juvenile

individuals of some species that are reported throughout the questionnaires are *Carcharhinus plumbeus*, *Isurus oxyrinchus*, *Carcharias carcharadon, Alopias* sp., Rhinobatidae, *Aetomylaeus bovinus*, *Gymnura altavela*, *Myliobatis aquilla,* and *Torpedo marmorata*.

Satellite images and meteorological data relations - Satellite imagery shows promise that LEK data will make it possible to understand the abiotic relationship with elasmobranchs. In the next figures you can see the effect of freshwater output and the range of the effect very clearly for Enez, Homa and Ceyhan River mouth (Mersin-Adana) (Figure 2 and 3). During an onboard observation, we were able to clearly see two waterbodies (freshwater output range meeting marine) and how it increased the possibility of bycatch of rays (*Gymnura altavela* and *Rhinobatos rhinobatos*, all mature). This clearly showed us that such "junctions" are hotspots for batoids and water temperature as well as visibility plays an important role for these species' distribution. In case of sharks, they prefer clearer waters, but they tend to stay close to these "mixing" points. It is safe to say there is a positive correlation with abiotic factors such as water temperature, total suspended material and chlorophyll on the species distribution or aggregation. Such outputs can help us find daily or monthly aggregation spots.

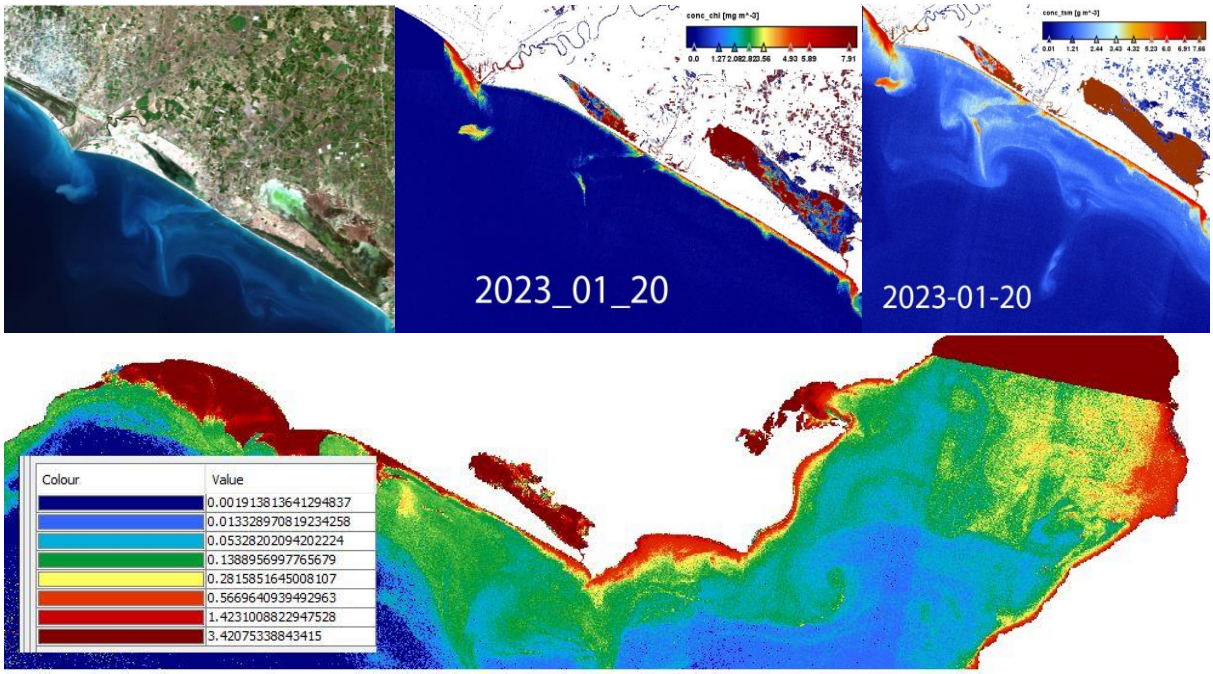

Figure 2. Images of the Ceyhan River mouth taken on 20 January 2023 (top left) and processed showing the amount changes in chlorophyll (top middle) and total suspended solids (top right) for that day. The bottom image shows the distribution of chlorophyll after processing the image taken on January 4, 2023, in the entire study area.

