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EDGE

EVOLUTIONARILLY DISTINCT & GLOBALLY ENDANGERED

Survival Blueprint

Hawksbill turtle, Eretmochelys imbricata
Costa Rica

Compiler: Daniel Arauz-Naranjo

Contributors: Andy Bystrom, Mario Espinoza, Francoise Cavada-Blanco

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1. *STATUS REVIEW*

1.1 ***Taxonomy:*** Hawksbill sea turtle's (*Eretmochelys imbricata*) evolutionary history has been a subject of debate for several years. The turtle's exclusive and rare spongivorous diet raises doubts on whether its ancestor was herbivorous (tribe Chelonini) or carnivorous (tribe Carettini); an issue that has been the centre of the debate. However, genetic analyses place hawksbill sea turtles in the tribe Carettini, alongside the genera *Caretta* (Loggerhead) and *Lepidochelys* (Olive ridley & Kempii's ridley), of carnivorous behaviour (Brian W. Bowen & Karl, 1997).

Class: Reptilia
Order: Testudines
Suborder: Cryptodira
Family: Cheloniidae
Genus: Eretmochelys
Species: *E. imbricata*

1.2 *Distribution and population status:*

1.2.1 *Global distribution:*

Hawksbill sea turtles are distributed globally in circumtropical waters.

Ocean	Population estimate*	Population trend	Notes
Atlantic	3,378	Decreasing (Mortimer & Donnelly, 2008)	Population trends are estimated using data from nesters due to the lack of in-water abundance data.
Indian	2,150		
Pacific	3,173		

*****Population estimates and trends as reported in the last IUCN Red List Assessment for this species (Mortimer & Donnelly, 2008). In this case, populations are calculated as the average number of nesting females per year in 25 Index Sites located in the Atlantic (12), Indian (6) and Pacific (7) oceans. Population estimates are based on raw data and linear extrapolation functions.

1.2.2 Local distribution:

There are no population estimates for the hawksbill sea turtle (sub)population of Costa Rica's Pacific coast as there is only a handful of nests recorded every season. With a population estimate of only 500 nesters in the whole Eastern Pacific Region (from México to Perú; Gaos et al., 2010), it seems the population in Costa Rica is composed mainly of juveniles. However, data for the country is limited to only four sites.

Region / province	**Site**	**Level of Protection**	**Population size**	**Reference(s)**
Northern Guanacaste	El Jobo	Management Area (small scale fishing is allowed)	Unknown	(Heidemeyer, Arauz-Vargas, & López-Agüero, 2014)
Southern Nicoya Peninsula	Cabo Blanco	Absolute Natural Reserve	Unknown	(Heidemeyer et al., 2014)
Southern Nicoya Peninsula	Coyote	Wildlife Refuge (small scale fishing is allowed)	Unknown	(Carrión-Cortez, Canales-Cerro, Arauz, & Riosmena-Rodríguez, 2013)
Golfo Dulce	Playa Blanca	Management Area (small scale fishing is allowed)	Unknown	(Chacón-Chaverri, Martínez-Cascante, Rojas, & Fonseca, 2015)

