ARTISANAL FISHERIES AND BYCATCH OF MARINE TURTLES

PRIORITY MITIGATION MEASURES IN MARINE PROTECTED AREAS OF RAMPAO
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Author: Dr Mamadou DIALLO
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<table>
<thead>
<tr>
<th>Abbr.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPA</td>
<td>Marine Protected Area</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>GN</td>
<td>Gillnets</td>
</tr>
<tr>
<td>LL</td>
<td>Lines and longlines</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>PNDS</td>
<td>Saloum Delta National Park</td>
</tr>
<tr>
<td>PNLB</td>
<td>Langue de Barbarie National Park</td>
</tr>
<tr>
<td>PRCM</td>
<td>Regional Partnership for the Conservation of the Coastal and Marine Zone</td>
</tr>
<tr>
<td>RAMPAO</td>
<td>West African Network of Marine Protected Areas</td>
</tr>
<tr>
<td>BS</td>
<td>Beach seines</td>
</tr>
<tr>
<td>ST</td>
<td>Purse seines</td>
</tr>
</tbody>
</table>
The West African marine ecoregion is home to large terrestrial sites represented by nesting beaches, critical marine habitats, such as growing and foraging areas, and migration corridors for sea turtles. Their state of conservation is of great concern mainly because of the intense fishing activities which lead to significant mortalities and bycatch, the consumption of meat and eggs and the use of products (blood, fat, carapace) as well as the degradation of marine and coastal habitats.

Artisanal fishing activities around MPAs, often resulting in sea turtles bycatch, need to be better understood to determine measures to mitigate this threat. This study aims to establish the baseline situation on sea turtle bycatch and the determination of specific mitigation measures in artisanal fisheries in four RAMPACO member countries, namely The Gambia, Guinea, Senegal and Sierra Leone.

In each of the countries concerned by the study, the marine protected areas, parks and reserves members of RAMPACO where sea turtles catches are / can be recorded, are identified. These areas are regularly subject to incursions by both artisanal fishermen and poachers.

This study shows that the capture of sea turtles is a reality, as more than 55% of the surveyed fishermen admit to catching them. However, as sea turtles are a fully protected species, it is difficult to obtain quantified catch data. Fishermen are aware of this protection of sea turtles both nationally and internationally and are careful not to make exhaustive declarations of turtles caught. The few quantitative data collected are very weak and do not seem to reflect reality.

Gillnets including trammel nets and hand line / longlines are the fishing gears that catch sea turtles the most. The vast majority are bycatch; however, targeted catches are reported at Joal-Fadiouth. Green turtle *Chelonia mydas* is the most represented species (over 50% of the catches), followed by Loggerhead turtle *Caretta caretta* and Leatherback turtle *Dermochelys coriacea*. Olive ridley turtle *Lepidochelys olivacea* and Hawksbill turtle *Eretmochelys imbricata* are also caught. The presence of the Kemp’s ridley turtle *Lepidochelys kempii* remains to be confirmed, although it appears in the catch declarations.

Priority mitigation measures for sea turtle bycatch are identified and turned into specific objectives: reduction of interactions with sea turtles, community awareness and involvement, enforcement of regulations protecting sea turtles. An action plan with activities and expected results is proposed to achieve these objectives. This action plan, along with an implementation strategy, should be reflected in the MPA management plans. The implementation strategy must be participatory and inclusive to ensure tangible and sustainable results.
I. BACKGROUND AND RATIONALE OF THE STUDY

The West African marine ecoregion is home to large terrestrial sites represented by nesting beaches, critical marine habitats, such as pelagic and benthic growth and foraging areas, and migration corridors for sea turtle populations. Sea turtles, which have a long lifespan, a life cycle that requires several habitat types and an extensive distribution due to the distances they cover, are affected by a range of different factors, natural or caused by human activities, at all stages of their life cycle (FAO, 2013). These factors have an impact on both the terrestrial part of their habitat and their marine environment.

