HAMMERHEAD SHARK use in Puntarenas, Costa Rica.
Effects of the application of CITES decisions on livelihoods in poor rural communities:

HAMMERHEAD SHARK
use in Puntarenas, Costa Rica.
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This case study of the effects on the livelihoods of rural poor communities resulting from the inclusion of species in CITES, was based on a rapid assessment of livelihoods of longline fishermen capturing hammerhead shark species - *Sphyrna lewini*, *Sphyrna zygaena*, *Sphyrna mokarran*. The study took place in Puntarenas, Costa Rica (between July 20TH - 25th, 2015). These species were included on September 2014 in Appendix II of CITES. They are not being captured directly by longline vessels but incidentally as by-catch during fishing operations and are captured along with other shark species for trade of meat and fins.

The inclusion in Appendix II of CITES allows for regulated international trade of species of hammerheads and its parts. At the date of the completion of the assessment in Punta Arenas, there was an internal agreement of the CITES Management Authority SINAC (National System of Conservation Areas) banning international trade until a Non-Detriment Findings (NDF) report was done. In extraordinary session No. 14 of August 5th, 2015 the Council of Representatives of CITES Scientific Authority (CRACCITES), responsible for developing the NDF report, and according to the text of the Convention, concluded that the NDF was negative (non-permissive), therefore, in Costa Rica exporting bodies, meat, fins and derivatives of hammerhead shark species is prohibited.

This case study has two objectives. First, to enlighten decision-makers about the management of the species listed in CITES Appendices with regards to the applicability of the “Handbook on CITES and livelihoods”. Second, to present the positive or negative effects on livelihoods for poor rural communities of listing species in CITES Appendices, using hammerhead shark species in Costa Rica as an example.

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1 2015. General Secretariat of the Organization of American States. Published by the Department of Sustainable Development. All rights reserved. The financial support provided by the Government of Canada and the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is greatly appreciated. In addition, special thanks are extended to Rodrigo Martinez, Randal Viales, José Joaquin Calvo and Isis Marquez as well as to all the stakeholders from community of Puntarenas in Costa Rica who collaborated in developing this case study.
The populations of *Sphyrna lewini* and *Sphyrna mokarran* are listed on the IUCN Red List as endangered worldwide. These species are the pelagic and semi pelagic sharks most threatened worldwide. *Sphyrna zygaena* (smooth hammerhead) species is classified by IUCN as globally vulnerable (Maguire et al. 2006).

In the northwest and central west Atlantic, where *S. zygaena* is outnumbered by *S. lewini* by about ten to one, and based on the analysis of pelagic longline log data of the USA, it was estimated that Sphyridae (including *S. lewini* -Scalloped Hammerheads-, *S. mokarran* -Great Hammerheads- and *S. zygaena* -Smooth Hammerheads-) decreased in abundance by 89% from 1986-2005 (Casper et. al. 2005).

*Sphyrna lewini* is object of direct hunting and bycatch produce by trawlers, purse seines, gillnets, static demersal longlines, pelagic longline and artisanal fishing from shore. Artisanal fishing activity from shore captures a large number of young and young sharks in some regions, with adults caught in gill nets and longlines along the platform and offshore in ocean waters. It is estimated that high intensity fishing pressure can deplete regional stocks quickly, and the re-colonization of impoverished areas by neighboring regions is a slow and complex process. It is estimated that this species has a low resistance to exploitation due to its life patterns (Maguire et al. 2006).

*S. zygaena* is trapped with a variety of arts, including pelagic longlines, handlines, gill nets, seines and pelagic trawls and bottom trawls (Baum et al, 2007, Maguire et al. 2006).

*S. mokarran* is highly valued for its fins, and it is subject to targeted fishing and by-catch. It suffers a very high mortality as by-catch and it reproduces only once every two years making it vulnerable to overexploitation and population depletion.
III. Methodology for Case Study

For the development of this case study the steps of the Handbook on CITES and Livelihoods were followed, hereinafter referred to as the handbook. The handbook seeks to provide a route for multiple key stakeholders and beneficiaries that wish to develop rapid rural assessments, in particular with regards to the effects on the livelihoods of poor rural communities species are listed in CITES. It also provides the means to identify mitigation or coping strategies that address the impacts of the implementation of CITES decisions.

Outcomes from the application of the Handbook on CITES and livelihoods to the case study of hammerhead shark

Part I. How to assess rapidly the effects of the implementation of decisions to list species in the Appendices of CITES on livelihoods in poor rural communities

The handbook provided elements to the team that developed the study, with tools and references that allowed for recommendations on a best way to address and mitigate the effects. The breadth of methodologies included in the handbook allowed for the assessment of the conditions of the fishermen. The steps as they are outlined in the handbook lead to the development of the case study as elucidated below:

**Step 1 - Select the scale and the taxon(s) for evaluation.**

Following step 1 the zone and scope of the study was selected together with the administrative authorities of CITES of Central American countries. Costa Rica was chosen given their logistical and operational facilities and having considering the time available to develop the assessment. Also while selecting Costa Rica it was also considered that the government was one of the proponents of the inclusion of hammerhead species in Appendix II of CITES. Subsequently a discussion with SINAC as CITES management authority in Costa Rica took place to select the area for the rural rapid evaluation considering the time, resources and potential impact. It was decided that the study would be focused in the mid and large size commercial fishing fleet using longline. This group of fishermen are distributed along the coasts of the country, and for the development of the rapid rural appraisal, the fishermen living in the Central Canton of the province of Puntarenas were selected. The taxon or species studied (hammerhead shark - Sphyrna sp.-) was selected in advance specifically for the case study, however it was decided together with the union of longline owners of Puntarenas that for the purposes of having a global view of the situation of the fishermen and fishing activities, other shark species that are currently being captured should be included in the analysis.
Step 2 – Collect biological and trade information of the taxon (or taxa). Step 2 was executed in two ways. First a review was done with secondary information on the distribution of populations, threats, and use of hammerhead shark species and conservation actions worldwide. This information was obtained mainly from government organizations such as the Costa Rican Institute of Fishing and Aquaculture (INCOPESCA), the International Union for Conservation of Nature (IUCN), the Food and Agriculture Organization of the United Nations (FAO); and the non governmental organization Mar Viva. Secondly, information was obtained through specific questions tailored to a focus group in a workshop that took place in Puntarenas with 27 participants involved in shark fishing activities.

At the same workshop an exercise was done to map the value chain following the guidelines of Step 3 – Map out the value chain. Views from the sailors, the shipowners and marketers were gathered using the questions in Lundy & Gorret (2004) of the International Center for Tropical Agriculture -CIAT-.

Step 4 -Identify indicators to assess livelihoods To understand the current socio-economic status of individuals and families involved in the fishing activity, information of households employment indicators, schooling, monthly expenses and savings capacity, access to credit, social security, housing conditions and elements of partnership was obtained. In this step the idea was to understand the current situation of the longline fishing industry given that at the moment of the evaluation, there was no apparent impact from the listings Appendix II the hammerhead shark species. The selected indicators allowed for monitoring both medium term (revenues, expenses, occupation) and long term (housing, education, etc.) improvements or loss of wellbeing. More information can be found in Annex B of this study.

Step 5 - Develop participatory rural appraisals in major towns.- The methodologies developed by CIFOR (Aldrich & Sayer, 2007) and WCS (Wilkie & Wieland et al 2015) described in the handbook were applied to this case study. Following the Sustainable Livelihoods Framework, information was raised on the potential effects on the fishing community of the implementation of decisions of inclusion of hammerhead shark species on CITES Appendices. The evaluation characterized the: nuclear family, occupation, education, income, expenses, savings, access to credit, social security, housing conditions, association and union organization. This was done using two focal groups. The information gathered at the workshop was later verified through individual semi-structured interviews with key informants and included interviews with: a shipowner of a large longline commercial vessel, representatives of the longline vessels sector, officials of INCOPESCA, a representative of marketing, and an officer of the organization Mar Viva. With the information collected, the baseline social indicators were selected, with which hereinafter the positive or negative social impact can be measured. The indicators used in this study allow monitoring for both medium (revenues, expenses, occupation) and long term (housing, education, etc.) changes.

Step 6 -Monitor and evaluate the impacts- With the market prices acquired through interviews and analysis of catches obtained from the Statistics Department of INCOPESCA, it was estimated that the impact on the national fleet of non-commercialization of shark fins would be around US $ 232.555 per year (for details see Annex section D). No other impacts were identified for fishermen thus the income variable was found as the only one with direct impact. Nonetheless, naturally the level of income affects other socio-economic variables such as savings, education and type of housing among others, as presented in Annex section
B. These variables in turn served for the application of Part II of the handbook “Addressing and mitigating the effects of the application of CITES decisions on livelihoods in poor rural communities”.

The national authority SINAC or the organization that would be designated for monitoring the impact on livelihoods, may resort to the indicators presented in Section B of the Annex, particularly the income level captured in the different links of the value chain. During the workshop some income levels were obtained but it is recommended that a new survey is launched where the participants have the chance to search on their own income level on historical records, in order to be able to get more accurate numbers. The survey should be done in an appropriate format, and individually, to avoid the reluctance of participants to provide their income in open audiences as it was experienced during the workshop. Some preliminary income data are presented in Appendix B in section Contracting Models and Income.

The Annex E presents three activities that could be presented separate or jointly to lessen the economic impact discovered including:

1. Train members of households of fishermen in other activities other than fishing that allows them to generate revenue in idle time.
2. Regulate tuna fishing in the exclusive economic zone (EEZ) of the Costa Rican Pacific Ocean, with the aim of upgrading the longline technology of the fleet, and redirecting the fishing efforts to more abundant species such as tuna that are not threatened.
3. Generate conditions of competitive advantage in the international trade in bluefin tuna, by seeking differentiation in the international market, for example through certificates or seals of sustainability of the catches.

Participants composition pollsters

23 of the 27 surveyed participants in the workshop are currently involved directly or indirectly in fishing. Each of them represents a household that participates in medium scale longline fishing. There is only one case representing a family of large size (advanced) longline fishing.

The participants represented:
- 12 families of fishermen,
- 6 families of shipowners,
- 3 families of traders,
- 1 family of administrative work within the fishery,
- 1 processor family.