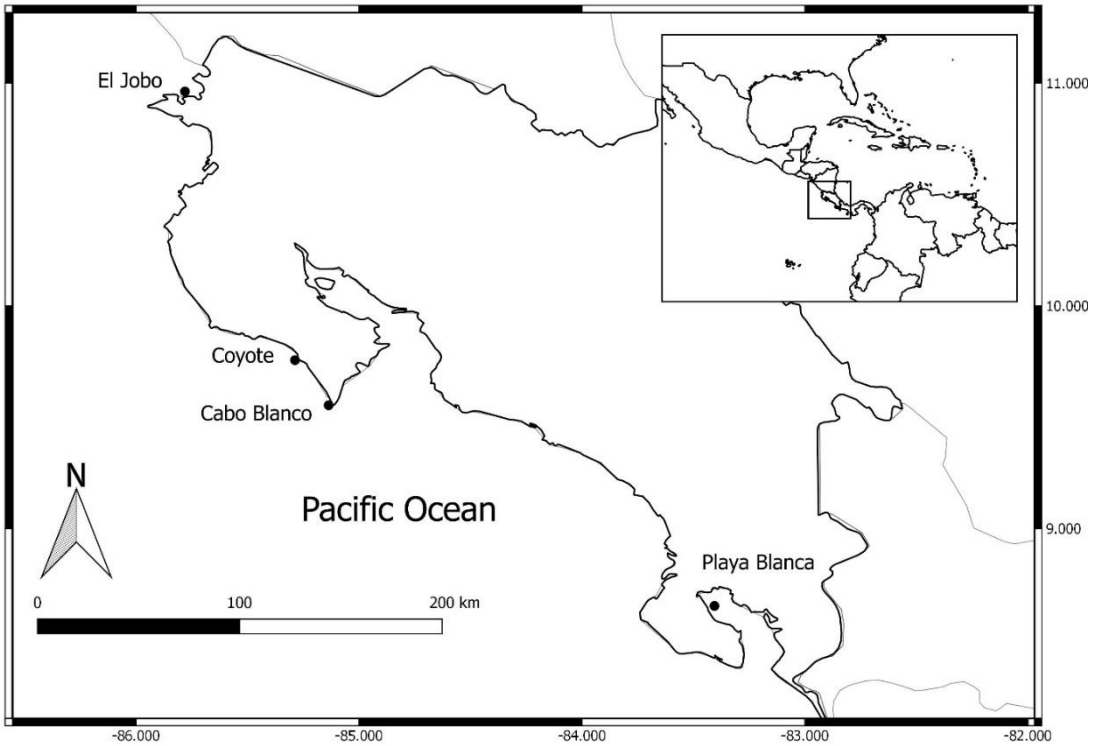

Figure 1. Map of Costa Rica. Black dots represent identified and studied (sub)populations of juvenile hawksbills (from left to right: El Jobo, Coyote, Cabo Blanco and Playa Blanca).

1.3 Protection status: Hawksbill turtles are protected by Costa Rica's wildlife protection law (Ley de Conservación de la Vida Silvestre N° 7317, 2012), which forbids any type of hunting or trade of individuals and their products, such as eggs, meat, or tortoiseshell. Hawksbill sea turtles are included in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) under Appendix I, which means that trade of this species is permitted only under exceptional circumstances. Additionally, Costa Rica is a member of the Inter-American Convention for the protection and conservation of sea turtles which provides a legal framework for countries to act in the protection of this species. Sea turtles nest practically all along the Atlantic and Pacific coasts, and although some nesting sites are located inside of protected areas, a large number of these fall in beaches that are legally unprotected.

1.4 Ecology, behaviour and habitat requirements: Like other sea turtles, hawksbill turtles nest on sandy beaches in tropical waters around the world. After hatching, neonates enter the sea and are carried away by currents where they remain until they are large enough to be recruited at near shore foraging grounds, usually comprised of reefs, or other habitats such as seagrass or mangrove bays (Musick & Limpus, 1997). Once they reach sexual maturity, the young adults undertake migrations between foraging grounds and nesting beaches to breed every season. Although some studies have documented long migration routes, especially in the Caribbean (B. W. Bowen et al., 2007), recent information has revealed that hawksbill sea turtles in the Eastern Pacific Ocean undertake very short migrations, with some individuals not migrating at all (Gaos et al., 2018).

Foraging grounds of Hawksbill sea turtles are usually located in shallow waters, with larger individuals rarely venturing in waters over 20 m in depth (Gaos et al., 2012). Feeding behaviour studies have shown that their diet changes between populations. While hawksbills in the Caribbean are primarily spongivorous (Meylan, 1988), other populations in Australia consume large amounts of algae (Mortimer & Donnelly, 2008), while in the Eastern Pacific, they complement their diet with tunicates (Carrión-Cortez et al., 2013).