In the subregion, sea turtle populations (Green turtle *Chelonia mydas*, Loggerhead turtle *Caretta caretta*, Leatherback turtle *Dermochelys coriacea*, Olive ridley turtle *Lepidochelys olivacea*, Hawksbill turtle *Eretmochelys imbricata* and Kemp’s ridley turtle *Lepidochelys kempii*) are in a worrying state of conservation (Diallo and Dossa, 2012) due to intense fishing activities that result in significant mortality and incidental catches, high traditional consumption (meat, eggs, blood, fat, shell) and degradation of marine and coastal habitats.

As part of the 2016-2022 strategy of the MAVA Foundation’s West Africa program and in support of certain action plans of this strategy, in particular action plan n°1 on the conservation of sea turtles, the Regional Partnership for the Conservation of the Coastal and Marine Zone in West Africa (PRCM) is implementing the project «Survival of Marine Turtles» (STM). The STM project is based on a multi-partnership approach that involves, among others, the Regional Network of Marine Protected Areas in West Africa (RAMPAO) as an implementing partner of the component on «Conservation of sea turtles through the reduction of bycatch in artisanal fisheries and the capacity building of RAMPAO MPAs managers».

This component specifically supports Senegal, The Gambia, Guinea, and Sierra Leone by contributing to the mitigation of the main threats to sea turtles in these countries. The aim is to implement conservation actions feeding, reproduction, growth, and path areas in and around the RAMPAO MPAs through (1) capacity building of managers, local communities and other users of the MPAs network and (2) mitigation of sea turtles bycatch in artisanal fisheries (RAMPAO, 2021).
Incidental catch, commonly referred to as bycatch, is the undesirable or non-targeted portion of fisheries catch. Bycatch constitutes a threat for sea turtles. Along the West African coast, fishing activities often result in bycatch of sea turtles. Although industrial and semi-industrial fisheries record more bycatch of sea turtles, those induced by artisanal fisheries deserve special attention because they are often less controlled and less monitored. Reason enough to seek to improve knowledge on bycatch of sea turtles by artisanal fisheries, a species already threatened globally.

In PRCM intervention countries, artisanal fishing areas may be located around MPAs that host sea turtle populations. Multi-objective management rules, covering both fisheries management and biodiversity conservation, mean that MPAs receive better protection. The increase in the number of fish in these MPAs, through a «spillover» phenomenon, enriches the peripheral areas and thus allows fishermen to increase their catches and thus their income. These artisanal fishing activities around MPAs, often resulting in bycatch of sea turtles, need to be better understood to identify measures to mitigate this threat.

In this context, this study aims at establishing a baseline situation on sea turtle bycatch and the determination of specific mitigation measures in artisanal fisheries in four (04) RAMPAO member countries, that are The Gambia, Guinea, Senegal, and Sierra Leone. All these countries are signatories to the Memorandum of Understanding on conservation measures for sea turtles on the Atlantic Coast of Africa (Abidjan Memorandum). Through this memorandum, signatories agree to work closely together, in a spirit of mutual understanding and cooperation, to improve the conservation status of sea turtles and their habitats. The memorandum was signed in 1999 in Abidjan, Côte d’Ivoire, and the first meeting of signatory states was held in 2002 in Nairobi, Kenya.
The methodological approach consisted of a literature review and perception and opinion surveys among the stakeholders involved in the issue of sea turtles bycatch.

The literature review was done based on physical documents but also through websites and online documents. As a first step, it was necessary to identify and confirm the marine protected areas that are members of RAMPAO in and around which incidental catches of sea turtles are or may be recorded.

Questionnaires and guides were developed to conduct individual interviews and focus group for field data collection. The purpose of individual interviews is to collect quantitative and qualitative data; while the objective of focus group is to have an overall view and a good cross-check to refine the information and data collected during individual interviews.

The individual questionnaires were administered to the main actors and resource persons in and around the targeted MPAs; these are the MPAs managers (Conservation and/or the President of the management committee) and fishermen.

