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OF AQUATIC RESOURCES AND ECONOMIC ALTERNATIVES**



# USAID REGIONAL PROGRAM FOR THE MANAGEMENT OF AQUATIC RESOURCES AND ECONOMIC ALTERNATIVES

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# MONITORING FINAL REPORT

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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## EXECUTIVE SUMMARY

Hawksbill (*Eretmochelys imbricata*) turtles are on the brink of extinction in the eastern Pacific Ocean. With support from USAID's Regional Program, in 2011 ICAPO and its partners carried out coastal surveys with local fishers and community members along the entire coast of the Gulf of Fonseca (GOF), including its many islands. The main goal of the surveys were to determine: 1) if hawksbill nesting occurs within the GOF (at sites other than Bahia Jiquilisco and Estero Padre Ramos) and if so, in what quantity and where are the most important sites located, 2) where and in what quantity hawksbills forage in the GOF, and 3) if fishery interactions occur with hawksbills and if so, where and in which fisheries (e.g. lobster, blast-fishing, etc.). MAREA funds were leveraged against financial and in-kind support of grant-making institutions and local organizations to ensure optimization of these efforts.

A total of 311 fishers were interviewed at 65 communities across the the three countries with jurisdiction of the GOF. According to interviews, hawksbill nesting is relatively sporadic throughout the region. Nonetheless, several important sites warrant further research and conservation action, including Punta Amapala and Meanguera Island in El Salvador, La Exposicion island and Punta Condega in Honduras, and La Salvia and Aserradores in Nicaragua. The GOF appears to be critical year-round foraging habitat for hawksbill turtles. Fisher interviews indicated the near-shore rocky substrates and mangrove estuarine habitats are important habitat for the species. Hotspots include the reef off of Punta Amapala in El Salvador, the Bay of Chismuyo and the neighboring estuaries extending into the Bays of Union and San Lorenzo in Honduras, and the rocky habitat off the coast of La Salvia in Nicaragua. Fisheries interactions with hawksbills appear fairly common throughout the GOF and are of great concern from a conservation perspective. Gillnets were reported as the most common gear-type interacting with hawksbills. Efforts to quantify incidental bycatch are urgently needed to further evaluate the threats of these fisheries in the region.

The surveys conducted by ICAPO provide extremely valuable information on the importance of the GOF for hawksbill turtles. Further research and conservation in the area will be paramount to recovery efforts directed at the species in the eastern Pacific.

## INTRODUCTION

Hawksbill turtles (*Eretmochelys imbricata*) play a critical role in maintaining healthy coastal marine ecosystems around the globe. Nonetheless, populations have been reduced by more than 80%, threatening the future viability of the species and limiting their ability to serve their ecological function (Mortimer & Donnelly 2008). Nowhere is this more apparent than in the Eastern Pacific Ocean (EP), where hawksbills were once common from Mexico to Ecuador, but today are considered among the world's most endangered sea turtle populations (Wallace et al. 2011). Protection of hawksbills was recently cited as the most pressing sea turtle conservation issue in the EP; only 200-300 female hawksbills are estimated to nest along the entire region's coastline (Gaos et al., 2010). These low nesting numbers suggest that the species is unlikely to survive without coordinated conservation actions to protect eggs, increase hatchling production, generate biological information and conserve coastal marine ecosystems. Furthermore, to ensure long-term success of recovery efforts, conservation actions must be socially, financially and ecologically sustainable.

Before 2008 and the inception of the Eastern Pacific Hawksbill Initiative (ICAPO), encountering a hawksbill in the EP was a rare if not impossible occurrence. Conservation efforts and especially recovering the population, was beyond the imagination of even the most optimistic researcher. In 2008 ICAPO pioneered activities to seek out information on the species, leading to discovery of several key nesting and foraging sites. These findings completely changed the conservation outlook for hawksbills in the EP and provided hope for recovery. Since the initial discoveries ICAPO has had phenomenal success, establishing numerous local conservation projects, consolidating an important body of scientific literature, and bringing EP hawksbill turtles to the forefront of the global marine turtle conservation agenda. ICAPO is now a strong, diverse network of individuals and organizations that work to protect and recover hawksbill turtles and their habitat in countries throughout the EP through close collaborations with coastal community members, private interest holders, scientists, management authorities and policy makers.

ICAPO has been carrying out hawksbill conservation efforts in Bahia Jiquilisco, El Salvador, and Estero Padre Ramos, Nicaragua, since 2008 and 2010, respectively. Located at the mouth of the Gulf of Fonseca (GOF), these two sites host approximately 90% of the known hawksbill nesting in the entire EP. Satellite telemetry research has been implemented as part of ICAPO's ongoing research and conservation efforts in El Salvador and Nicaragua to learn about hawksbill movements and identify critical habitat. A total of eleven satellite tags have been attached to hawksbills in both countries [El Salvador (n=6); Nicaragua (n=5)], showing high connectivity among countries bordering the GOF and the high-use of the inner bays and canals of the GOF. Despite its apparent importance for the species, aside from Bahia Jiquilisco and Estero Padre Ramos, the rest of the GOF had yet to be evaluated for nesting or foraging of hawksbills. In 2011, with support from USAID's Regional Program and other partners, ICAPO carried out interviews with fishers and coastal community members along the coast of the GOF, including its many islands, to generate information on hawksbills. This report summarizes the results of that effort.

## METHODOLOGY

### **Coastal surveys and monitoring:**

ICAPO and its partners carried out local fisher and community member surveys (i.e. interviews) along the entire coast of the Gulf of Fonseca (GOF), including its many islands, to generate information on hawksbill nesting, foraging and fishery interaction. The GOF was divided into nine ‘work zones’, three in El Salvador (two along the coast and one for the islands), four in Honduras (three along the coast and one for the islands) and two in Nicaragua (both along the coast). These work zones were necessary to ensure systematic survey activities in the region as dictated by political boundaries and/or the geographic isolation of particular areas (e.g. islands and communities isolated by mangroves). Between August and December 2011, we conduct thorough surveys at coastal communities within each work zone. Local field technicians and NGO staff were hired to conduct interviews and were trained on how to properly conduct interviews and accurately complete survey forms (Annex 1).

The main goal of the surveys were to determine: 1) if hawksbill nesting occurs within the GOF (at sites other than Bahia Jiquilisco and Estero Padre Ramos) and if so, in what density and where the most important sites are located, 2) where hawksbills forage in the GOF, and 3) if fishery interactions occur with hawksbills. While interviews were the principal form of data-capture, when potentially important sites were identified we opportunistically conduct beach monitoring activities and/or visual surveys of marine sites to verify nesting and foraging, respectively.