As the main spongivorous predator in a coral reef, studies in the Caribbean Sea have shown that hawksbill sea turtles can affect coral reefs in three ways (León & Bjorndal, 2002). First, hawksbills are highly selective and can reduce prey species to restricted shelters within the reef. Second, hawksbills can make certain prey species more vulnerable to other predators, such as small fish, by exposing the soft inner tissues after breaking the outer layer. Finally, hawksbill sea turtles can have an influence on space competition. It has been shown that sponges out-compete corals and other benthic invertebrates when taking up free space in the reef, therefore, predation by hawksbills can have a major role in maintaining species diversity in coral reefs.

1.5 Threat analysis:

With a global population estimate of less than **25,000** individuals (Spotila, 2004) and a decline of **87%** in the number of mature females over the last three generations, Hawksbill sea turtles are listed as Critically Endangered according to the IUCN Red List of threatened species.

Threat	**Description of how this threat impacts the species**	**Intensity of threat** *(low, medium, high, critical or unknown)*
Tortoiseshell Trade	Hawksbill sea turtles have been heavily exploited over the last two centuries, mainly for the creation of tortoiseshell trinkets. With millions of individuals being killed to supply the market, this is the main threat behind the decline of hawksbill populations worldwide. Even though hawksbills are protected in Costa Rica (see Protection status above) there is still a lot of opportunistic poaching by fishers who encounter hawksbills during their work. A recent report published by Too Rare to Wear (Harrison, Von Weller, & Nahill, 2017) found 949 pieces of tortoiseshell products in 72 stores across the country. Around 87.8% of the pieces were found in the Pacific coast.	Critical
Egg poaching	In many countries, like Costa Rica, human consumption of sea turtle eggs is considered part of the local culture. In the Pacific coast there is a high demand for this product and it's legal to harvest eggs from olive ridley (*Lepidochelys olivacea)* nesters from one specific beach. However, national authorities lack the training to differentiate eggs from different species of sea turtles, providing a loophole for the poaching and trafficking of eggs from other species, including hawksbills.	High
Entanglement and ingestion of marine debris	Due to their habitat, hawksbill sea turtles, especially juveniles, are very susceptible to unsustainable fisheries practices and interactions with marine debris. Nearshore rocky reefs in the Pacific coast of Costa Rica tend to be a fishing and snorkelling destination for locals and tourists, increasing the possibility of juvenile hawksbills interacting with fishing lines, hooks, nets, and floating debris (mainly plastic). Without proper care and attention, these	Critical

	interactions can seriously imperil the turtle's health and could lead to the loss of limbs or even death.	
Destruction of habitat	The increasing development and tourism activity in coastal communities around the tropics have led to considerable destruction of suitable beaches for sea turtle nesting. Additionally, unsustainable fishing practices (bottom trawling), climate change, and pollution, amongst other factors have severely affected near-shore, shallow reefs where hawksbills usually forage for food. As one of the main attractions for international tourists, the Pacific coast of Costa Rica has been heavily affected by unplanned tourism development, with a lot of communities lacking proper water treatment facilities and solid waste management, polluting coastal waters.	High
Hunting for human consumption	In certain places, like Baja California (Mexico) or some Caribbean countries, hawksbill sea turtles are targeted for their meat. However, in Costa Rica, sea turtle meat is only consumed in the Caribbean coast, with green turtle (*Chelonia mydas)* the primary target for this market. While in the Pacific coast, locals eat only eggs laid by the turtles at the beach and adults are not harmed.	Low

1.6 Stakeholder analysis:

Stakeholder	**Stakeholder's interest in the species' conservation**	**Current activities**	**Impact** *(positive, negative or both)*	**Intensity of impact** *(low, medium, high or critical)*
The Sistema Nacional de Áreas de Conservación (SINAC) is a governmental institution in charge of the country's protected areas management	SINAC's main objective is the conservation of biodiversity in the country through the creation of protected areas and management plans.	Recent creation of the Cabo Blanco Management Area, a marine management area to regulate small scale fishing. Several foraging grounds for juvenile hawksbill sea	Positive. SINAC is the authority that manages all marine protected areas. They also handle issues regarding poaching of wildlife,	Critical

