Final Evaluation Report

Your Details	
Full Name	Mario Espinoza Mendiola
Project Title	Identifying the last remaining areas of the Critically Endangered Largetooth Sawfish in Costa Rica
Application ID	31552-D
Date of this Report	05/04/2022

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
Strengthen research efforts and capacity-building among local fishers to identify and monitor critical habitats of sawfish in Costa Rica				This project did a great job at identifying key sites for the recovery of the large-tooth sawfish in Costa Rica, as well as local threats, communal allies, and the potential of the environmental DNA tool. Two graduate students (Jorge Valerio and Jorge Salmeron) were involved in research and education activities that were essential to completing this project. They both graduated with a MSc degree from the University of Costa Rica. The project has also trained numerous students and volunteers, as well as locals in biological monitoring techniques (fishing and the use of eDNA surveys). We have now a new graduate student (Nathalie Goebel) who is leading the identification of key habitats for sawfish in the north Caribbean region by using eDNA sampling. Nathalie is a biologist and graduate student who is currently pursuing a master's degree in Integrated Management of Tropical Coastal Areas, at the University of Costa Rica since 2022, but she has been involved in the project since 2019 and last year she conducted a DNA sampling focused on the northern and north Caribbean regions. During the fieldwork, she trained a group or people in the eDNA sampling, including five biology students and five local people (fishers, boat drivers and tour guides) (Fig.1 and 2). The interaction with these people was crucial at strengthening the links

				between research, outreach, and education. All of these key stakeholders were interested and willing to collaborate in upcoming activities. The local people we have met over the last year have the potential to promote specific activities between these communities and the critical habitats of the large-tooth sawfish.
Launch educational and outreach campaigns at coastal and riverine communities where sawfishes are still being landed				Over the past 2 years, the COVID-19 global pandemic made it difficult to achieve this objective. However, with the help of social media tools and virtual webinars we have engaged with different audiences and participated in several activities that were important to continue our sawfish education and outreach component of the project. We also recently launched an online poster so that people could make reports of the species, which has been very positive (Fig. 3). Besides, the links we did last year through community allies are crucial to recover the contact with the communities and work together in benefit of the species and the local communities. We also recently published an online book titled Diagnóstico del Pez Sierra en Costa Rica: hacia un enfoque regional (EN: Diagnosis of Sawfish in Costa Rica: towards a regional approach - https://online.flippingbook.com/view/278623880/ - Fig. 4) with the main goal of summarising all the information generated by this project since 2016 on the species, specifically for the general public. We have also given hard copies of this book to key stakeholders and managers, including members of the communities who have been actively involved in the project. This is key because through casual conversations they are able, more than us as researchers, to educate other community members.

				Since May 2021, we have resumed face-to-face activities now that the pandemic is under control and most of the population is vaccinated (Fig. 5) and are looking forward to organising several activities during 2022.
Work with locals and with our national environmental and fisheries institutions towards implementing a sawfish recovery program.				This was the most difficult objective to achieve due to the global pandemic and its consequences described above. However, the publication of the book marks the end of one stage and the beginning of another for sawfish in Costa Rica. In the first stage our efforts were focused on assessing the state of the species in the country, identifying local threats, carrying out awareness and educational campaigns, and using novel tools (eDNA) to detect the species. The second stage will be focused on proposing specific conservation actions defined in time and the actors involved to substantially improve the conservation status of the large-tooth sawfish at a national, and probably regional, level. The plan was to start this stage in 2020, however, it was impossible because it needs to be a participatory process to be realistic and sustainable in time.

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

a). Extension of the eDNA sampling area and training of this sampling method: From January to October 2021, we did six eDNA sampling field trips to four areas located in the northern Caribbean regions of Costa Rica in order to detect the presence of the large-tooth sawfish (*Pristis pristis*) DNA from filtered water samples in situ. These four areas were San Carlos & San Juan, Barra del Colorado, Tortuguero and Caño Negro (Fig. 6). We decided to focus on these areas based on historical and recent sightings, local interviews and previous positive eDNA detections from 2019. Until now, Tortuguero and Caño Negro had not been explored by the project; however, with San Carlos & San Juan and Barra del Colorado form a large freshwater system that connects large rivers and wetlands through the San Juan River (natural border between Costa Rica and Nicaragua) with the Caribbean coast. Today, 318 samples have been analysed and there are 78 left. We have obtained positive detections from San Juan & San Carlos and Barra del Colorado. Although the species was not detected in the samples from Caño Negro nor Tortuguero, we made a platform to continue working in those sites and surroundings, since we think there is a great

probability that the species moves through the whole system, including Caño Negro and Tortuguero, since those sites share relevant similarities with Barra del Colorado and San Juan & San Carlos, such as the habitat composition, and besides, are protected in some degree. Tortuguero has a complex system of rivers, channels and lagoons and has been a national park since 1975 (Fig. 8). Caño Negro is a Mixed National Wildlife Refuge which allows some degree of extractive activities and was declared a Ramsar site, providing additional protection for threatened terrestrial an aquatic wetland species that are unique to this region (Fig. 9).