## RESULTS AND DISCUSSION

### **COMMUNITIES VISITED AND SURVEYS ADMINISTERED**

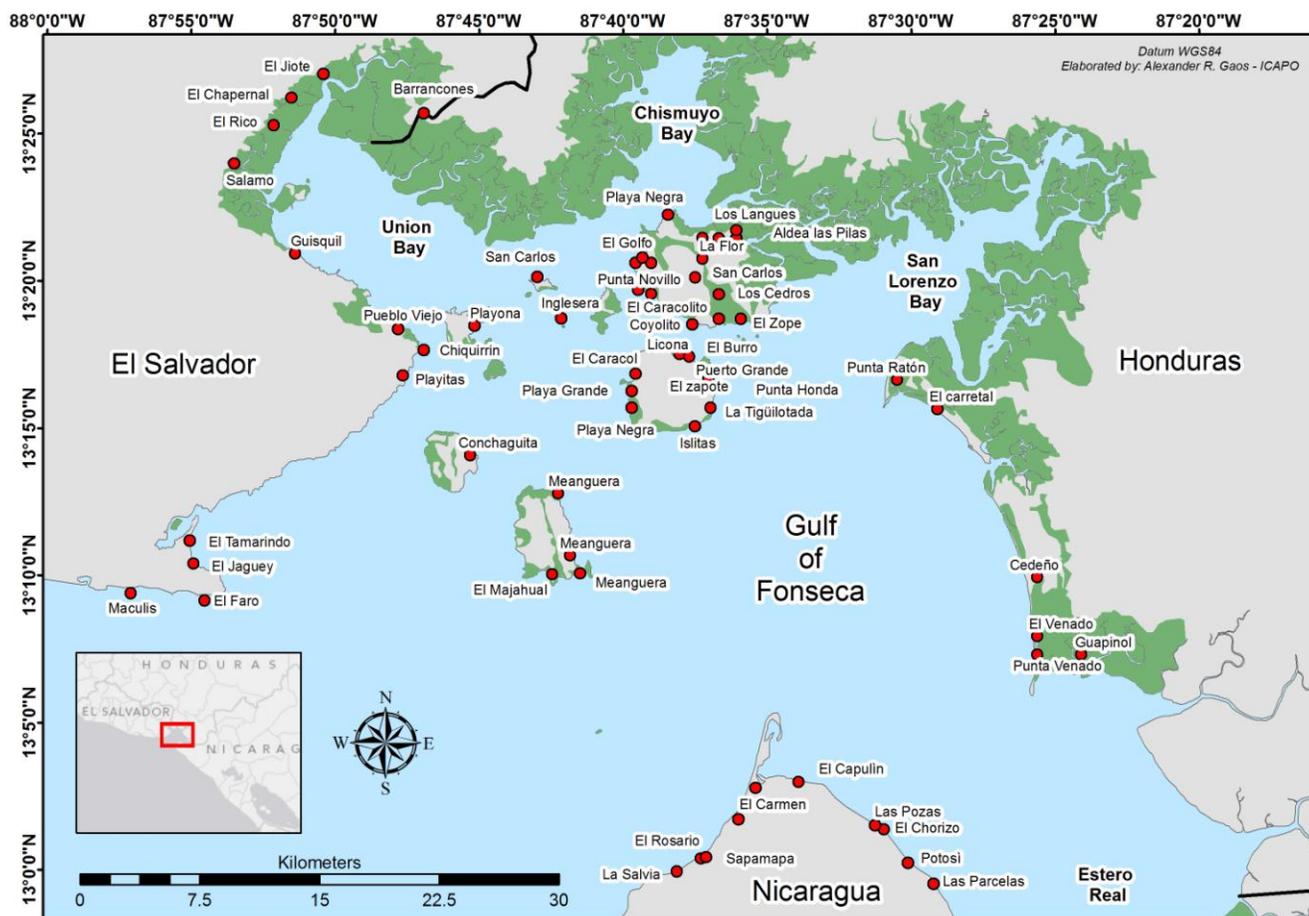
ICAPO interviewed a total of 311 fishers at 65 communities across the GOF (Figure 1) to generate information on hawksbill turtles. In several cases communities were first visited to gather a list of potential interviewees, then a date was set to return and conduct the interviews. These return dates ensured that fishers and community members were available for in-depth interviews, and also instigated an initial level of cooperation from these stakeholders with the interviewers. Interviews targeted experienced fishers and community members (e.g. egg collectors) to maximize the amount and accuracy of data collected.

#### *El Salvador-*

A total of 22 communities were surveyed in key areas along the Salvadoran portion of the GOF. The areas visited included communities along Punta Amapala in the vicinity of El Maculis-El Tamarindo, near La Unión, along the mangroves leading to the border with Honduras and several communities located on islands under Salvadoran jurisdiction within the Gulf (Figure 1). A total of 97 interviews were successfully administered (Annex 2). These included primarily locals involved in extraction of fish, lobsters and

turtle eggs in areas where hawksbills were likely to be present, thus providing the best opportunity to generate information on the species.

**Figure 1. Primary communities where hawksbill interview surveys were carried out in the Gulf of Fonseca. Numerous smaller communities/settlements in the vicinity of those shown were also visited.**



### *Honduras-*

A total of 31 communities were surveyed in key areas along the Honduran portion of the GOF. The interviews included communities along the northern and eastern portions of the GOF, as well as at several islands under Honduran jurisdiction (Figure 1). The Bay of Chismuyo and the Bay of San Lorenzo, in the northern portion of the GOF, are entirely surrounded by mangroves with few settlements. Nonetheless, we were able to generate information on hawksbill presence in these areas due to the fact that the majority of fishing that occurs is by fishers who travel to the sites from communities we visited.

A total of 180 interviews were successfully administered (Annex 3). These included primarily locals involved in extraction of fish, oysters, lobster and turtle eggs in areas where hawksbills were likely to be present, thus providing the best opportunity to generate information on the species.

#### *Nicaragua-*

Surveys were carried out in a total of 12 communities along the Nicaraguan coast of the GOF. These interviews were conducted in the Department of Chinandega and focused on the regions of Potosí and Punta San Jose (Figure 1). We also conducted interviews in the community of Mechapa, on the western portion of the peninsula, which is not shown in Figure 1.

A total of 34 interviews were successfully administered (Annex 4). These included primarily locals involved in extraction of fish and turtle eggs in areas where hawksbills were likely to be present, thus providing the best opportunity to generate information on the species. Similar to the situation in Honduras, the southern most portions of the GOF are mangrove areas with few human settlements. Nonetheless, we were able to generate information on hawksbill presence on this area due to the fact that the majority of fishing that occurs is by fishers who travel to the sites from communities we visited.

## **NESTING**

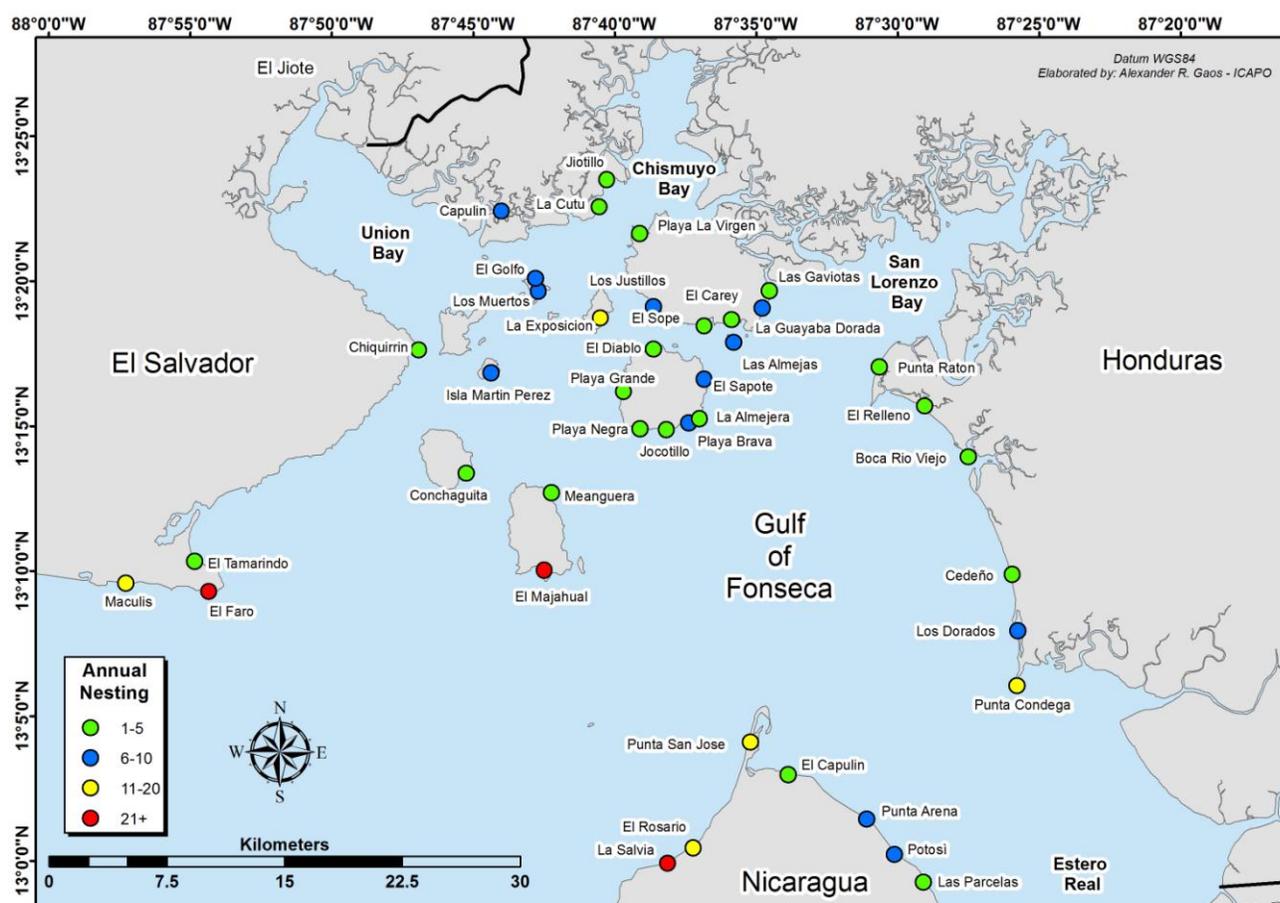
Interviews provided important anecdotal information regarding hawksbill nesting at sites along the coast within the GOF (Figure 2). Nesting appears to be sporadic in most cases, with few indications of large rookeries other than those previously identified (Bahia Jiquilisco and Estero Padre Ramos) and no sites were reported to receive more than 50 nests per year. However, a few sites were reported to receive >20 nests per year and merit further investigation. It is important to point out that all information provided in this report are based on interviews and actual hawksbill nesting levels may be greater or less than those reported here.