Individual fishermen interviews and focus group were conducted at the fishing and landing sites that are polarized by the nearest MPA.
IV. RESULTS

4.1. Marine Protected Areas (MPAs) identified

In each of the countries concerned by the study, marine protected areas, parks, and reserves members of RAMPAO where catches of sea turtles are/can be recorded, are identified, and listed below:

THE GAMBIA
- Bolong Fenyo Community Wildlife Reserve
- Reserve of the Tanji Bijol Islands Banks

GUINEA
- Loos Islands Wildlife Sanctuary
- Rio Kapatchez Managed Nature Reserve
- Tristao Islands Managed Nature Reserve
- Alcatraz Strict Nature Reserve

SIERRA LEONE
- Yawri Bay Marine Protected Area

SENEGAL
- Sangomar Marine Protected Area
- Saloum Delta National Park
- Saint-Louis Marine Protected Area
- Langue de Barbarie National Park
- Joal-Fadiouth Marine Protected Area
- Cayar Marine Protected Area
- Palmarin Community Nature Reserve
- Bamboung Community Management Marine Protected Area
- Gandoul Marine Protected Area
- Popenguine Nature Reserve
- Abene Marine Protected Area
- Somone Marine Protected Area

Co-management or participatory management is predominant as a management mode in the different MPAs. Biodiversity monitoring and follow-up activities, including sea turtles, are carried out by the staff of marine protected areas, with the participation of local communities. Local associations, local and even international NGOs collaborate with most of the identified MPAs.

It has been noted that incursions occur in the MPAs. Fishermen’s incursions of moderate magnitude and frequency occur throughout the year with peaks between July and September. Incursions of low magnitude and frequency by poachers also occur in the MPAs, except in Saint-Louis MPA, Langue de Barbarie National Park, La Somone MPA and Popenguine Community Reserve. Poaching mainly targets eggs, meat and subsidiarily shells.
**Figure 1**: Country overview of MPAs members of RAMPAO
4.2. Characterization of catches

4.2.1. Recognition of sea turtle catches

The majority (54.8%) of the fishermen interviewed (651) admit to catching sea turtles during their fishing trips, whether as targeted or incidental catches. They are 100% in The Gambia, 88.9% in Guinea, 78% in Sierra Leone and 47.7% in Senegal (figure 2).

More than 46% of the species caught are not identified. Among the species identified, the green turtle comes first (50%), followed by the loggerhead turtle (15%), the leatherback turtle (14%), the olive ridley turtle (9%), the Kemp’s ridley turtle (7%) and the hawksbill turtle (5%) (figure 4).

The presence of species by MPA is also indicative of the predominance of the green turtle (figure 3).

4.2.2. Sea turtles species caught

To facilitate the identification of the different species of sea turtles caught, the questionnaires were accompanied by illustrated identification guides.

The analysis of catches by species reveals a poor knowledge or confusion of by fishermen. So, analyses by species must be relativized, although they remain indicative of the trends generally observed.

1 According to Mnah Soumah (pers. com.), and Fretey (2001), the Kemp’s ridley turtle is not believed to be found in Guinea. According to Fretey (2001), there is no evidence of the presence of the Kemp’s ridley turtle in Senegal. However, juvenile individuals are sometimes observed in the Azores, the Canary Islands and Madeira, it cannot be excluded that some individuals are dragged further south by the Canary Current (Brongersma, 1981-1982). Cans (in Fretey, 2001) claims to have discovered a small shell and a skull on a beach in the Saloum Delta. Diagne (1999) speaks of sporadic sightings of this species off Bétanti. 
The presence of species by MPA is also indicative of the predominance of the green turtle (figure 4).

Investigations took place in Gunjur for Bolong Fenyo MPA and in Tanji and Sagna for Tanji Bird Reserve MPA. All the fishermen surveyed (23) around these two MPAs acknowledge catching sea turtles (Figure 5).

The green turtle is the most represented species in the reported catches with 92%. The other two declared species are the loggerhead and leatherback turtles, which are marginal with 4% each (figure 6).

Figure 4: Species cumulation in reported catches by MPA
Figure 5: Recognition of sea turtles catches during fishing trips by MPA in The Gambia
Figure 6: Proportion of species in reported catches in The Gambia
The surveys covered the landing sites listed in table 2 below.