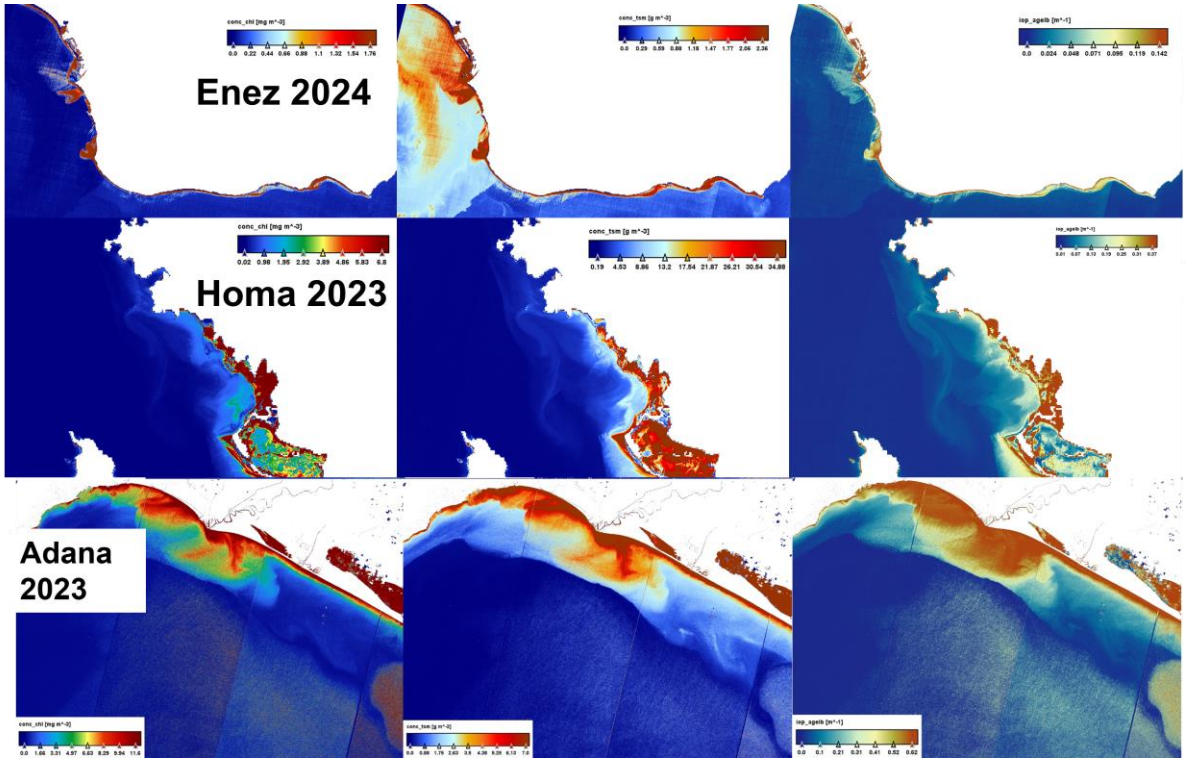

Figure 3. Images of Enez, Homa, Ceyhan River (Mersin-Adana) mouth taken during February of 2023 and 2024 when the rainy season was high, and the images were clear for processing. From left to right shows chlorophyll, total suspended solids and detritus for that day.

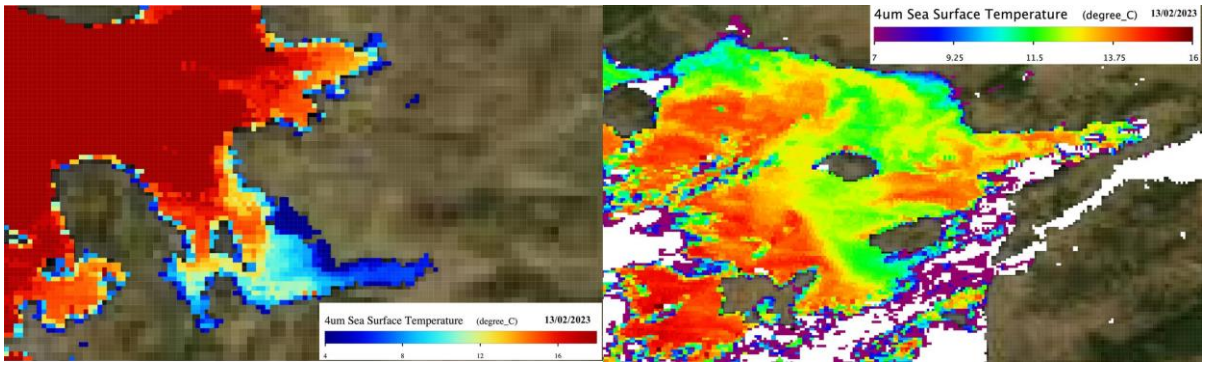

Figure 4. The image on the left shows Homa and the right one shows Enez Lagoon system during one of the coldest day (according to meteorological data).