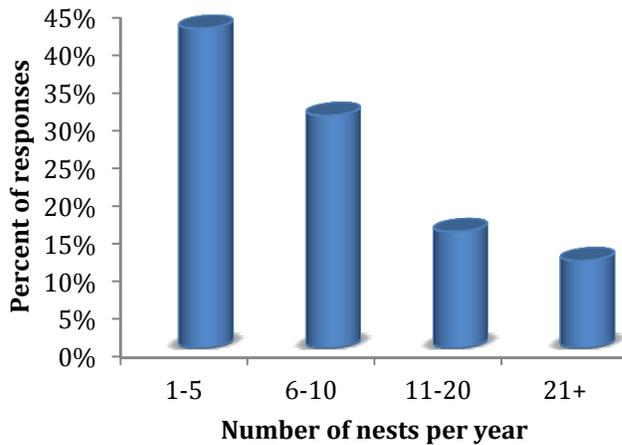
#### *El Salvador-*

Interviewees at each community visited were asked the number of nests laid on an annual basis. The majority of nesting fell within the 1-5 nests per season range, followed by 6-10, 11-20 and 21+ (Figure 3). Nesting levels of 21+ were reported for two sites; El Faro on Punta Amapala and Majahual on Meanguera Island (Figure 2). Previous research on the former has confirmed hawksbill nesting at the site, however robust monitoring and nest protection has yet to be carried out, thus accurate information on nesting numbers is lacking. Further research is needed to confirm hawksbill nesting levels at both sites. The only other site with nesting reported above 1-5 nests per year was Isla Martin Perez. Isla Martin Perez is under control of the Salvadoran Navy with several service-men stationed on the island year-round. This offers a good potential opportunity for long-term hawksbill nest protection at the site. Unfortunately, locals reported that the overwhelming majority

of nests laid throughout the Salvadoran portion of the GOF, including those on Martin Perez, are currently poached (Table 1) and sold on the black market. The unsustainable and illegal collection of eggs throughout the country represents a major threat to the hawksbill nesting population in the region.

**Figure 2. Reported annual hawksbill nesting within the GOF in increments of 1-5 nests/year (green circles), 6-10 nests/year (blue circles), 11-20 nests/year (yellow circles) and 21+ nests/year (red circles).**





**Figure 3. Reported hawksbill nesting levels in ranges of 1-5, 6-10, 11-20 or 20+ nests per year at beaches in the Salvadoran portion of the GOF.**

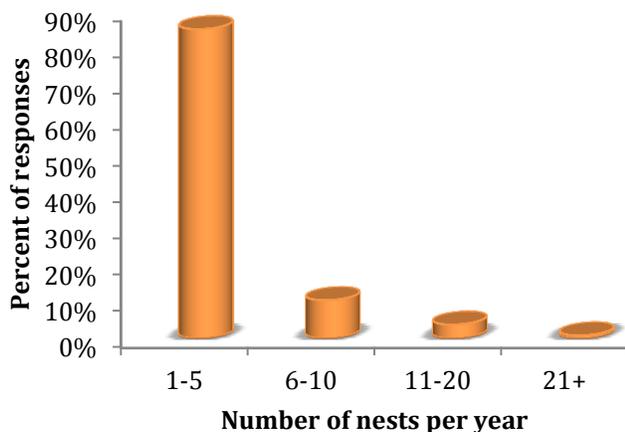
El Salvador	
Nesting site	% poached
El Faro	100%
El Tamarindo	100%
Maculis	95%
Chiquirrin	100%
Martin Perez	75%
Conchagueta	95%
Meanguera	NR
Majahual	75%

NR - No response

**Table 1. Reported percentage of nests poached at identified nesting sites in the Salvadoran portion of the GOF.**

#### Honduras-

Information collected via interviews indicated that nesting sites hosting more than 20 nests per season do not exist within the Honduran portion of the GOF (Figure 2). Nonetheless, two areas, La Exposicion island and Punta Condega, were both reported to receive 11-20 nests per season. The former site is reportedly poached at high levels (Table 5), but less than 100% due to its relative remoteness and lack of inhabitants. Similarly, Punta Condega was reported to have a poaching rate of 50%, with the relatively reduced levels due to an existing sea turtle conservation program in the area (Table 2). Nonetheless, it is important to point out that current sea turtle conservation activities at the site focus on activities during the 25-day national egg ban period in September of each year. Considering the peak hawksbill nesting season is in June and July, it is likely the majority of hawksbills nests laid in Punta Condega are collected and sold to the black market.



**Figure 4. Reported hawksbill nesting levels in ranges of 1-5, 6-10, 11-20 or 20+ nests per year at beaches in the Honduran portion of the GOF.**

Honduras			
Nesting site	% poached	Nesting site	% poached
Capulin	100%	Playa Brava	100%
La Cutu	NR	La Almejera	100%
Jiotillo	NR	El Sapote	100%
La Virgen	100%	El Carey	100%
El Golfo	100%	Las Almejas	100%
Los Muertos	50%	La Guyaba Dorada	100%
La Exposicion	75%	Las Gaviotas	100%
Los Justillos	95%	Punta Raton	100%
El Sope	100%	El Relleno	100%
El Diablo	75%	Boca Rio Viejo	100%
Playa Grande	100%	Cedeño	100%
Playa Negra	100%	Los Dorados	100%
Jocotillo	100%	Punta Condega	50%

NR - No response

**Table 2. Reported percentage of nests poached at identified nesting sites in the Honduran portion of the GOF.**

During our surveys in Honduras we found that the majority of interviewees indicated they did not dedicate significant effort to egg collection, except for those in the communities of Punta Raton, El Venado, El Carretal, and Punta Raton, which are important olive ridley (*Lepidochelys olivacea*) sea turtle nesting sites. Despite this fact and generally low levels of hawksbill nesting across most of the Honduran coast, the majority of nests are poached (Table 5). There are currently only two sea turtle conservation projects along the entire Honduran coast of the GOF, both of which focus efforts during the peak of the olive ridley season. One of these programs operates in the vicinity of Punta Condega and it is recommended that efforts be extended to include monitoring and conservation during the peak hawksbill nesting months in order to protect nests and better understand nesting levels by the species in the Punta Condega.