17 participants are men and 6 women. Three women are the wives of fishermen and three others are working in commercial fishing activities.

Part II. Addressing and mitigating the effects of the application of CITES decisions on the livelihoods of poor rural communities

For this case study based on Part II of the handbook some elements and recommendations were used and highlighted to support a mitigation strategy.

Step 1 - Identify priority species and review existing legislation on the use of the species - As it was indicated previously the selected species for the case study that were recently included in Appendix II species were:

1. Hammerhead (*Sphyrna lewini*)
2. Hammerhead (*Sphyrna zygaena*)
3. Hammerhead (*Sphyrna mokarran*)

The capture of the hammerhead is not illegal in Costa Rica, nor its consumption given the following conditions are met: a) the unloading of sharks is done with the fins attached; b) the capture is not performed in restricted areas (National Parks, biological reserves, etc.); and c) regulations of the Inter-American Tropical Tuna Commission (IATTC) are met.
The permissibility of export fins of any kind of Costa Rica, according to INCOPESCA (pers. comm. Antonio Porras, 2015) is based primarily on compliance with regulations. The vessel must have their respective fishing license to date, and the authorization of navigation (departure), which is issued by the Ministry of Public Works and Transport.

The exploitation of sharks from territorial waters and the EEZ of Costa Rica takes place currently with some restrictions, including a prohibition on engaging in commercial fishing activities in national parks, natural monuments and biological reserves (Article 9 Fisheries Act is 8436); the ban on doing seine fishing using “plantados” (AJDIP / 241-99 of 07.15.99); and the requirement to unload the fins attached naturally to the animal body (Article 40 Fisheries and Aquaculture Act 8436, and Article 40 of the Regulation to the Fisheries and Aquaculture Act, Executive Order No. 36782, May 24, 2011). Also, by being Costa Rica an IATTC member country, it must comply with the different resolutions adopted in the framework of the resolution. Including the Resolution C-05-03 related to sharks and C-11-10 related to the conservation of oceanic white tip shark *Carcharhinus longimanus*.

Costa Rica must comply with the Regulation OSP-05-11 to ban shark finning in the countries of the Central American Integration System (SICA), which also includes the Organization of the Fisheries and Aquaculture Sector of Central America (OSPESCA). This regulation states that “shark fins unattached to the body naturally or in part, entering countries of the SICA, or who may be exported by them, must be accompanied by a document issued by the competent authority of the respective country, in which it is guaranteed that are not the result of finning “.

The Constitutional Court reaffirmed this mandate with vote number 2012-17269 of December 7, 2012, in which orders to whom ever exercise the Executive President of INCOPESCA, the Directorate General of Customs, and the Minister of the Ministry of Environment and Energy MINAE, to dictate the measures required to ensure that the certification for importing shark fins in turn is required for the purpose of export and re-export.

Currently, applications for export permits for shark fins of any kind must be accompanied by the Forms for Inspection and Authorization to Land (FIAD) that cover the fins in question as a mechanism for monitoring compliance with current regulations.

Prior to its inclusion in Appendix II of CITES, the exported fins of hammerhead sharks *Sphyrna gender* was permitted under the assumption of compliance with current legislation (unload attached fins and respect marine protected areas). Currently, and since September 14, 2014 an NDF report is required for issuing a CITES permit from the country of export (SINAC as CITES Management Authority).

The agreement of INCOPESCA Board AJDIP / 105-2013, sets a minimum size for the capture and trade of *S. lewini* of 46 cm back precaudal length (with a tolerance margin of 30%). The same was published in March 2013, and became effective since June 2015.

**Step 2 Generate the baseline of scientific and technological information for the sustainable use of the species**, In Costa Rica progress has been made in traceability and control systems and in the collection of scientific information, which has been led by a number of institutions and organizations including: SINAC, INCOPECSA, National University, University of Costa Rica (all state institutions), and secondly by NGOs MarViva, Pretoma and Promar. All these efforts aim to improve fisheries and sustainable use of sharks and specifically hammerhead species. However more information is needed on the reproduction among other biological aspects to be able to estimate the
optimal sustainability of catches. Costa Rica worked on a Non-Detriment Finding report that would indicate the steps to follow in this regard.

As it was identified at the workshop, there are some union organizations in the longline vessels owners and one Chamber of Fishermen of Artisanal Fisheries (captains and crew). The fishermen are the most vulnerable of the value chain. Given their commonly low level of education and the skills specialization in the art of fishing, they can hardly access a paid job in the formal sector. This is why, and according to the Step 3 Strengthen the rural-communities, it is recommended that an organization representing the fishermen is created to aid in channeling resources for capacity building and training. This empowerment should extend to the members of the household and emphasize on women who are not involved in fishing but affected by it.

**Step 4 Design incentives and development of market information to promote in-situ and ex-situ production** - It is recommended through the Ministry of Foreign Trade, that tuna is captured with the highest sustainability standards possible, allowing the country to promote a tuna brand with responsible fishing. A tuna brand accompanied by a certification of origin and sustainability may grant advantages to access certain segment markets and provide a purchase price plus. This incentive may ultimately encourage longline vessels to update their technology and diverts fishing efforts currently focused on shark to catch tuna instead.