		turtles have been identified in this area.	including hawksbill sea turtles.	
Asociación de Desarrollo Integral (ADI) of Malpaís is the local organization responsible for the proper development of local communities in the region	ADI has an environmental committee responsible for planning and implementing activities for environmental education and biodiversity conservation in the community.	ADI performs a series of beach clean-ups in the area, as well as talks and environmental activities in local public schools.	Positive. Members of ADI are local leaders, which increases opportunities to carry out activities focused on hawksbill conservation reducing the threats affecting them.	High
Iguana Divers, the only dive shop operating in the area	As hawksbill sea turtles are often encountered by divers and snorkelers, they provide value to the dives, indirectly generating economic benefits for the company.	Staff and divemasters working at the company collaborate as citizen scientists in different projects run by CREMA (Rescue Center for Endangered Marine Species).	Positive. Business owners are conservationists and very conscious on their impact on marine wildlife. As a business they do not use single use plastics and are constantly promoting eco-friendly tourism, indirectly reducing threats such as marine debris and habitat destruction.	Low
Local NGO's (CREMA, Jaquera, Center for Investigation of Natural and Social	These NGOs' work on the protection of sea turtle nesting beaches and have international	Members and volunteers of the organizations patrol a long stretch of beach where different	Positive. There is a good relationship between the different organizations in	High

Resources (CIRENAS))	volunteering programs that financially support the organizations.	species of sea turtles lay their eggs. They also collaborate on clean ups and sustainability projects in the local communities.	the area. This increases the opportunity to collaborate, share data, fundraise, and promote activities that tackle specific threats to juvenile hawksbills.	
Small scale fishers from the local communities	Hawksbill sea turtles usually get hooked or entangled on fishing gear, resulting in their death or injury if released with hooks or entangled pieces of gear.	Fishers are organized in local associations that aim for the sustainability of the resources they exploit and a better livelihood for fishers in the community.	Both. Local associations have a board of directors composed by local leaders in the fishing community. Some leaders have developed a good relationship with researchers and NGOs, which increases the opportunity to carry out activities to reduce direct threats affecting juvenile hawksbills. However, there is a strong movement between fishers to stop collaborating in conservation initiatives, as	High

			they believe this will negatively affect their main source of income.	
Tourism sector (hotels and tour operators)	Hawksbill sea turtles can provide economic benefits to the local community, mainly through sustainable and nature-based tourism.	Most hotels offer snorkeling or fishing tours where they encounter sea turtles.	Both. Tourism industry is growing rapidly on the Pacific coast of Costa Rica. While there is an increasing trend in environmentally friendly eco-tourism that could indirectly reduce threats to juvenile hawksbills, there is still a lot of unplanned development in the area, directly affecting water quality and pollution in the nearshore environments.	Low

1.7 Context and background information that will affect the success of any conservation action for this species:

	Description	Barriers to conservation	Opportunities for conservation
Socio-cultural effects and cultural attitudes	Communities in the Pacific coast of Costa Rica rely heavily on tourism and small-scale fishing for their survival. Hawksbill sea turtles are a charismatic species that could improve tourism in the area. Additionally, this species has a very specific role in the ecosystem as it is the only sea turtle that feeds on sponges, tunicates, and other sessile invertebrates that settle on rocky reefs.	If not managed properly, both tourism and fishing activities can have a negative impact on the conservation of this species, as it inhabits small, shallow rocky reefs very close to the shore.	The rise of the tourism industry in the area and the need of fishers to look for other sources of income, provide the opportunity to develop nature-based tourism. This would not only provide an alternative source of income but would integrate the sector in different conservation initiatives.
Economic implications	Hawksbill sea turtles can have a positive economic impact on these communities. As fishers look for alternative sources of income to fishing, eco-tourism activities have increased substantially in the region.	Tourism activities and urban development have increased very rapidly in these communities. This pace has not been accompanied by enforcing laws and regulations to mitigate and reduce negative impacts, which is the responsibility of local authorities.	Hawksbill sea turtle observation can provide an alternative source of income for fishers and boat captains. This can provide the opportunity to develop conservation initiatives with local monitoring by citizen scientists and tour guides within a responsible sea turtle observation scheme or programme.