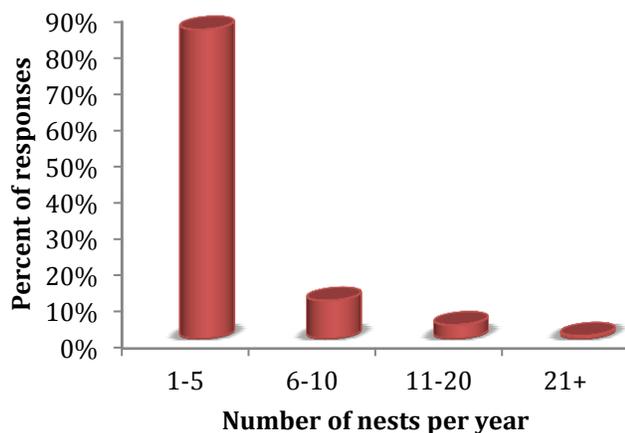
#### *Nicaragua-*

Similar to other countries, the majority of nesting in Nicaragua fell within the 1-5 nests per season range, followed by 6-10, 11-20 and 21+ (Figure 3). Despite the relatively small number of interviews conducted in Nicaragua, the area was reported to receive relatively substantial nesting numbers. Nesting levels of 21+ was reported for La Salvia and neighboring areas (e.g. Punta San Jose) were also reported to receive 11-20 nests (Figure 23). These numbers provide justification for research in the area to establish hawksbill nesting levels.

Sea turtle monitoring and conservation efforts were previously carried out in the area of Potosi and Punta San Jose by LIDER (Luchadores Integrados al Desarrollo de la Region), but were discontinued in 2004. Those efforts, which concentrated monitoring and protection activities during the olive ridley nesting season (September and October), documented 5 hawksbills nesting events in the 2004. Considering the peak hawksbill nesting season is in June and July and monitoring efforts did not include the southern sites of La Salvia, it is likely the majority of hawksbills nests laid in the area were not recorded and thus the 5 documented by the program were only a fraction of what actually occur in the area. It is recommended that monitoring efforts be re-initiated and include the area of La Salvia, with a specific focus of conducting monitoring and conservation during the peak hawksbill nesting months (June and July), in order to protect nests and better understand hawksbill nesting levels in the area.

While not pictured in Figure 2, we also carried out surveys in the community of Machapa, on the western coast of the Cosiguina Peninsula, in the Nicaraguan portion of the GOF. Interviewees reported substantial nesting at a site called Aserradores, a mangrove estuary located to the south of Estero Padre Ramos, the latter representing the largest hawksbill nesting rookery in the eastern Pacific and one of ICAPO's principal project sites. Interviewees indicated well-above 20 hawksbills nest are deposited within the Aserradores estuary each year and provided information on the spatial distribution of those events (Figure 6). It is highly recommended that efforts be initiated to quantify and protect hawksbill nesting in the area.

The need to initiate hawksbill conservation efforts in La Salvia/Punta San Jose and Aserradores is highlighted by the fact that locals reported that 100% of nests are poached (Table 3). The unsustainable and illegal collection of eggs throughout the country represents a major threat to the hawksbill nesting population in the region.

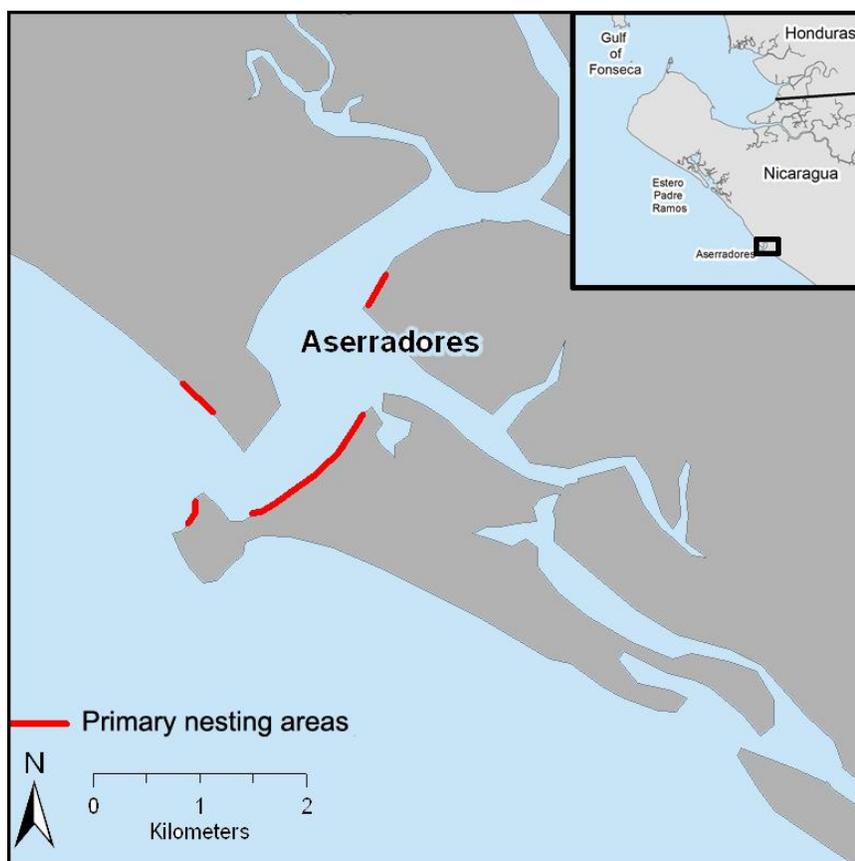


**Figure 5. Reported hawksbill nesting levels in ranges of 1-5, 6-10, 11-20 or 20+ nests per year at beaches in the Nicaraguan portion of the GOF.**

Nicaragua	
Nesting site	% poached
La Salvia	100%
El Rosario	100%
Punta San Jose	100%
El Capulin	100%
Punta Arena	100%
Potosí	100%
Las Parcelas	100%

*NR - No response*

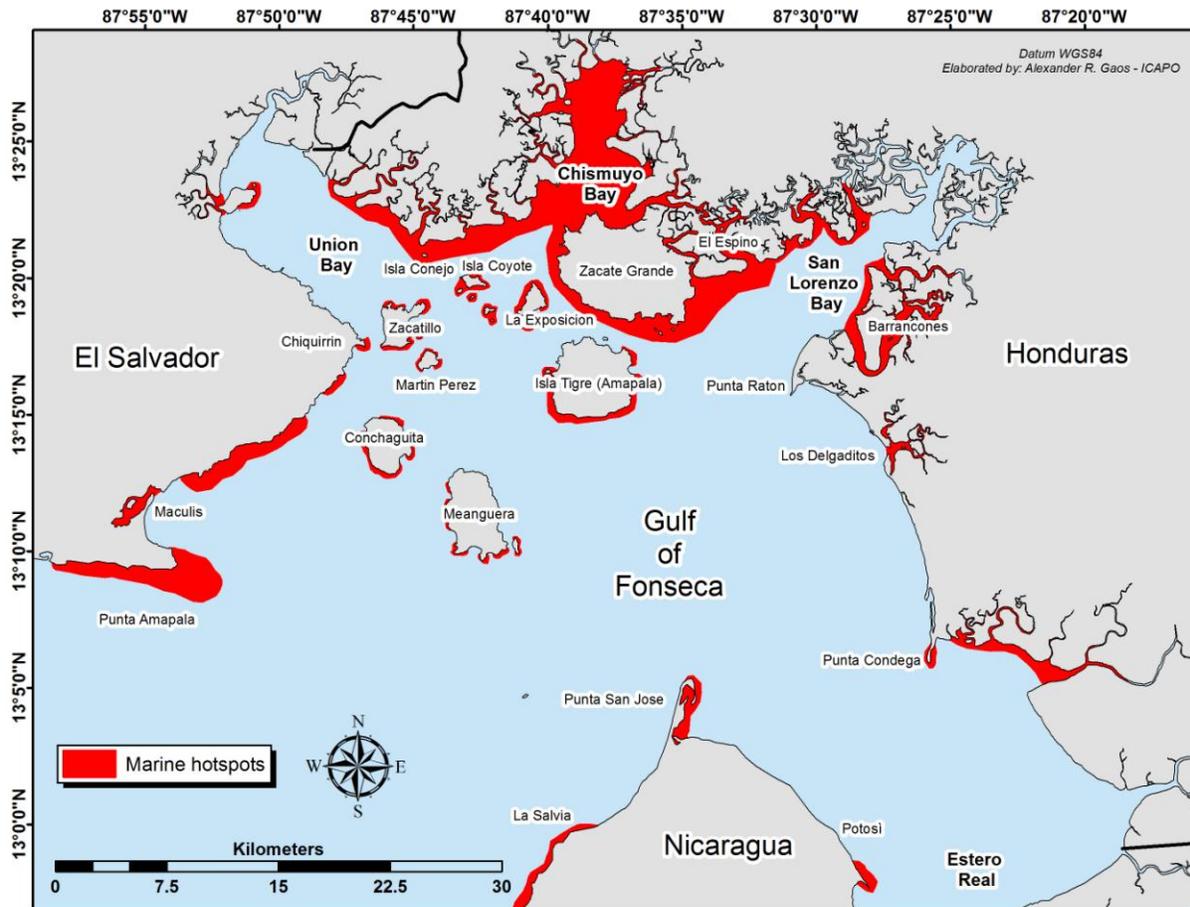
**Table 3. Reported percentage of nests poached at identified nesting sites in the Nicaraguan portion of the GOF.**