**Step 5. To promote policies of engagement with NGOs and agencies that support the sector** - It is recommended to establish advantageous conditions to the longline fleet (in the Exclusive Economic Zone ZEE) for the domestic tuna. These recommendations are expanded in Annex B of this study.
ANNEX: Summary of quantitative and qualitative information collected during the workshop and fieldwork in Puntarenas

To apply the steps of the handbook on CITES and Livelihoods described above, the team gathered the corresponding analytical information on the ways to capture and trade hammerhead. Also the socioeconomic characteristics of the participants of the value chain and the operation of fishing and fishing profit margins were described.

Likewise using the quantitative data of INCOYESCA on historical catches that separates the information between 2009 to 2014 of individuals and kilograms captured, the impact of a prohibition in the trade of shark fins was obtained and it is presented in the following chapters.

A. Capture and trade of Hammerhead (Sphyrna spa.) in Costa Rica

The capture of the hammerhead shark occurs mostly incidentally. Catches are made with artisanal boats, and medium and large fishing vessels. The pressure to the populations depends partly on the size of the fishing fleet. In Costa Rica fishing is classified into three categories:

- artisanal commercial vessels
- medium size commercial vessels
- large size or advanced commercial vessels

Artisanal commercial vessels

The artisanal sector has at least 2,500 boats across the country (INCOYESCA, 2014) that use hand rope, and gillnets. This group is characterized to use boats generally with 40 horsepower engines, and perform their activity near the coast, mangroves and wetlands (in the latter two cases fishing is prohibited). Artisanal fishermen direct their fishing effort to grouper, conger eel, sea bass and red snapper species in a subsistence way. This group of fishermen does not directly focus their effort on hammerhead species. Because the birth and upbringing of juvenile sharks occur in wetlands and mangroves in shallow coastal waters the species is particularly susceptible to the effect of artisanal fisheries that often make significant incidental catches. The behavior of shark females to return to the wetlands to give birth makes them susceptible of falling into fishing lines. The fishing activity leads to capturing juvenile sharks, but given their small size they are not attractive to the trade of meat or fins (Pers. Comm. Ross, 2015).
**Medium and large size Commercial vessels**

Catches of sharks from medium and large size commercial vessels are made with longline. Semi-industrial vessels use trawl and fencing nets. Adults and sub-adults are captured using pelagic and deep longlines in the national semi-industrial fleets, and international industrial ones usually at sea or in the waters of oceanic islands and seamounts. The produce of these captures is unloaded in the port of Puntarenas to be traded for domestic consumption (meat) and export (meat and fins).

There are 396 fishing licenses in the medium and large size vessels sector according to data from INCOPECSA (2014). The medium-scale fleet operating in the EEZ corresponds to approximately 80% of the total fleet of medium and large vessels. The large commercial fleet made of boats with more than 40 miles of autonomy can operate inside and outside the EEZ.

**Characterization of the productive and social activity of commercial medium and large longline vessels**

EOn average six sailors work per vessel amounting to approximately 2,340 families with at least one member working in the fishing industry. Other families live on supporting occupations for the fishing industry including as wholesalers and retailers, guards, unloaders, boats maintenance, cleaning, carriers, dryers skinning and fin drying. There is no aggregate socio-economic data available for these activities.

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**Roles in the Fisheries Value Chain**

- Fisherman
- Captains
- Owners
- Crew
- Processors (skinning)

**Traders:**
- Receivers
- Point of Sale person
- Carrier
- Processors
- Wholesalers
- Retailer (Those with a fridge mounted in the bicycle)
- Exporter

**Maintenance.**

**Guards.**

**Suppliers of inputs:**
- Raw material / inputs
- Hardware
- Industrial
- Food
- Technology

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**Human Development Index in Puntarenas**

The canton of Puntarenas averaged a 0.69 in the Human Development Index from 2000 to 2004, with a downward trend thereof.
B. Description of socioeconomic characteristics of participants

Families
The average number of members in the household is five. The family with the least number of members is two, and the largest has seven. From the total, 94 family members 22% are minors and 42% of households do not have children. These data indicates an average of one child per family.

Occupation
Three main occupations were identified based on the medium size vessels that differ in salary level:
• The sailor is dedicated to the manual offices of capturing fish.
• The captain assumes command and responsibility in the vessel while fishing activity takes place.
• The owner is the proprietor of the ship and who bears the costs of operation and maintenance.

Findings show that in each participant household the most performed occupation is domestic housework - 28 persons - corresponding to 30% of the total family members, and it mostly consists of women.

The second most performed occupation in number is students with 23 persons from the sample being students. Most are in primary school and only two in college. There are also 19 fishermen, 5 owners and 5 dealers. Besides these main occupations there are also individuals involved in: peeling shrimp, seafood for local trade, maintenance of boats, filleting, unloaders, an accountant and a teacher.

Impact of fishing activities on family cohesion
Interviewed Fishermen expressed that the fisheries activities have taken toll on the families and causes psychological effects. The fishing trip days lasting one, two and up to five months generate social problems including:
• Families without a father present much of the year
• Dissolution of marriages (common situation in these households).
• Fear of death of not returning home. The death of relatives (children, parents, spouses) when fishermen are in a fishing trip.