Existing conservation measures	Cabo Blanco Absolute Natural Reserve, with a no-take marine protected area (12.7 km^2) is in the study area. This reserve and its new management area, created in 2017, encompass an area of 820 km^2 where fishing and tourism activities will be regulated and managed with a special set of rules and zoning.	Government authorities working in the newly created management area still do not have sufficient resources to enforce local rules and the management plan needed for the area to maintain the conservation value it was created for.	Management plans and rules for the area have not been published yet, therefore, conservation measurements specific for hawksbill sea turtles can still be considered and included.
Administrative/political set-up	The creation of the Cabo Blanco Management Area has increased interest and the will of local authorities and community leaders to have conservation projects in the area.	It has been made clear by the national government that the country does not have sufficient funds to hire new staff for the national park or buy surveillance equipment such as boats. This diminishes the enforcement capacity, reducing the effectiveness of the protected area.	Despite the challenges presented by the national government, local park rangers, staff from Cabo Blanco and members of the local ADI are willing to contribute to conservation initiatives in the area.
Local expertise and interest	The local ADI from the communities near to Cabo Blanco Absolute Reserve has an environmental committee in charge of developing conservation and educational projects in the	The environmental committee from the local ADI have a restricted budget and does not count with support from municipal governments. Most of	Leaders from the community working in the ADI have a strong bond with the community and the environment surrounding it. Empowering local associations will

	community. Also, various NGOs work in the area.	the conservation initiatives held by the ADI are funded by members of the association.	provide the region with more conservation opportunities.
Resources	Resources to support conservation initiatives in the area mostly come from national and international NGOs. Government funds for conservation initiatives are invested in the protected area.	Funding for research and conservation initiatives focusing on sea turtles in the area rely heavily on small grants or volunteering programs to remain active. There is a strong need to train and provide the local ADIs with the resources to manage their own projects.	Members of the local ADI are very interested in developing conservation projects. Therefore, building the capacity of their members on fundraising and project management can provide a huge opportunity for conservation initiatives in the area.

2. ACTION PROGRAMME

Vision (30-50 years)	
Coastal communities in the Nicoya Peninsula use hawksbill sea turtle conservation as a tool to promote sustainable development and tourism through the protection of foraging grounds, environmental education and sustainable fishing.	
Goal(s) (5-10 years)	
Ensure the Cabo Blanco management plans encompass a set of effective regulations for the protection of the most active hawksbill foraging grounds supported by improved knowledge and accurate empirical data, in partnership with local communities and fisher associations.	
Objectives	**Prioritisation** *(low, medium, high or critical)*
Expand the acoustic monitoring program to at least 10 acoustic receivers and 50 acoustic transmitters within the Cabo Blanco Management Area	Critical
Identify threats to hawksbill sea turtles in foraging grounds within the Nicoya peninsula and gulf	Critical
Secure the protection of hawksbill sea turtle foraging grounds within the management plan of the Cabo Blanco Management Area	Critical
Design and develop an education program around juvenile hawksbill turtles for primary schools in coastal communities within the Cabo Blanco Management Area	High
Promote sustainable fishing methods within local fishers' associations	High
Develop a reef monitoring programme in collaboration with local associations, dive shops, and national authorities	Medium
Promote the use of hawksbill sea turtles as *flagship species* in the local communities	Critical

Activities	Country / region	Priority *(low, medium, high or critical)*	Associated costs (currency)	Time scale	Responsible stakeholders	Indicators	Risks	Activity type
Objective 1: ***Expand the acoustic monitoring program to at least 10 acoustic receivers and 50 acoustic transmitters within the Cabo Blanco Management Area***								
Increase number of acoustic receivers deployed in Cabo Blanco	Cabo Blanco Management Area	Critical	- At least £15,000 for the purchase of receivers and equipment. - £ 5,000 for field campaigns to deploy receivers.	1-5 years	NGOs	Number of receivers deployed	- Risk of receivers being vandalized by fishers or divers. - Risk of receivers getting lost due to bad weather.	Improving knowledge
Increase number of hawksbills under monitoring by acoustic tags	Cabo Blanco Management Area	Critical	- £5,000 /year for field campaigns. - At least £20,000 for acoustic tags (50).	5 years	NGOs	Number of animals tagged	- Risk of tags falling from animals. - Risk of field campaigns being cancelled due to bad weather or unforeseen circumstances.	Improving knowledge