**Figure 6. Reported hawksbill nesting areas in Aserradores, Nicaragua. The site is located to the south of Estero Padre Ramos.**

## FORAGING AREAS

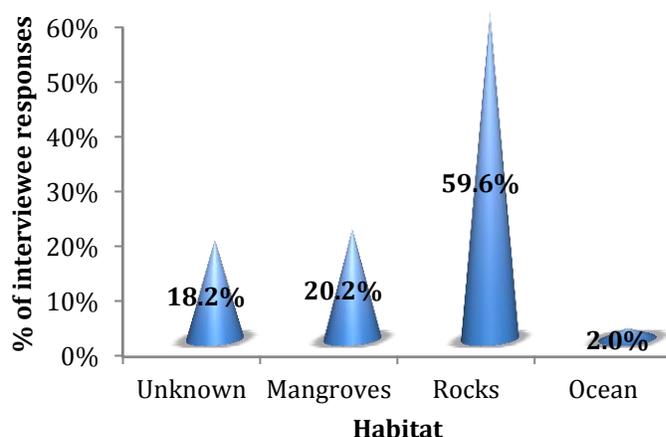
Survey activities generated substantial information on hawksbill foraging areas throughout the GOF. It is important to point out that the findings presented here do not necessarily represent the full extent of hawksbill habitat-use in the region as it is only what fishers and community members were able to report. It is likely hawksbills also use areas where fishers are not present or are not aware of hawksbill present. Despite this reality, it is apparent that both adult and juvenile hawksbills are present throughout the coastal areas of the GOF, with several regions being identified as particular hotspots (Figure 7). It is important to highlight the fact that all hawksbill foraging hotspots were reported to be extremely coastal, with very few reports of the species in the open water habitat. This coincides with habitat-use by the species in other areas of the world, where hawksbills are also reported as being highly neritic.



**Figure 7. Hawksbill marine hotspots according to interviews in the GOF.**

#### *El Salvador-*

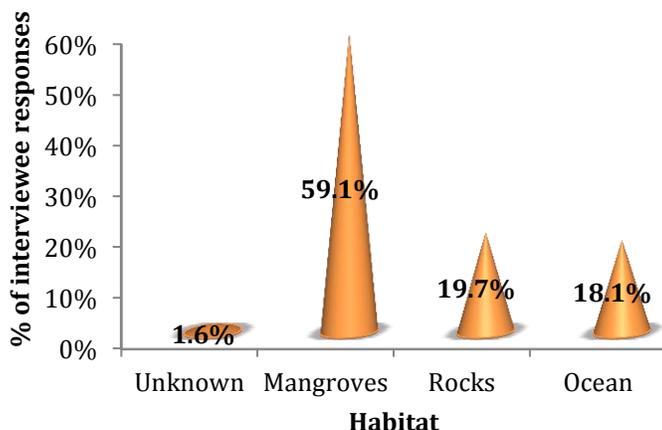
Interviews indicate there are several important foraging areas for hawksbill turtles in the Salvadoran portion of the GOF. Of particular importance is the large coral and rock reef off the coast of Punta Amapala (Figure 7), immediately adjacent to the entrance to the GOF. Locals reported hawksbills feed in these areas during the day and take refuge under rock ledges and caves located throughout the reef. The coastal area between El Maculis and Chiquirrin is also reportedly frequented by foraging hawksbills. The majority of marine sightings in El Salvador were reported at habitats consisting of rocky substrate, with mangrove habitat also being particularly important (Figure 8).



**Figure 8. Hawksbill sightings by habitat according to interviews in the Salvadoran portion of the GOF.**

#### *Honduras-*

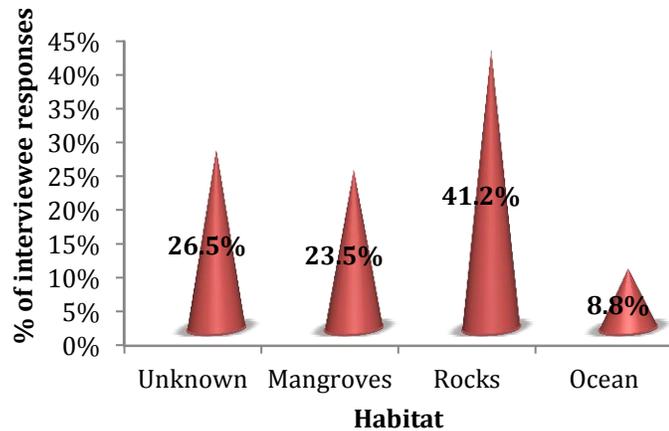
Several hawksbill foraging hotspots were identified in Honduran portion of the GOF, particularly in the northwest region (Figure 7). Most of the rocky habitats surrounding the islands appear to be frequented by the species. Additionally, locals reported that the entire Bay of Chismuyo and the mangrove-estuarine habitats leading into the Bay of Union, around Zacate Grande and into the Bay of San Lorenzo are of particular importance to hawksbills in the region. Sites in the southeast portion of the GOF, particularly the Estero Real, received less reports of hawksbill presence, but the importance of these areas should not be discounted as fewer interviews were conducted in the region. Coinciding with habitat availability in the region, the majority of marine sightings in Honduras were reported at habitats consisting of mangrove estuaries, followed by rocky substrates and ocean habitat (Figure 9). The ocean reports likely largely reflect the use of the waters off the coast within the Bays of Chismuyo and San Lorenzo as hawksbills sightings were not common within the main open-water body of the GOF.



**Figure 9. Hawksbill sightings by habitat according to interviews in the Honduran portion of the GOF.**

### Nicaragua-

Fishers in the Nicaraguan portion of the GOF were asked about the marine distribution of hawksbill turtles in the area as well as habitat type associated with the species. The majority confirmed seeing hawksbill turtles using rocky substrate areas and identified this as their primary habitat, followed by mangrove areas and open-ocean areas away from the coast (Figure 10). The rocky habitat in front of La Salvia was identified as an important hotspot, as was a small bay on the point of Punta San Jose (Figure 7).