Education
Among the participants who are not active students, the level of education identified is:
• 20% incomplete primary
• 18% complete primary
• 17% incomplete secondary
• 29% complete secondary
• 9.6% incomplete college
• 6.4% complete university

The sailors, captains and women engaged in domestic activities were found to be those with the lowest levels of education. Shipowners and traders of fish products have higher levels of education.
Recruitment and Revenue Model

Contracts are made per fishing trip and income depends on the volume of produce. According to the statement by one of the participants “fishing is an art ... it is not about a boat that produces fish ... there are many factors that affect captures: cold currents, weather, etc. you can not say for sure how much you are going to catch when you go fishing, sometimes it is a good catch and sometimes it is a bad one. “

The workshop found that there is a stable monthly and determinable income. The team of evaluators gathered some information about the last times fishermen went fishing. Among the participants there were at least four crew groups with very different results with regards to the level of income, perhaps because the question about how much they earan had to be done openly and this may have lead to skewed results:

- At least three fishermen crews mentioned that more than once they lost their income due to the poor performance of fisheries.
- A boat captain mentioned that his large size longline vessel in 2014 went into the sea two times in a year for five months each, earning approximately USD 925 in each trip. This resulted in a yearly income of income of approximately $ 154 a month . One of the captains said that his monthly income is $ 490.
- The other three crew groups, mentioned that in three month trips, they obtained revenues between USD 462 per trip, which is the equivalent of a yearly income of USD 115\(^2\) per month.

- Incomes are low considering that they are below what is set as the minimum wage in Costa Rica (unskilled construction laborer) by the Ministry of Labour who set it up at USD 524 per month\(^3\)

The income of ship owners range from USD 550 to USD1.500 per month.

During the preparation of the case study the evaluation team realized the importance of managing good relationships and trust with the fishermen to avoid bias in the answers. This was achieved by inviting industry leaders with whom a relationship of trust existed prior to the workshop. The CITES regulations were interpreted by fishermen in some instances as a threat to their livelihoods. The bonds of trust with industry leaders was key to the proper application of the steps of the handbook.

The income reported by people processing shark meat was:

- Individuals “slicing meat”: monthly income = USD 220.
- Individuals “Preparing and selling ceviche”, occasional activities to generate income done at home to contribute to household income = USD 74.

People with higher education working in the marketing of the product in administrative or financial activities earned an average monthly income of USD 1,200\(^4\).

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3 Minimum salary listed for first semester 2015 by the Ministry of Labor and Social Security. Available at: www.mtss.go.cr.
C. Description of fishing operations and fishermen profit margins

Operating expenses are paid by the owner and are known in the local jargon as readiness –“alisto”- which includes: maintenance of fishing equipment and refrigeration; spare parts and repair costs for contingencies; basic operating costs of the fishing trip: ice, gasoline and food during the fishing trips. Some boats can stay overseas for a month, others can do it for three to five months. According to participants the readiness investments for vessels is not readily determinable. One respondent estimated that a medium size vessel on average must invest at least USD 37,000 for fishing activities for three months.

The fishing produce is sold to the receiver or exporter. The gross income for the owner is calculated after you substract the readiness costs and the earnings of the owner of the boat “armador” from the sales made to the “receivers” or the exporters. Gross income is distributed 60% for the captain and 40% for the rest of the crew. Before the distribution of gross income to the captain or crew, the owner will deduct any advance payments given to them through “vouchers”.

Monthly expenses and savings
The participants, mainly the fishermen, said that the income only basic monthly expenses can be covered: food, education, transport, etc. Both fishermen and captains claim that there is no opportunity for savings. Regularly the captain and crew have to borrow cash from the owners of boats to defray costs. According to the women, occasionally when the are able to work in activities such as: preparing and selling ceviche, informal food sales, child care) they are able to contribute to household expenses. Only three owners and one trader reported they are saving 20% of monthly income.

Access to credit
The formal financial system in Costa Rica does not have credit lines that take into account the characteristics of the fishing sector and fishing activity. Issues such as lack of regular income, and using the boats as assets against guarantees are not accepted as collateral for loans. Lack of financing instruments hamper further development of the industry. Shipowners therefore need to resort to mortgage guarantees. This practice has ended in some fishermen loosing not just their boats but property assets.

Social security and state subsidies
85% of household members are covered with social security. Those who are not covered are specifically the members of families of the first link on the value chain of labor fishermen. According to the findings of the workshop, the participants indicated that they do not benefit from any subsidies (education grant, subsidy for seniors, and allowance for families living in extreme poverty) granted by the Costa Rican government.
**Housing**

Most participants own their homes. Those who are not are between a few months to 21 years of being home owners. It is important to clarify that 30% of the sailors live in a rented house. In the case of traders two had a second property in their name. Also 18% achieved homeownership through housing allowance granted by the State.

As for the households only in 13% of the cases two families live in the same house. Despite that it was not possible to determine the average size of the houses that will provide a indication of overcrowding, houses have three bedrooms on average.