**Tableau 1: Landing sites surveyed by MPA in Guinea**

<table>
<thead>
<tr>
<th>MPA</th>
<th>Landing sites surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loos Islands</td>
<td>Kassa, Boubinet, Mangue</td>
</tr>
<tr>
<td>Kapatchez</td>
<td>Bongolon, Koukoude</td>
</tr>
<tr>
<td>Tristao/Alcatraz</td>
<td>Dougoufoulon, Katfoura, Nafaya, Katountoun</td>
</tr>
</tbody>
</table>

In the Tristao/Alcatraz complex and Kappa- 
tchez, all the 54 fishermen surveyed admit to 
catching sea turtles; they are more than three 
quarters in the Loos Islands (figure 7).

Five of the six species present in the sub- 
region are relatively well represented in the 
reported catches with 27% for the green turtle, 
26% for the leatherback turtle, 18% for the 
olive ridley turtle, 15% for the hawksbill, 11% 
for the loggerhead turtle. The Kemp’s ridley 
turtle<sup>2</sup> represents 2% (figure 8).

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<sup>2</sup> According to Mmah Soumah (pers. com.) it would be a declaration error because the kemp’s ridley turtle would not be encountered in Guinea; Freley (2001) comes to the same conclusion.
The landing sites where the investigations were conducted are listed in table 3 below. Around the 12 AMPs concerned, 533 fishermen were surveyed.

More than 55% of fishermen in 7 MPAs report catching sea turtles. In Bamboung MPA, the number of fishermen who report catching turtles drops to 35%, 24.4% in Gandoul MPA and 5.4% in Abene (figure 10).

We should point out the appearance of Ngaparou in the list of MPAs with 17.2% and the absence of the La Somone MPA and the Popenguine Community Nature Reserve (figure 10). This is explained by the fact that the fishermen surveyed from the landing sites polarized by these MPAs, in this case Ndayane, Popenguine, Somone, Ngaparou and Mbour, rather refer to the protected fishing zone (PFZ) of Ngaparou as an MPA which has an impact in their work because of the prohibitions and the surveillance of the area. The La Somone MPA and the Popenguine Community Reserve appear to have no influence in the execution of their fishing activities. It would be interesting to see how this PFZ could integrate the RAMPAO member MPAs.

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* Tableau 2: Landing sites surveyed by MPA in Senegal

<table>
<thead>
<tr>
<th>MPAs</th>
<th>Landing sites surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saint-Louis MPA</td>
<td>Guet Ndar, Gokhumbach, Hydrobase</td>
</tr>
<tr>
<td>Langue de Barbarie National Park</td>
<td>Moumbaye, Mouit, Tassinere</td>
</tr>
<tr>
<td>Cayar MPA</td>
<td>Cayar, Fass Boye</td>
</tr>
<tr>
<td>Popenguine Nature Reserve</td>
<td>Ndayane, Popenguine, Somone, Ngaparou, Mbour</td>
</tr>
<tr>
<td>La Somone MPA</td>
<td>Ndayane, Popenguine, Somone, Ngaparou, Mbour</td>
</tr>
<tr>
<td>Joal-Fadiouth MPA</td>
<td>Joal, Mbandiène, Pointe Sarene</td>
</tr>
<tr>
<td>Palmarin Community Nature Reserve</td>
<td>Palmarin Ngallou</td>
</tr>
<tr>
<td>Sangomar MPA</td>
<td>Djifère</td>
</tr>
<tr>
<td>Saloum Delta National Park</td>
<td>Béténé, Bossinkang</td>
</tr>
<tr>
<td>Bamboung MPA</td>
<td>Bassoul, Missirah, Néma Ba, Toubacouta</td>
</tr>
<tr>
<td>Gandoul MPA</td>
<td>Bassoul, Djirnda</td>
</tr>
<tr>
<td>Abene MPA</td>
<td>Abene, Kafountine</td>
</tr>
</tbody>
</table>

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3 A protected fishing zone (ZPP in French) is an area where fishing is prohibited or with limited or regulated access, adopted by village communities in accordance with the Maritime Fisheries Code as part of a co-management system, and subject to agreements. co-management with the official competent services.
The green turtle is well ahead with 61% of the reported catches, followed by the loggerhead turtle with 18%, the Kemp’s ridley turtle with 12%, the leatherback turtle with 6% and the hawksbill turtle with 3%. Only one olive ridley turtle was identified and reported as such (figure 10).