b). Recent release detailed reports: thanks to a new outreach campaign via social network, we have expanded our presence all over the country and within specific communities that have a high degree of interaction with sawfish and their critical habitats. Our outreach activities and materials and social media presence have increased the number of reports of the species in the north Caribbean region (Fig. 10).

c). Sawfish diagnostic online book for the general public: The publication of the book that resumes the state of knowledge and the status of the species in Costa Rica is the first step for the elaboration of the recovery strategy and coexistence plan which will be led by Nathalie Goebel, with the close orientation of Dr Silvio Marchini. In this second step will be crucial the inputs of different actors and their involvement in our project. In 2021 and the first months of 2022, it was key to know some of these actors and introduce the project to them. Some others knew the project almost since its beginning and the book has been an important instrument for this purpose.

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

The main difficulty we could not foresee was the COVID-19 global pandemic. This situation affected our outreach and involvement activities with the local communities where our work is focused. The pandemic led to strict measures like institutional closures, vehicle restrictions and remote work, which did not allow us to organise face-to-face activities. However, we continued giving virtual talks and presentations to different target audiences (e.g., university students, pre-school and primary students and teachers, the community of the National Alliance Rivers and Basins of Costa Rica, among others). Despite these being very valuable, it was impossible to achieve the level of capacity building and educational outreach campaigns desired, particularly with the targeted local communities since most of the community members do not have access, nor interest in, virtual activities since these localities are mostly remote and isolated. However, during the eDNA sampling we interacted we local members that usually act as positive leaders when there is a benefit for the community and the environment involved. These people will be key to the second stage of the project: the sawfish recovery strategy and coexistence plan.

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

One of the main goals of the project was to educate the public and raise awareness about the current status of sawfish in Costa Rica. For that, our interviews with fishers and local communities throughout the country helped us assess people's perception of sawfish conservation and the threats that affect the health of their populations. With every interview, we spread the word of its conservation status and the importance to secure the future of its populations. We also conducted a series of talks and town meetings in coastal and riverine regions where sawfish were recently sighted, including talks/workshops activities with schools (children ages 8-12) aiming to create more awareness around sawfish in young people.

During the project, we identified key people to help us lead this important conservation effort at local scales. Esteban Jimenez is a fisher from TSNW and has become our best ally to protect the species and teach others about the importance of conserving sawfish, not only because of his past encounters with sawfish and infinite desire to contribute with the project, but also due to his vast knowledge about the TSNW. The latter led to his full involvement as our boat captain during the 2 years of fishing expeditions in phase II and also to his collaboration as field assistant during eDNA surveys (phase III). On the other hand, Rubén González is a local tourist guide from the northern region that became critical in our interview process in the area, and that led to the identification of this area as one the hotspots in which sawfish may still hold viable populations. Rubén has also collaborated as field assistant during eDNA surveys. Esteban is getting known as one of our crew members, which has attracted attention from local fishers who trust him and maintained close contact with him; thanks to this, we have gained access to some reports that otherwise would be impossible for us to discover, likewise Rubén has led us to the locals that could give quality information on recent captures. Esteban has shown signs that he could take the lead on the TSNW, and possibly with some guidance and further help from others could also benefit from education and tourism-related activities promoting sawfish conservation.

5. Are there any plans to continue this work?

Yes, this is a long-term conservation project which means we are constantly integrating actors, dimensions, and factors. Our priorities also change as we achieve goals, since new goals arise. I am tutor of Nathalie Goebel, the biologist and graduate student mentioned above, who is currently pursuing a master's degree in Integrated Management of Tropical Coastal Areas. She is going to analyse the socioecological systems we work with and outline in the actions of the recovery strategy and coexistence plan. Other valuable contributions to the project will be through the junction of Silvio Marchini to our team and as reader of Nathalie master's degree research. Silvio Marchini is a biologist with great experience in human-wildlife coexistence and all what it involves (e.g., research design and implementation, instrument development, planning and decision making). You can access to his professional profile here: https://silviomarchini.com, https://www.researchgate.net/profile/Silvio-Marchini).