In Figure 4 it can clearly be seen that even during the coldest days Homa (left image) which is south to Enez (right image) has warmer water temperatures and Enez has cooler temperatures closer the coastline. Which can answer the question on the species distribution difference between both areas where juvenile great whites can be observed at Enez and where juvenile guitarfish can't be observed above Homa lagoon system.

Other possible nursery areas (Karina, Didim and Manavgat) for guitarfishes as well as unknown or little known nursery areas for couple of sharks (shortfin mako, sandbar etc.) and rays (Lusitanian cownose ray, spiny butterfly, bull ray) were identified. But more focus and further studies are needed for some of these locations to prove.

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

All the planned questionnaires were conducted in the study area except for Köyceğiz, Dalyan. This was due to the fishers in Dalyan area have focused on more on working in tourism sector for the tourism period and almost never fish during this period. We were able to talk to couple of local businesses during our visits who have been there more than 30 years. According to them outside the lagoon in front of the Iztuzu Beach was an aggregation area for a couple of shark species such as sandbar and they were able to observe mantas as well when they went out for recreational fishing but now there hasn't been any recent sightings of these species from there. Since we couldn't conduct questionnaires in Dalyan we widened our focus area and conducted questionnaires at small freshwater outputs or lagoons along the Mediterranean coasts of Türkiye, such as Karina, Didim, Akyaka, Manavgat, Fethiye, Erdemli, Mersin. Figure 1 is a map showing all the locations that were visited.

Additionally due to the earthquake the facilities that were planned to be used in Cukurova University was unsuitable, so the facilities of 9 Eylül University Marine Science and Technology Institute were used for the first meeting. For nationwide online stakeholder meeting a meeting led by TUDAV was done.

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

Even though the network was focused on fishers we got help from local people of the areas we visited such as market owners, fishmongers and local inhabitants. They were eager to learn about the species in their region and some information on their biology. During our stay at EKAD's camp, besides the international group, there were also local volunteers and young people from a wide range of backgrounds and study subjects (such as university students studying architecture, interior design, physic, biology, soccer coach, social sciences) who were very interested and amazed to learn about elasmobranchs. Also, fishers were interested to listen about the species in their area and were pleased to be acknowledged as a critical information source.

5. Are there any plans to continue this work?

As for next step we are eager to try out some mitigation measures to reduce the bycatch numbers of elasmobranchs for couple of small-scale fisheries gears and maybe tagging as well to understand their migration or spatial patterns. We are still at the design and research stage on this but hopefully soon we will be ready for some trials.

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

We have already started sharing our preliminary results. Such as the presentation given at International Science Symposium in Sofia, Bulgaria. Besides the results were also presented during the nationwide meeting. We plan to draft at least two papers from the results, one on the relationship between satellite images and

meteorological data and their correspondence on species distributions, second on species composition changes along the coast of Türkiye (from northern Aegean Sea to northeastern Mediterranean Sea).

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

Now we have a better understanding of the species, when and where are important, it is important to focus on mitigation measures with the focus on identified gears with high bycatch rates. Also, with the meetings we were able to identify where there is information gap. By doing this we can now utilise our efforts more cleverly and have a better chance to see results.

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?

Yes, we have produced couple t-shirts to wear during field work, fliers and ID cards to give out during the project with the logo. The keychain ID cards was a hit among the stakeholders. Additionally, a presentation was given to a group of international volunteers at EKAD's Nature Monitoring Center in Manavgat, Antalya, where all the projects of mine up to this date that was funded by The Rufford Foundation were presented.

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

Assoc. Prof. Dr. Elizabeth Grace Tunka BENGIL; is the team leader. She over seen every work package and led the fieldwork as well as analysis and computer work. Was also the link between every member of the team.
Assoc. Prof. Dr. İsmet Saygu; was one of the advisors from the other project who has experience both on elasmobranchs as well as the lagoons. Assisted and still assists with the meteorological data analysis and data modelling.
Dr. Ferhat Büyükdeveci; is an officer at local Agriculture Ministry responsible for the fisheries at lagoon areas. He made it possible to connect with his wide network of fishers in Mersin and Iskenderun Bay as well as used his network of other officers of Agriculture Ministry from other field locations.
Assoc. Prof. Dr. Fethi BENGIL; He provided and still provides the necessary statistics and connections between satellite and meteorological data.

Assoc. Prof. Dr. Atilla Hüsnü Eronat; he provided remote sensing and radar imagery and processed them for the project.
Fishers: from the fisheries cooperatives at the cooperatives contribute to the network with their experience and knowledge.
Volunteers: there were few volunteer students who participated in questionnaires as well as onboard observations. Such activities were first for them provided experience for them.

10. Any other comments?