According to Fretey (2001), there is no evidence of the presence of the Kemp’s ridley turtle in Senegal. Cans (in Fretey, 2001) claims to have discovered a small shell and a skull on a beach in the Saloum Delta. Diagne (1999) speaks of sporadic sightings of this species off Bétanti.
In Yawri Bay MPA, the landing sites covered by the surveys are: Tombo Big Wharf, Shenge, Sherfe, Katta, Plantain Island, Kent, Ricket, Banana Island, Kissy Town, Fogbo, Fululu, Mama Beach, Tissana. 78% of surveyed fishermen (41) admit to catching sea turtles (figure 11).

4.2.3. Catch areas

Catches of sea turtles occur all year round. However, it is mainly between April/May and October/November, when turtles approach the coast for nesting, that they are more likely to be caught.

The majority (55%) of fishermen surveyed report catching turtles offshore and 40% near the coast (Table 3).

Tableau 3 : Sea turtle catch areas (%)

<table>
<thead>
<tr>
<th></th>
<th>In the MPA</th>
<th>Offshore</th>
<th>Near the coast</th>
<th>On the beach</th>
<th>In the bolong</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>8.1</td>
<td>49.5</td>
<td>40.1</td>
<td>1.4</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Guinea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>79.2</td>
<td>20.8</td>
</tr>
<tr>
<td>The Gambia</td>
<td>4.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95.5</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>50.0</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Senegal, the reports show catches from the offshore (49.5%), near the coast (40.1%). There are 8.1% of catch declarations from the AMP itself; this is the case at the Joal-Fadiouth MPA, Saint-Louis MPA, Sangomar MPA, Langue de Barbarie National Park, Saloum Delta National Park.

According to the reports in Sierra Leone, 50% of the catches are declared as coming from the MPA itself (Yawri Bay) and 50% from offshore. It should be noted that in some MPAs, certain types of fishing, such as fishing pole, fishing sparrowhawk and even beach seine are authorized.

In The Gambia, 95.5% of the reported catches come from fishing grounds near the coast, the rest coming from offshore.

The situation shows that 79.2% of the reported catches come from offshore and 20.8% from near the coast in Guinea.
4.2.4. Periodicity and importance of reported catches

The periodicities of the catch declarations are reported on a day, weekly, monthly, and annual basis. Most declarations refer to the year; the category “Other” includes indetermined periodicity. Daily catch reports are insignificant and concern only Senegal. Weekly and monthly reports are made in Senegal and Guinea. Annual catches reporting are made by fishermen of the four target countries.

The vast majority (81.2%) of reporting in Sierra Leone does not have a defined periodicity (table 4).

<table>
<thead>
<tr>
<th></th>
<th>Every day</th>
<th>Every week</th>
<th>Every month</th>
<th>Once a year</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senegal</td>
<td>0.8</td>
<td>4.2</td>
<td>21.5</td>
<td>46.0</td>
<td>27.4</td>
</tr>
<tr>
<td>Guinea</td>
<td>8.3</td>
<td></td>
<td>14.6</td>
<td>70.8</td>
<td>6.2</td>
</tr>
<tr>
<td>The Gambia</td>
<td></td>
<td></td>
<td></td>
<td>59.1</td>
<td>40.9</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td></td>
<td></td>
<td></td>
<td>18.8</td>
<td>81.2</td>
</tr>
</tbody>
</table>

As sea turtles are protected species, it is very difficult to collect quantitative catch data. The few reported cases seem to be far below the reality; however, they are illustrative of the trends observed and/or reported.

In Senegal where daily catches are reported, one fisherman reported catching one turtle per day, while another reported 5.

Weekly, 5 fishermen reported catching one turtle each, 3 reported 2, one reported 3 in Senegal. In Guinea, 2 fishermen reported 1 turtle, while 1 reported 2.

Monthly catch reports show that in Senegal 20 fishermen reported catching a turtle, 10 reported 2, 6 reported 3, 3 fishermen reported 4, 6 and 8 turtles respectively, 2 fishermen reported 5 each. In Guinea 4 fishermen each reported 1 turtle each, 2 reported 3 and 4 respectively. The annual situation shows that in The Gambia, the fishermen surveyed acknowledge catching at least one turtle during the year. In Sierra Leone, 5 fishermen interviewed declared catching 15 turtles during the year. In Senegal the declarations go up to 14 and 6 in Guinea; however, the majority is between 1 and 4 turtles.