**Supporting Organizations**

Six trade chambers for the fleets were found in Cuajiniquil, Guanacaste, Puntarenas, Quepos, Golfito and Limon. The chambers facilitate a space for discussion and policy preparation for the protection and maintenance of the rights of individuals and companies involved in the fishing industry. In the Chamber of Puntarenas owners, traders and exporters are represented. Artisanal fishermen have the Chamber of Fishermen of Artisanal Fisheries.
D. Impacts on livelihoods of longline fishermen

Catch volumes
Prior to the inclusion of hammerhead sharks and oceanic white tip shark in CITES there were no tariffs for the species, which is why it becomes difficult to extract export volumes and export prices data. During the workshop it was found that 80% of the shark catch land in Puntarenas, but there is no indication of which percentage is exported. Exports of shark require vessels with freezing chambers which only large size and advanced boats have.

Exporting companies have characterized for declaring meat and shark fins in tariffs that do not correspond. In some case they have been classified rightly but also in generic sea fish tariffs and even as mollusks, or non edible products. Given these data flaws, it is difficult to extract information from official data from PROCOMER or the Central Bank of Costa Rica.

The second source of information used is from INCOPESCA which can be also inaccurate given that sharks have been placed in different tariff categories, but up to now it is considered the best source available.

During the workshop, fishermen estimated that the species of shark with higher catches by volume is the gray shark (Carcharhinus falciformis). C. falciformis is focus of direct capture by the vast majority of the boats. To date, the gray shark is not on the list of the Inter-American Tropical Tuna Commission - IATTC-or CITES, thus there are no restrictions on fishing.

A current analysis of preliminary data from the NGO MarViva, based on data from INCOPESCA, indicates that the volume of hammerhead catch corresponds to 4% of the total shark fishing. The latter data indicate that on average 0.5% of the total fish catches corresponds to hammerhead shark fishing. At first glance, then, with the recommendations of the NDF report as non-permissive, the impact on the income of fishermen would not be substantial. Fishermen came up to this conclusion during the workshop.

Landing hammerhead shark trunks
During the period 2009-2014, landings of hammerhead shark trunks came mainly from the domestic fleet. Landings were relatively constant between 8,000 and 10,000 trunks per year (Figure 1).
**Figure 1.** Landings of hammerhead shark trunks in Costa Rican ports by foreign and domestic fleets between 2009-2014.

![Graph showing hammerhead shark trunks landings](image)

Source: Department of Statistics INCOPECA. Calculations by author.

**Table 1.** Landings of hammerhead trunks and all shark species in Costa Rican ports by foreign and domestic fleet between 2009-2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>International Fleet</th>
<th>National Fleet</th>
<th>Combined Fleet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hammer-head trunks</td>
<td>Total Shark trunks</td>
<td>% Hammer-head trunks over total</td>
</tr>
<tr>
<td>2009</td>
<td>523</td>
<td>214.425</td>
<td>0.24%</td>
</tr>
<tr>
<td>2010</td>
<td>636</td>
<td>189.097</td>
<td>0.34%</td>
</tr>
<tr>
<td>2011</td>
<td>228</td>
<td>94.469</td>
<td>0.24%</td>
</tr>
<tr>
<td>2012</td>
<td>224</td>
<td>57.546</td>
<td>0.39%</td>
</tr>
<tr>
<td>2013</td>
<td>259</td>
<td>49.126</td>
<td>0.53%</td>
</tr>
<tr>
<td>2014</td>
<td>662</td>
<td>54.073</td>
<td>1.22%</td>
</tr>
</tbody>
</table>

Source: Department of Statistics INCOPECA. Calculations of the author.
Table 1. Landings of hammerhead trunks and all shark species in Costa Rican ports by foreign and domestic fleet between 2009-2014. During this period, hammerheads represented between 0.24% and 1.22% of shark landings of the international fleet, while for the national fleet it was in the range of 1.75% to 4.1%.

Landing hammerhead shark fins

During the period 2009-2014, landings of hammerhead shark fins, showed the same trends as trunk landings suggesting a degree of accuracy of the data gathered. The main contribution was made by the national fleet. Landings remained relatively constant between 8 and 13 metric tons (Figure 2).

Figure 2. Tons of hammerhead shark fins in Costa Rican ports by foreign and domestic fleets between 2009-2014.

Source: Statistics Department Incopesca. Calculations by authors
Table 2. Landings of hammerhead shark fins and the total species of shark in Costa Rican ports by foreign fleets and the domestic fleet, 2009-2014.

<table>
<thead>
<tr>
<th>Year</th>
<th>International Fleet</th>
<th>National Fleet</th>
<th>Combinado Fleets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hammerhead Fins (kg.)</td>
<td>Unidades de aletas de especies de tiburón</td>
<td>% Hammerhead fins from shark total</td>
</tr>
<tr>
<td>2009</td>
<td>1.331</td>
<td>325.522</td>
<td>0.41%</td>
</tr>
<tr>
<td>2010</td>
<td>1.383</td>
<td>292.436</td>
<td>0.47%</td>
</tr>
<tr>
<td>2011</td>
<td>624</td>
<td>154.141</td>
<td>0.41%</td>
</tr>
<tr>
<td>2012</td>
<td>690</td>
<td>110.297</td>
<td>0.63%</td>
</tr>
<tr>
<td>2013</td>
<td>1.171</td>
<td>94.230</td>
<td>1.24%</td>
</tr>
<tr>
<td>2014</td>
<td>1.850</td>
<td>67.474</td>
<td>2.74%</td>
</tr>
</tbody>
</table>

Source: Department of Statistics INCOPECA. Calculations by author

Hammerhead shark fins represented between 0.41% and 2.74% of the landings of shark fins of the international fleet, while for the national fleet it was in the range of 2.06% to 4.64%.