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

Some of our results have been shared, and others will be shared through several outlets:

- Scientific publications.
- Scientific and town-hall meetings.
- Talks and seminars.
- Meetings with the Costa Rican Natural Environmental Agency (MINAE-SINAC).
- Meetings with the Costa Rican National Fishing Institute (INCOPESCA).
- Meetings with local NGOs.
- Radio and TV interviews.
- Newspaper articles.
- Social media (Facebook and Twitter).

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

As stated above, our focus now is to continue the negotiations with the Nicaraguan authorities to start field expeditions in the Lake Nicaragua – Rio San Juan System. Fishing expeditions in other areas identified through our eDNA surveys are also expected to occur. The education programme phase is continuous in our project, as education and awareness are key in conservation initiatives. The social media outreach has proven to be a very valuable tool but we also should invest more resources to reach more remote and isolated communities in which social media is useless due to the socio-economic situation of these villages. Our next big effort will be to start drafting a national sawfish conservation strategy with the participation of locals and key stakeholders, national NGOs and governmental agencies.

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 presented the logo in every talk and workshop and mentioned the important support you represented. The logo is also in the book cover (Fig. 4), which reflects your significant support for our project.

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

Name	Role
Nathalie Goebel	MSc student, researcher, logistics, fieldwork
Mario Espinoza	Project leader, researcher
Jorge A. Valerio-Vargas	Associated researcher
Lucía Vargas	Principal author of the book, social media
Michelle Gaither	Associated researcher from University of Central Florida
Kathryn Greiner-Ferris	Doctoral student, sample analysis
Diego Fallas	Project assistant
Camila Valverde	Project assistant

Sofía Garro	Project assistant
Crista Alpízar	Project assistant
Keylin Castro	Project assistant
Rubén González	San Juan & San Carlos local, project assistant (guide)
Jesús Cháves	Barra del Colorado local, project assistant (boat captain, fisher)
Alexis Torres	Tortuguero local, project assistant (boat captain, guide)
Pedro Domínguez	Caño Negro local, project assistant (boat captain, guide)
Jeff Hernández	Professional storyteller

10. Any other comments?

Figure 1. People involved on the environmental DNA sampling from Costa Rica Sawfish project during 2021.

Figure 2. Some Local people involved in the fieldwork. A. Jesús Cháves a fisherman from Barra del Colorado. B. Eddy Martínez, a boat driver from San Carlos & San Juan. C. Pedro Domínguez a tour operator from Caño Negro. D. Alexis Torres a tour operator from Tortuguero.

Figure 3. Release campaign of the Large-tooth Sawfish launched in March 2022.

Figure 4. Book Diagnóstico del Pez Sierra en Costa Rica: hacia un enfoque regional (EN: Diagnosis of Sawfish in Costa Rica: towards a regional approach) published in March 2022. https://online.flippingbook.com/view/278623880/

Figure 5. Workshop Pesca artesanal y gigantes de las lagunas: ¿Cómo ser parte de la ciencia ciudadana? (EN: Artisanal fishing and giants of the lagoons: How to be part of citizen science?) in October 2021.