4.2.5. Use of catches

Non-targeted catches remain the rule, even though in Senegal targeted catches of sea turtles are recorded. These are two fishermen whose main motivation would be the scarcity of fish. They explain that when fishing is not good and fish is scarce, they catch a few turtles to reduce the costs incurred for the outing. These targeted catches are consumed, sold and used for traditional and ritual purposes.

The Non-targeted catches are released according to 462 fishermen surveyed, while 137 report to land them. The case of Sierra Leone is interesting to note. Indeed, the reports show that the non-targeted catches are landed and then released. In fact, with the help of MPA staff and turtle conservation associations, they proceed to the specific identification of individuals and make biometric and possibly biological samples before releasing them. This is a case study and an example of good practice to be multiplied and encouraged.

The non-targeted catches landed are consumed (87.1%), sold (9.7%); a very small part is kindly offered (table 6).
### Table 5: Use and destination of non-targeted catches (%)

<table>
<thead>
<tr>
<th></th>
<th>Consumption</th>
<th>Sale</th>
<th>Consumption and sale</th>
<th>Gift</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Gambia</td>
<td>86</td>
<td></td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guinea</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>87</td>
<td>1</td>
<td>10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>28</td>
<td>5</td>
<td></td>
<td></td>
<td>67</td>
</tr>
</tbody>
</table>

### Table 6: Proportion of fishing gears (%)

<table>
<thead>
<tr>
<th></th>
<th>GN</th>
<th>LL</th>
<th>BS</th>
<th>PS</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Gambia</td>
<td>39</td>
<td>52</td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Guinea</td>
<td>70</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>47</td>
<td>28</td>
<td>7</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>Sierra Leone</td>
<td>66</td>
<td>7</td>
<td>7</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Average</td>
<td>50</td>
<td>27</td>
<td>6</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>

4.2.6. Fishing gears

For treatment and comparison conveniences, fishing gears encountered are grouped into 4 categories:

- gillnets (GN): all types of gillnets including trammel nets, regardless of the mode of action and the target species, whether fixed, drifting, dormant, surface, bottom, wedged, etc.
- lines, longlines (LL): hand lines, longlines
- beach seines (BS): beach seines maneuvered from the beach or on-board canoes
- purse seines (PS): all types of purse seines, purse nets, encircling nets

On average, gillnets (GN) are the fishing gears that catch sea turtles the most (50%), followed by lines/longlines (LL) (27%); purse seines (PS) and beach seines (BS) represent 11% and 6% respectively (table 6).

In Senegal and Sierra Leone, all gears catch sea turtles, while in The Gambia and Guinea only GN and LL catch them. In The Gambia, it is worth mentioning that LL are in first place in terms of fishing gear catching sea turtles (figure 13).

![Figure 13: Proportion of fishing gear catching sea turtles by country](image-url)
In the different MPAs, GN and LL remain the main fishing gears that catch sea turtles (figure 14).

The analysis of species caught by fishing gear shows that GN and LL capture all species of sea turtles (Figure 15).

Females also predominate in catches of the different countries (figures 17, 18, 19, 20, 21, 22).

This majority presence of females confirms that the sub-region is an important area for the reproduction of marine turtles. Indeed, they come to lay eggs on the various beaches of the countries covered by this study.

4.2.7. Sex ratio and stages of maturity

4.2.7.1. Sex ratio
Most of the individuals captured are females; in some cases, they represent up to 90% of the samples.
According to Mmah Soumah (pers. com.), and Fretey (2001), Kemp’s ridley turtle is not believed to be found in Guinea. According to Fretey (2001), there is no evidence of the presence of the Kemp’s ridley in Senegal. Cans (in Fretey, 2001) claims to have discovered a small shell and a skull on a beach in the Saloum Delta. Diagne (1999) speaks of sporadic sightings of this species off Bétanti

\[5\]
4.2.7.2. Stages of maturity

The catches are composed of adult and sub-adult, although the proportion of juveniles is quite marked in some cases (Figures 23, 24, 25, 26, 27, 28). The presence of the different stages of maturity - adults, sub-adults and juveniles - shows that the sub-region is a reproduction and growth zone for at least the green turtle, the loggerhead turtle, the leatherback turtle, the hawksbill turtle and the olive ridley turtle. Although reported in the catches, the presence of the Kemp's ridley turtle remains to be confirmed.