Train locals for tagging of turtles	Communities in the Cabo Blanco Management Area	High	- £5,000 /year for workshops and training sessions.	2 years	NGOs and ADI	Number of animals successfully tagged by locals	- Risk of not finding interested members of the local communities.	Education & Awareness
Analyse data from acoustic receivers	Cabo Blanco Management Area	Critical	- £5,000 year for field trips to recover data.	5 years	CREMA	Peer reviewed paper of accoustic data	- Risk of losing data from lost receivers (vandalism, bad weather).	Improving knowledge
Perform habitat assessments at suspected foraging grounds	Cabo Blanco Management Area	High	- £5,000 year for field trips to perform studies.	1-5 years	NGOs and SINAC	Data gathered and analysed for each site Report of results from habitat assessments	- Risk of field campaigns being cancelled due to bad weather or ocean conditions or unforeseen circumstances	Improving knowledge
Objective 2: Identify threats to hawksbill sea turtles in foraging grounds within the Nicoya peninsula								
Systematically record hawksbill interactions (captures in fishing lines, number of released or	Communities in the Nicoya Peninsula	Critical	- £1,500 /year in surveys and observations at fishing sites.	1-5 years	NGOs	Annual reports with data from surveys	- Risk of fishers not wanting to cooperate in data collection.	Improving knowledge

deceased turtles, etc.) with local fishers								
Start a local community-led monitoring program for stranded (injured/deceased) hawksbills in coastal communities	Communities in the Nicoya Peninsula	High	- £5,000 /year for local monitors to provide data on deceased/injured hawksbills.	5- years	NGOs, SINAC and ADI	Number of reports recorded/attended, and data collected	- Risk of disinterest in participation in monitoring amongst members of the local communities.	Education & Awareness
Objective 3: **Secure the protection of hawksbill sea turtle foraging grounds within the management plan of the Cabo Blanco Management Area**								
Draft a policy brief to include and protect active foraging grounds within the management plans.	Cabo Blanco Management Area	Critical	- £3,000 for a series of workshops in the local communities. - £2,000 for consultants and advisors to draft a policy brief.	1-3 years	NGOs, SINAC and ADI	Policy draft presented to stakeholders	- Risk that information is not enough to make policy changes. - Risk of not being supported by leaders of the local communities and fisher associations.	Law & Policies

Lobby national and regional authorities to adopt recommendations into the management plan	Cabo Blanco Management Area	Critical	- £2,000 for meetings with members of local councils, park ranger authorities, and members of SINAC.	1-3 years	NGOs, SINAC and ADI	A new set of management regulations included in the Cabo Blanco Management Area general plan	- Risk of authorities or local leaders not being interested in this project. - Risk that policies are not included in the new management plan.	
Objective 4: Design and develop an education program around juvenile hawksbill turtles for primary schools in coastal communities within the Cabo Blanco Management Area								
Design and develop a concise and participatory program for an environmental education course for primary school	Coastal communities of Malpais & Santa Teresa	High	- £10,000 to hire teachers and educators to design and develop the program specifically on this community and focusing on juvenile hawksbills conservation.	1 year	NGOs and ADI	Program as well as course content successfully developed	- Risk that institutions at communities are not suited for this program (lack of interest from principals or teachers, lack of resources, etc).	Education & Awareness