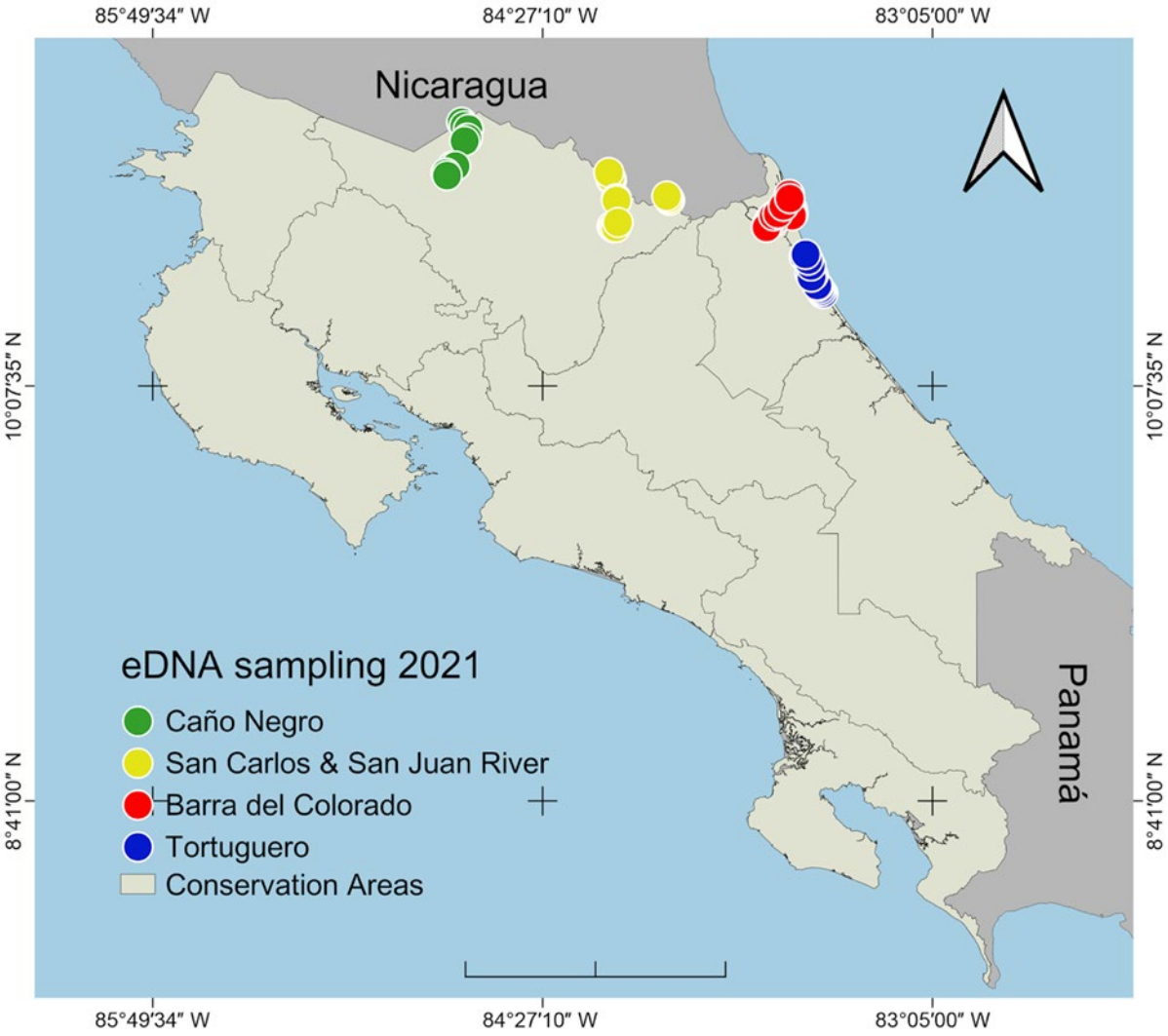

Figure 6. Costa Rica's Sawfish project environmental DNA sampling from January to October 2021 focused on the north and northern Caribbean regions.

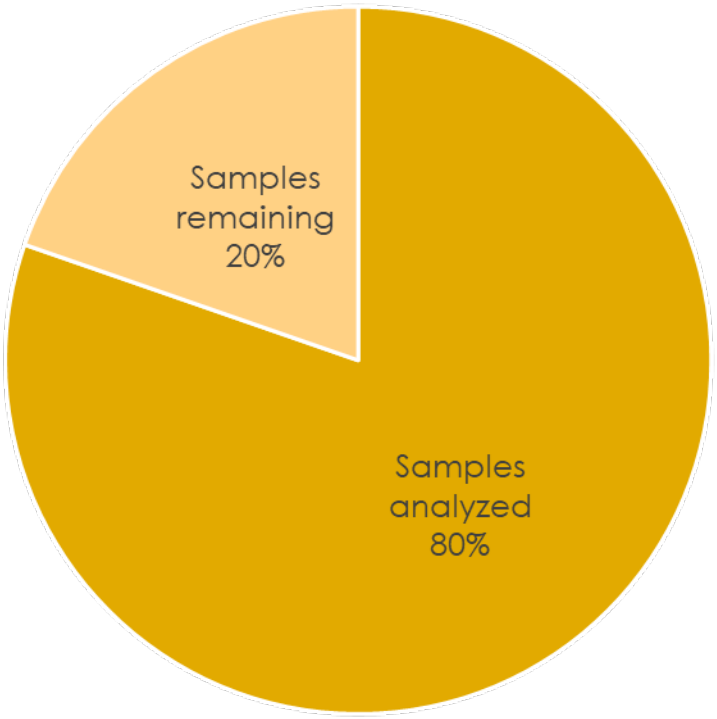

Figure 7. Progress of the environmental DNA samples analysis to 2022 based on number of samples.

Figure 8. Sampling area Tortuguero, a National Park since 1970 according to the National System of Conservation Areas.

Figure 9. Sampling area Caño Negro, a National Mixed Wildlife Refuge since 1984, according to the National System of Conservation Areas and a RAMSAR site according to the UNESCO.

Figure 10. Large-tooth Sawfish release at Boca San Carlos reported to our project the date 03/04/2022.