**Relative weight of the hammerhead shark in national landings**

Given the lack of information of the total landings of the longline fleet, the total national fish landings were used to calculate the relative importance of hammerhead shark fisheries in Costa Rica.

Table 3 was drawn with official data from INCOPECA from period 2005-2012, using total national landings, and shark specific landings. An estimate was done to calculate the share of shark landings in total fish produce (Shark / Total Fishing). To this ratio a 3% was applied as an average of the hammerhead over the total shark landings. As a result the hammer is generally less than 0.5% of total national landings of fish produce.
Table 3. Relative weight of shark and hammerhead shark in national landings.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fisheries</td>
<td>17,167.674</td>
<td>15,932.648</td>
<td>19,467.403</td>
<td>12,813.004</td>
<td>12,956.003</td>
<td>13,418.881</td>
<td>13,968.945</td>
<td>14,250.519</td>
</tr>
<tr>
<td>% Shark</td>
<td>15,61%</td>
<td>11,45%</td>
<td>12,95%</td>
<td>22,07%</td>
<td>16,28%</td>
<td>23,33%</td>
<td>25,95%</td>
<td>18,17%</td>
</tr>
<tr>
<td>% Hammerhead</td>
<td>0,76%</td>
<td>0,47%</td>
<td>0,47%</td>
<td>0,34%</td>
<td>0,39%</td>
<td>0,66%</td>
<td>0,49%</td>
<td>0,70%</td>
</tr>
</tbody>
</table>

Source: Department of Statistics INCOPESSA. Calculations by author

Prices and profit margins
Fishermen claim that the purchase price offered by middlemen and exporters of both meat and fins of hammerhead shark is falling for two main reasons. The first one has to do with the reduction in the demand for shark fins in China by national regulations that eliminated government shark fin purchases, and changes away from shark fin soup consumption preferences in China and Hong Kong (Wild Aid, 2014). The second corresponds to the export ban currently in force in Costa Rica decreed by the CITES Management Authority, SINAC. The purchases made by the sole purchaser in Puntarenas were being done at his own risk since the outcome of the NDF report at the time the evaluation was being made was not known.

As for the current market demand and consumer preferences, fishermen consider that consumption of shark meat over the years is decreasing due to imported substitute products that can be found at lower prices. They also indicate that the regulation to label the products distributed by retailers and superstores that require a statement that the meat comes from shark has negatively affected sales.

Prior to the entry into force of CITES regulations for the hammerhead shark, the meat was exported to Mexico with a purchase price at the exporting port (Free on Board) between 1400-1500 colones/kg (USD 2.6 and USD 2.8) at today’s prices.

In the domestic market, the receiver at the port pays the owner a minimum of 1,300 colones/kg., and in high season prices can reach 1,500 colones/kg. Large size sharks are less appreciated and are purchased at 800 / kg. either by the exporter (FOB) or receiver. The receiver sells the meat to the transporter whole and eviscerated at 1,500 colones/kg., and the transporter at 1,700 colones/kg at the National Center for Food Supply and Distribution (CENADA). When the meat is traded at a processing plant (fish) the final consumer purchase it at an average of 3,000 colones/kg.

It is worth mentioning that the gray shark has more demand than the hammerhead, thus there is a comparative variation in purchase prices for both domestic traders and exporters.

As for the purchase price of hammerhead shark fins compared with gray shark ones, fishermen mentioned that there are no differences, while others stated that hammerhead shark fin has a more valued fiber and sold at better prices. The only fin buyer present in Puntarenas differentiates the quality of the fins and offers a different purchase prices based on a classification on a scale of A, B, C where A is considered as of a higher fiber quality.
The complete set of fins (two breast, one dorsal and rudder) of gray shark and hammerhead shark are usually purchased at 12,000 colones / kilo (USD 22 / kilo) green (fresh), for fins above 9 inches. It is estimated though that the export ban decreed by the SINAC signal the risk in the market lower the purchase price at 6,500 colones / kilo (USD 12 / kilo) (pers. comm. Steven Lamchang). One respondent stated that the purchase price hammerhead shark fin of the only owner was reduced by approximately 50% since the ban came into force.

It is worth noting that one ton of fresh “green” fins when dried, lose on average two thirds of their weight. Thus a kilo of dry fin sells for $ 70.

**Revenue fishing for shark**

During the workshop, the fishermen claimed that on average 80% of their income comes from catching shark species, of which the bulk is attributed to the capture of the sandbar shark (Carcharhinus falciformis). However it is important to note that not all the surveyed vessels engaged in direct fishing of shark, and in a number of them, shark products came from by-catch.

One advantage of focusing on shark catch is that it is present throughout the year, unlike other species of fish which are seasonal, reducing then the annual variability of revenue from its sale. Fishermen mentioned also that shark meat maintains its freshness properties and “reddish” color for longer (up to 20 days) when stored frozen in contrast to other fish species.