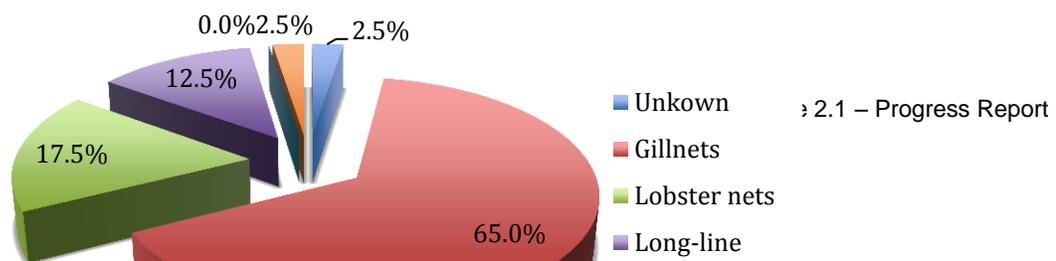


**Figure 10. Hawksbill sightings by habitat according to interviews in the Nicaraguan portion of the GOF.**

## FISHERIES INTERACTIONS

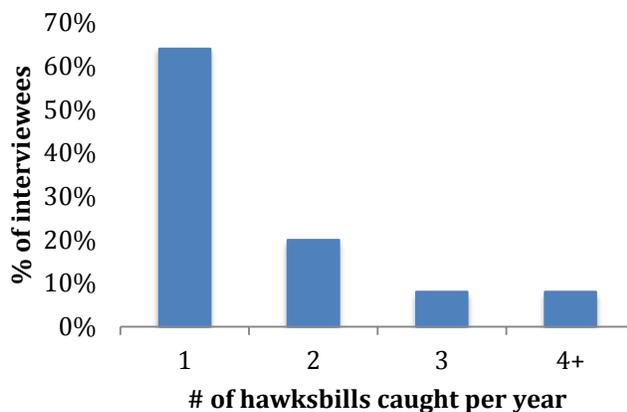
### El Salvador-

A number of fisheries gear types/methods were identified as interacting with hawksbills in the Salvadoran portion of the GOF. The most common response was gillnets, followed by lobster nets (independently recognized as a particular type of gillnet), long-lines and shrimp trawls (Figure 11). Lobster fishing using nets appears to only occur in the Salvadoran portion of the GOF and this technique was singled out as having high interactions with hawksbills off the coast of Punta Amapala. Fisheries observations will be critical to evaluating the impacts of this fishery on hawksbills at this site.



**Figure 11. Fisheries gear identified as interacting with hawksbill turtles in the Salvadoran portion of the GOF.**

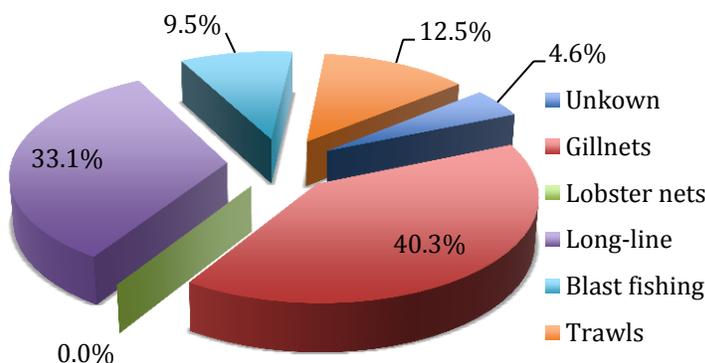
The majority (71.3%) of fishers in El Salvador indicated they did not capture hawksbills. Whether this reflects actual bycatch rates or is a result of fishers not wanting to admit to capturing hawksbills due to the illegal nature of the activity, remains unclear. However, of those fishers that did admit to capturing hawksbills, the majority indicated catching only 1 per year (64.0%), followed by 2 per year (20.0%), 3 per year (8.0%) and 4+ (8.0%) per year (Figure 12). Evidently, hawksbill bycatch does occur in Salvadoran waters of the GOF and future research is urgently needed to quantify and evaluate fishery interactions in the area.



**Figure 12. Annual hawksbill interactions according to fisher interviews in the Salvadoran portion of the GOF.**

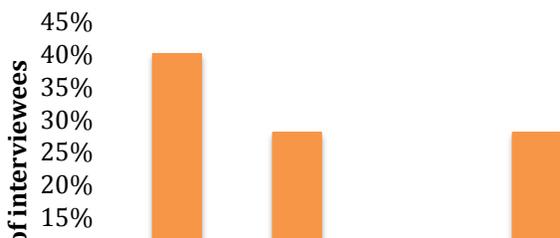
*Honduras-*

The most common fishery gear/method identified to interact with hawksbills in the Honduran portion of the GOF was gillnets, followed closely by long-lines, then shrimp trawls and blast-fishing (Figure 13). The relatively high reports of blast-fishing interactions is particularly worrisome considering the unselective and highly destructive nature of the fishing practice. Also, considering the highly illegal nature of the technique, it is likely hawksbill interactions were underreported. The majority of fishermen sighted their strong opposition to blast-fishing and recognized its destructive, unsustainable nature. Nonetheless, they reported the technique to be widespread throughout much of the GOF and ICAPO has documented several hawksbill deaths in Bahia Jiquilisco (El Salvador) due to blast-fishing. Increased enforcement and funding by government bodies to reduce blast-fishing will be critical to maintaining the ecological integrity of the GOF, as well as to reducing incidental mortality of hawksbills.



**Figure 13. Fisheries gear identified as interacting with hawksbill turtles in the Honduran portion of the GOF.**

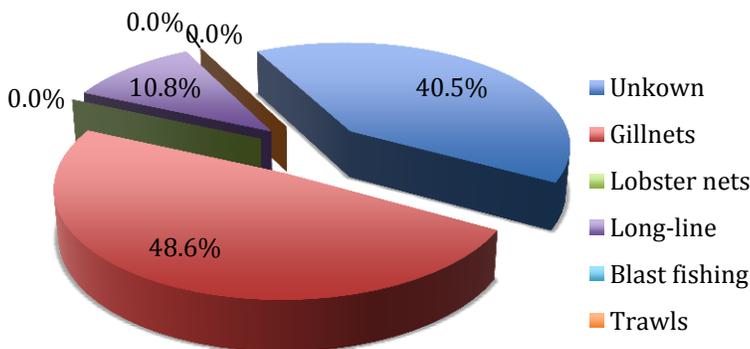
The majority (86.0%) of fishers in Honduras indicated they did not capture hawksbills. Whether this reflects actual bycatch rates or is a result of fishers not wanting to admit to capturing hawksbills due to the illegal nature of the activity, remains unclear. However, of those fishers that did admit to capturing hawksbills, the majority indicated catching only 1 per year (48.0%), followed by 2 per year (28.0%), 3 per year (4.0%). A surprising 28% of respondents report catching 4+ hawksbill per year (Figure 14). These high levels of reported bycatch warrant urgent research to determine exact locations of bycatch and to develop effective mitigation efforts in the region.



**Figure 14. Annual hawksbill interactions according to fisher interviews in the Honduran portion of the GOF.**

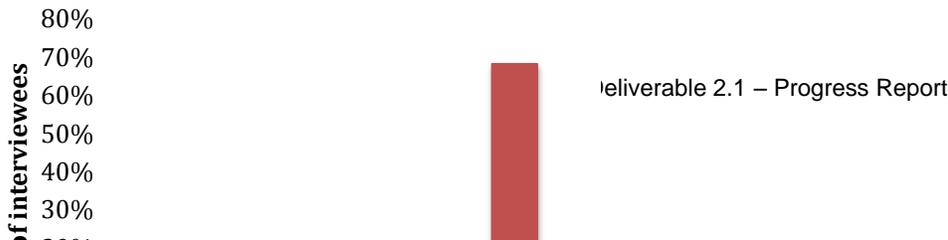
*Nicaragua-*

As with the other countries, the most common gear/method indicated to interact with hawksbills in Nicaragua was gillnets, followed by long-lines (Figure 15). No reports of lobster nets (per se) or blast fishing were documented for the region.



**Figure 15. Fisheries gear identified as interacting with hawksbill turtles in the Nicaraguan portion of the GOF.**

A far smaller percentage (40.5%) of fishers in Nicaragua indicated they did not capture hawksbills. Of great concern is the fact that of the fishers that admitted to capturing hawksbills, the majority (40.5%) indicated catching 4+ per season (Figure 16). Thus, interviews indicate that hawksbill bycatch in Nicaragua is higher than that in Honduras or El Salvador. Nonetheless, this could also be a result of fishers in Nicaragua being more willing to admit to hawksbill bycatch and actual rates of incidental capture will not be available until directed research is carried out.