Pilot the course at two schools at local communities.	Coastal communities of Malpais & Santa Teresa	High	- £5,000 /year in order to develop material and set up the classes for the pilot course.	4-5 years	NGO's, ADI and local schools	Number of institutions that will carry out the pilot project	- Risk that the pilot is not successful. - Risk that teachers and students are not interested in the program.	Education & Awareness
Evaluate the course	Coastal communities of Malpais & Santa Teresa	High	- £2,000 to carry out the evaluation of the course.	4-5 years	NGO's, ADI and local schools	Result of the evaluation	- Risk that the course does not pass the evaluation. - Risk that the course needs to be significantly modified after evaluation.	Education & Awareness
Promote the inclusion of the course within the curriculum of local schools	Coastal communities of Malpais & Santa Teresa	High	- £5,000 /year for a series of workshops with teachers and principals.	2-3 years	NGO's, ADI and local schools	Number of institutions interested in carrying out the program	- Risk of institutions not being interested or able to carry out the program.	Education & Awareness

Objective 5: Promote sustainable fishing methods through local associations								
Conduct workshops to identify barriers for the use of "circular" hooks	Nicoya Peninsula	Critical	- £5,000 pounds for a series of workshops.	1-2 years	NGOs	Number of fisherfolk listed in the workshop	- Risk of fishers not attending workshops.	Education & Awareness
Design and implement a campaign to promote the use of "circular" hooks when fishing in hawksbill foraging grounds	Nicoya Peninsula	Critical	- £3,000 for the production of material for the campaign.	1-5 years	NGOs	Posters, infographics, stickers, videos, etc.	- Risk of fishers not interested in the campaign.	Education & Awareness
Monitor uptake and train fishers to handle sea turtles in case they interact with one.	Nicoya Peninsula	Critical	- £5,000 pounds for surveys and training sessions.	1-2 years	NGOs and fisher associations	Number of fisherfolk listed in the workshop	- Risk of fishers not being interested in participating on the workshops.	Education & Awareness
Objective 6: Develop a reef monitoring programme in collaboration with local associations, dive shops, and national authorities								
Design the methodology, budget and timeline for a 5-year	Cabo Blanco Management Area	Medium	- £3,000 pounds for a series of meetings and development of the main	1 year	NGO's, ADI, SINAC, local dive shops	Final produced document for the programme	- Risk of local members or national authorities not being able or	Improving knowledge

monitoring programme			document for the programme.				willing to carry out the programme.	
Training sessions (species ID, diving techniques, etc.) for local monitors	Cabo Blanco Management Area	Medium	- £5,000 for a series of workshops and open water training sessions.	1 year	NGOs, ADI, SINAC and local dive shops	Number of people achieving the competencies set for the training	- Risk of not finding local members interested in receiving training. - Risk of not being able to perform open water sessions due to bad weather or ocean conditions.	Education & Awareness
Field campaigns at rocky reefs in the region (species list, depth, type of bottom, etc.)	Cabo Blanco Management Area	Medium	- £5,000/ year to carry out field trips for reef monitoring.	2-5 years	NGOs, ADI, SINAC and local dive shops	Information gathered	- Risk of not being able to perform field campaigns due to bad weather or ocean conditions.	Improving knowledge

Analyse data from field trips	Cabo Blanco Management Area	Medium	- £3,000 to carry out analyses and produce a final report.	5 years	CREMA	Final report and possible peer reviewed paper	- Risk of not being able to produce the report due to lack of data. - Risk of paper not being published.	Improving Knowledge
Present results to members of the local communities	Communities around Cabo Blanco Management Area	Medium	- £5,000 to give talks and presentations and local communities.	5 years	NGOs, ADI, SINAC	Number of people attending the talks and new initiatives derived from them	- Risk of community members not being interested in the project.	Education and awareness
Objective 7: Promote the use of hawksbill sea turtles as flagship species in the local communities								
Workshops with business owners on the economic advantages of having a flagship species for the community aligning core conservation messaging with school outreach lessons learnt	Costa Rica	Critical	- £2,000 /year for a series of workshops and meetings.	1-5 years	NGOs, SINAC, ADI and the tourism sector	Number of workshops held, and business owners interested in the program	- Risk of business owners not being interested in promoting a flagship species for income generation.	Education and awareness

Train tour guides on responsible practices for sea turtle observation	Costa Rica	Critical	- £2,000 /year for a series of training sessions.	1-5 years	NGOs, SINAC, ADI and the tourism sector	Number of guides trained	- Risk of tour operators not being interested in the activity.	Education and awareness

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