Shark bodies specifically for export purposes need freezing chambers to maintain the cold chain, which normally can only be found in large vessels. These vessels add up to 20% of the fishing fleet. Given this market requirement, in addition to the low percentage of hammerhead shark bycatch, the vast majority of shark meat is consumed locally; hence the economic impact of a ban on exports by SINAC of hammerhead trunks would be meager. Since there are no reported consumption of shark fins in the domestic market, it is assumed that they are all for export purposes, such that the economic impact in terms of CITES decisions to fishing communities lies on shark fins. From the calculations made by the authors using information from INCOPESCA, the national fleet that hires exclusively local fishermen, extracted during the past six years on average 10,571 kg of fins.

Using the data obtained from interviews the full set of fins (two breast, one dorsal and rudder) of gray shark and hammerhead shark, are usually buys 12,000 colones/kilo (USD 22 / kg.) green (fresh) and above 9 inches. Taking the USD 22 / kg. the average annual economic impact on the fishery for Costa Rica if the ban of hammerhead shark fins is uphold is calculated at US $ 232,555 subject to variability in the price per kg.

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**Order of shark economic importance according to fishermen interviewed:**

1. Silky Shark or Gray (Carcharhinus falciformis)
2. Blue Shark (Prionace glauca)
3. Hammerhead (Sphyrna sp.)
4. Tresher (Alopias sp.)
5. Ocean or dog Shark (Carcharhinus longimanus). It has a total ban on harvesting and marketing.
E. Ideas to mitigate the impact of the inclusion of hammerhead sharks in CITES

1. **Train members of fishermen households**

Education levels of fishermen and members of their households was found to be very low. Usually they lack skills in other activities in which they can earn a living. It is recommended to earmark a study of potential sources for labor (existing or new) and skills, in order to generate capacity building and training for members of the family so they enter into the workforce. At the workshop, participants mentioned repeatedly that they “do not work on anything else ... because there are no jobs.” The placement of this labor force in other sectors is very difficult because Puntarenas is not a city of growth, according to their own words.

2. **Regulate tuna fishing in the exclusive economic zone of the Costa Rican Pacific Ocean**

The establishment of measures to upgrade the fishing technologies of the national longline fleet to reduce the by-catch, would be key to redirect the activity towards other species that generate higher revenues given that tuna is caught deeper than the hammer shark. It is estimated that the tuna yield is still below the maximum sustainable.

Currently the industrial tuna fishing fleet (purse seine) affects the longline fleet given the non-selective fishing gear used. The international tuna fleet today takes most of the catch that could be done by a national fleet. If advantageous conditions and technology conversions are given for tuna fishing, the longline fleet could redirect their efforts towards reducing the pressure on sharks.

An initiative of these characteristics can be supported by the Executive Decree No. 386811 where tuna fishing in the EEZ is regulated, could lead to positive results. With the Decree issued in October 2014 the Government of Costa Rica created a measure that regulates tuna fishing in its EEZ. The Decree establishes four fishing zones:

- **Zone A**: A polygon near the coast ranging from 12 to 40 nautical miles.
- **Zone B**: A buffer zone of five nautical miles, which extends the entire length of the Zone A polygon.
- **Zone C**: It is an oceanic polygon located in the vicinity of Cocos Island. This polygon excludes the Marine Management Area Seamounts, and the Marine National Park and Isla del Coco, which is bound by the Fisheries Management Plan regulations.
- **Zone D**: is another oceanic polygon located in the southern part of the EEZ, considered a protection zone given the abundance of juvenile tuna, dorado and wahoo. This area needs to be protected to ensure the recruitment of adult populations and healthy fisheries.

Special regulations on fishing areas must be dictated by INCOPECSA within 24 months of the decree but in none of these areas the cerquera fleet could operate. This creates an exclusive fishing zone for medium and large size vessels in the first 45 miles.
This zoning, yet to be regulated, can become an opportunity to give and advantage and sustainability conditions to the longline fleet, allowing for the improvement of the economic conditions of fishermen and owners.

For these measures to be implemented, monitoring and control capabilities (using satellite location devices and monitoring fishing vessels in port) should be improved, and generate scientific capacity and information for resource management. For instance by establishing a research program for tuna and related species through the collection of information, and on-board observer crew that are able to gather data to improve fishing practices and by-catch reduction.

3. Create conditions of competitive advantage in international trade in bluefin tuna

Through the Ministry of Foreign Trade (COMEX) a market strategy to offer a tuna product internationally with origin denomination of Costa Rica.

With regulations and additional training for fishermen aiming at responsible fishing arts targeted to species different from sharks, in addition to measures that reduce shark and tortoise bycatch, a segment or niche market that values these attributes could be targeted. Eventually the reinal de plastico could be used to reduce bycatch. A “responsible” tuna could eventually undergo certification processes. Likewise, the conversion of longline vessels to use “green stick” seal could help in the sustainability of catches.

At the national level, conditions can be set for landing and trade that allow tuna to be auctioned with competitive advantages in order to benefit national fishermen. Since tuna meat requires special handling to maintain quality and improve the price, studies are recommended to design the training on post catch tuna handling.


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