**Figure 16. Annual hawksbill interactions according to fisher interviews in the Nicaraguan portion of the GOF.**

## **CONCLUSIONS AND RECOMMENDATIONS**

- The information provided in this report is anecdotal (i.e. empirically unconfirmed) and it will be necessary to conduct directed research to confirm the validity of findings on nesting, foraging and fisheries interactions.
- Hawksbill nesting is reported as fairly sporadic throughout the GOF. However, relatively high levels of nesting appear to occur in areas near the mouth of the GOF. Sites of particular importance include:
  - Punta Amapala and Majahual (Meanguera) in El Salvador
  - La Exposicion island and Punta Condega in Honduras
  - La Salvia/Punta San Jose and Aserradores in Nicaragua
- The overwhelming majority of hawksbills nests deposited within the GOF are illegally collected for consumption. Poaching of eggs is likely associated with high levels of poverty in the GOF. A hawksbill nest can typically fetch between \$20 and \$30 on the black market, a sum of money equivalent to several days of work, thus nests represent an invaluable source of income to many community members, the majority of whom are trying to meet the basic necessities to their families. Without sufficient incentives and employment alternatives, egg poaching will continue indefinitely in the GOF.
- Research to further quantify hawksbill nesting and protect nests at the aforementioned sites is highly recommended.

- The results of this study, as well as previous satellite telemetry research on hawksbills, indicate the GOF is a critical foraging ground for hawksbill turtles.
- Hawksbills were reported inhabiting neritic (i.e. coastal) areas consisting predominantly of rocky substrates and mangrove estuaries throughout the GOF. Sites of particular importance include:
  - The reef areas off of Punta Amapala in El Salvador
  - The Bay of Chismuyo and neighboring estuaries in Honduras
  - La Salvia/Punta San Jose in Nicaragua
- Research to quantify hawksbill abundance and spatial distribution at these sites is recommended to better understand the importance of these marine areas to hawksbills.
- Efforts to characterize the substrates in marine hotspots would provide important information on hawksbill habitat requirements in the region and would assist with management efforts.
- Fisheries interactions with hawksbills appear to occur across the GOF and further research is recommended to quantify levels of incidental bycatch and evaluate the fate of turtles caught in different gear-types.
- Gillnets reportedly incur high levels of bycatch in the region and efforts to limit this gear type in hawksbills hotspots, particularly those in front of Punta Amapala and within the region of the Bay of Chismuyo, are recommended.
- Considering the geography and habitats of the eastern Pacific, the GOF represents a unique and extremely valuable ecosystem. Considering its abundant natural resources, the ecological services it provides to humans, its importance for hawksbills and numerous other species of fauna and flora, the governments of El Salvador, Honduras and Nicaragua should give serious consideration to providing protective status for the entire region.

## Annex 1. Survey form used to collect information on hawksbill turtles in the GOF.

## ENCUESTA SOBRE LAS TORTUGAS CAREY EN EL GOLFO DE FONSECA

1. Fecha: \_\_\_\_\_ Comunidad: \_\_\_\_\_ (GPS) N \_\_\_\_\_ O \_\_\_\_\_

**A. Datos del informante local:**

2. Nombre (opcional) \_\_\_\_\_ 3. Sexo: M \_\_\_\_\_ F \_\_\_\_\_ 4. Edad: \_\_\_\_\_

5. Ocupación \_\_\_\_\_ 6. Cuantos años tiene de serlo? \_\_\_\_\_

**B. Anidación de las tortugas marinas (TM) y tortugas carey en playas locales:**

7. Cuantos tipos de TM anidan en la zona de su comunidad? \_\_\_\_\_ Cuales son? Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_  
Otras \_\_\_\_\_

\*Muestre fotos de las 4 especies y anote cuales pudo identificar correctamente\* Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_

8. Cuál es el orden de abundancia de estas especies de tortugas anidando? (coloque 1,2,3,4, etc. según el orden)  
Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_ Otras \_\_\_\_\_

9. En cuales playas anidan a las tortugas carey? \*Marque los nombre(s) en el mapa \_\_\_\_\_

10. Cuantas tortugas carey anidan cada temporada en esta(s) playa(s)? \*cuantificar el número de nidos aproximados usando los rangos abajo para c/ playa (pon el nombre de la playa(s) en la línea respectiva).  
0 \_\_\_\_\_ 1-5 \_\_\_\_\_  
6-10 \_\_\_\_\_ 11-20 \_\_\_\_\_  
21-50 \_\_\_\_\_ 51-75 \_\_\_\_\_  
75+ \_\_\_\_\_

11. En que meses anidan la mayor cantidad de tortugas carey? (coloque 1,2,3,4, etc. según el orden)  
En \_\_\_\_\_ Fe \_\_\_\_\_ Mr \_\_\_\_\_ Ab \_\_\_\_\_ My \_\_\_\_\_ Jn \_\_\_\_\_ Jl \_\_\_\_\_ Ag \_\_\_\_\_ Se \_\_\_\_\_ Oc \_\_\_\_\_ No \_\_\_\_\_ Di \_\_\_\_\_

12. Qué porcentaje de estos nidos son saqueados? 0% \_\_\_\_\_ 25% \_\_\_\_\_ 50% \_\_\_\_\_ 75% \_\_\_\_\_ 95% \_\_\_\_\_ 100% \_\_\_\_\_

13. Hace 20 años cuantas tortugas carey anidaban en estas misma playas?  
Mucho menos \_\_\_\_\_ Menos \_\_\_\_\_ Igual \_\_\_\_\_ Mas \_\_\_\_\_ Mucho mas \_\_\_\_\_

14. Cuales otras playas son importantes para las otras especies de tortugas marinas y aproximadamente cuantos nidos son depositadas por especie en cada una? \*Marque las áreas en el mapa y anote el nombre de la(s) playa(s) \_\_\_\_\_

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**C. Estacionalidad y distribución de las tortugas marinas y tortugas carey en aguas:**

15. Ha visto tortugas marinas dentro del mar o en los esteros? Si \_\_\_\_\_ No \_\_\_\_\_ Cuales? Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_  
Otras \_\_\_\_\_

16. En cuales áreas y a que profundidad aproximadamente ha observado a las tortugas carey? \*\*Marque el nombre del área en el mapa y tipo de hábitat (manglar, arrecife rocoso, arena, etc.) de cada uno\*\*

1. \_\_\_\_\_ ( \_\_\_\_\_ bra) 2. \_\_\_\_\_ ( \_\_\_\_\_ bra)  
3. \_\_\_\_\_ ( \_\_\_\_\_ bra) 4. \_\_\_\_\_ ( \_\_\_\_\_ bra)

17. De que tamaño son típicamente (mas o menos)? \*Mida el espacio entre sus manos con una cinta\* \_\_\_\_\_

19. Que están haciendo (comiendo, apareando, etc.)? \_\_\_\_\_  
Si están comiendo, de que se alimentan? \_\_\_\_\_

20. Durante que meses están allí? En \_\_\_\_\_ Fe \_\_\_\_\_ Mr \_\_\_\_\_ Ab \_\_\_\_\_ My \_\_\_\_\_ Jn \_\_\_\_\_ Jl \_\_\_\_\_ Ag \_\_\_\_\_ Se \_\_\_\_\_ Oc \_\_\_\_\_ No \_\_\_\_\_ Di \_\_\_\_\_ Todos \_\_\_\_\_

21. Si va a este sitio 10 veces, cuantas de esas veces ve a una tortuga carey (por cada sitio mencionado)

1. \_\_\_\_\_ (Nº \_\_\_\_\_) 2. \_\_\_\_\_ (Nº \_\_\_\_\_)  
3. \_\_\_\_\_ (Nº \_\_\_\_\_) 4. \_\_\_\_\_ (Nº \_\_\_\_\_)

22. En cuales áreas ha observado a otras especies de tortugas marinas en el agua? \*Anote las áreas y especies en el mapa

1. \_\_\_\_\_ ( \_\_\_\_\_ bra) Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_  
2. \_\_\_\_\_ ( \_\_\_\_\_ bra) Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_  
3. \_\_\_\_\_ ( \_\_\_\_\_ bra) Lo \_\_\_\_\_ Cm \_\_\_\_\_ Ei \_\_\_\_\_ Dc \_\_\_\_\_

**D. La pesca:**

23. Hay tipos de pesca que accidentalmente capturan a tortugas marinas? Si o No  
Cuales son? Cimbra \_\_\_\_\_ Arrastre \_\_\_\_\_ Bombeo \_\_\_\_\_ Red Agallera \_\_\_\_\_ Apaleo \_\_\_\_\_

24. Se ocupan estos equipos de pesca en su comunidad/área (cuales)? \_\_\_\_\_

25. Cuantas tortugas carey se capturan accidentalmente por año utilizando estos equipos de pesca (por equipo)?  
Cimbra \_\_\_\_\_ Arrastre \_\_\_\_\_ Bombeo \_\_\_\_\_ Red Agallera \_\_\_\_\_ Apaleo \_\_\_\_\_ Trasmallo \_\_\_\_\_

26. Que proporción (%) de estas son adultas? \_\_\_\_\_ \*clarificar que es una adulta si es necesario.

27. En cuales áreas (por equipo)? \*Marque las áreas en el mapa y anote su nombre, el equipo usado, el número de tortugas carey capturadas por año, y el tipo de hábitat. \_\_\_\_\_

28. Que les pasa a las tortugas capturadas (por equipo) ?  
Cimbra \_\_\_\_\_ Arrastre \_\_\_\_\_  
Bombeo \_\_\_\_\_ Red Agallera \_\_\_\_\_  
Apaleo \_\_\_\_\_ Trasmallo \_\_\_\_\_

29. Estos equipos de pesca que capturan tortugas son legales? \_\_\_\_\_

30. Hace 20 años cuantas tortugas carey se veía en estas mismas aguas?  
Mucho menos \_\_\_\_\_ Menos \_\_\_\_\_ Igual \_\_\_\_\_ Mas \_\_\_\_\_ Mucho mas \_\_\_\_\_

31. Cuál es la amenaza principal a las tortugas carey? \_\_\_\_\_

32. Hay lugares donde capturan otras especies de tortugas marinas y con cuales equipo?  
\*Marque las áreas en el mapa y anote su nombre, el equipo usado, el número de tortugas capturados (aproximadamente) por año por especie y el tipo de hábitat \_\_\_\_\_

**Annex 2. Country, names, sex, age, communities, occupation and years dedicated (to occupation) of the 97 locals surveyed in the Salvadoran portion of the Gulf of Fonseca for information on the presence of hawksbill turtles.**

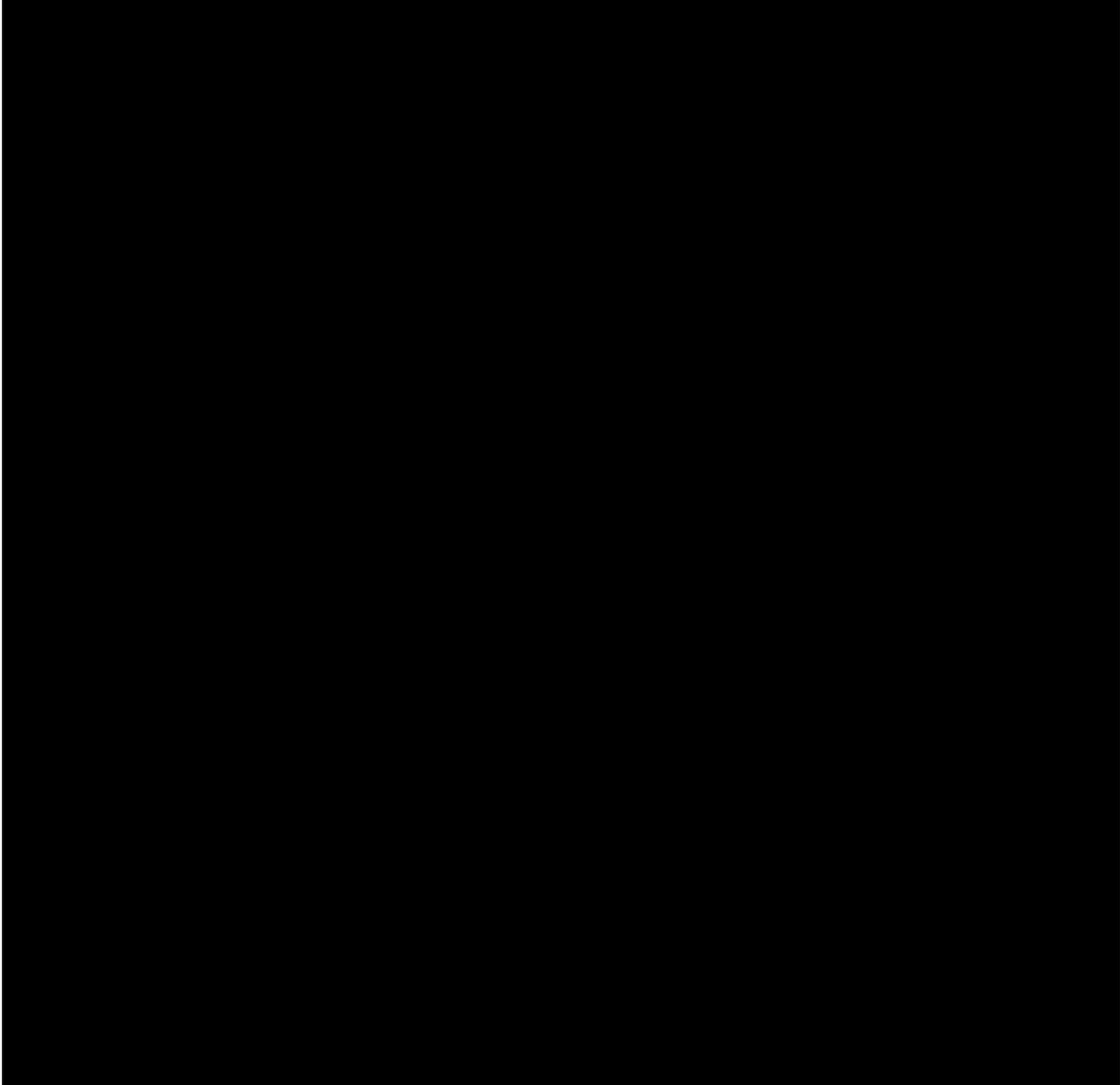
#	Country	Name	Sex	Age	Community	Occupation	Years Dedicated	#	Country	Name	Sex	Age	Community	Occupation	Years Dedicated
[Redacted content]															

**Annex 3. Country, names, sex, age, communities, occupation and years dedicated (to occupation) of the 180 locals surveyed in the Honduran portion of the Gulf of Fonseca for information on the presence of hawksbill turtles.**

**Annex 4. Country, names, sex, age, communities, occupation and years dedicated (to occupation) of the 34 locals surveyed in the Nicaraguan portion of the Gulf of Fonseca for information on the presence of hawksbill turtles.**

#	Country	Name	Sex	Age	Community	Occupation	Years Dedicated

#	Country	Name	Sex	Age Community	Occupation	Years Dedicated	#	Country	Name	Sex	Age Community	Occupation	Years Dedicated
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## Annex 5. Photos of program activities



Photo 1. Program staff conducting interviews along the Honduran coast of the GOF.



Photo 2. Fisher meeting to gather information on hawksbills in Honduras.

Photo 2. Community meetings to gather information from fisheries in the GOF.



Photo 3. View of the gulf islands from Playa Grande on Isla Tigre, Honduras.



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**Photo 5. Fisher interviews and program presentation on Meanguera island, El Salvador.**



**Photo 6. Typical fishing community on the islands of the GOF.**