According to Mmah Soumah (pers. com.), and Fretey (2001), Kemp's ridley turtle is not believed to be found in Guinea. According to Fretey (2001), there is no evidence of the presence of the Kemp's ridley turtle in Senegal. Cans (in Fretey, 2001) claims to have discovered a small shell and a skull on a beach in the Saloum Delta. Diagne (1999) speaks of sporadic sightings of this species off Béthani.
4.2.8. Knowledge of the protection status of sea turtles

The vast majority (more than 90%) of interviewed in all four countries know that sea turtles are protected species. They also know that sea turtles species are protected by local, national or even international laws. However, they do not know why sea turtles are protected and would like to know.

Despite this protection, sea turtle bycatch is a real threat to the survival of the species. Several studies have addressed the issue of sea turtle bycatch, but quantifying it remains a challenge.

In a bibliographic synthesis, Jribi & Nejmeddine (2008) specify that, among the threats of human activities, which can be qualified as indirect and which are detrimental to marine turtles at all stages of their life cycle, incidental fishing is the most worrying.

Quantitative data are scarce or non-existent. Given the intensity of fishing near the region’s nesting and feeding areas, sea turtle bycatch rates are likely high (Kimberly & Tiwari, 2013). Accurate and reliable data are difficult to obtain and statistics on small-scale fisheries in the region are largely incomplete (Kelleher, 2005; Moore et al., 2010; Wallace et al., 2010). Data collected from a literature review, direct field observations and the use of a questionnaire by Gomis (2020) show that fishing is the leading cause of mortality of green turtles in protected areas. Incidental catches are largely responsible for this.

A 2010 study by researchers at Duke University estimated that up to 1.5 million sea turtles were caught in fisheries around the world over the period 1990-2008 (Bryan et al., 2010).
4.3. Mitigation measures

4.3.1. Identification of mitigation measures

All technical measures, modifications of fishing gear and/or other management measures must be adapted to the areas, vessels and gear used. There is no perfect one-size-fits-all solution for mitigation measures (FAO, 2013).

Following investigation, several actions are proposed by stakeholders to mitigate the incidental catches of sea turtles. To make them mitigation measures, these actions were analyzed, aggregated, and cross-referenced with the profiles of MPAs covered by the surveys, the bioecological characteristics of the species caught, the technical characteristics of the fishing gear, in addition to considering the knowledge of the protection status of marine turtles. This exercise allows the integration of these measures into MPAs management tools and their implementation by managers and local communities.

The following three mitigation measures are identified:

- reduction of interactions with sea turtles;
- awareness and involvement of communities;
- enforcement of regulations protecting sea turtles.

These measures are common to all four countries, but with a different hierarchy depending on the country. Thus, in The Gambia, Guinea and Senegal, the first measure identified is the reduction of interactions with sea turtles; while in Sierra Leone, enforcement comes first (table 8). Awareness-raising and community involvement plays an important role in the 4 countries.
**THE GAMBIA**

Bycatch is a threat to sea turtles in The Gambia (Barrett et al., 2004; Hawkes et al., 2006). The identified priority mitigation measures for Bolong Fenyo Community Wildlife Reserve and the Tanji Shore and Bijol Island Reserve are:

- reduction of interactions with sea turtles;
- awareness and involvement of communities.

**GUINEA**

Artisanal fishermen incidentally catch sea turtles in their nets, and 85% indicate that they do not target them (Letourneau, 1996). The Tristao/Alcatraz Islands complex, Loos Islands and Kapatchez are the MPAs where the following priority mitigation measures should be conducted:

- reduction of interactions with sea turtles;
- awareness and involvement of communities;
- enforcement of regulations protecting sea turtles.

**SIERRA LEONE**

In 2010, a study showed that the bycatch of sea turtles is mainly made by gillnets, which represent 50% of artisanal fishing gear (Moore et al., 2010); this is confirmed by the present findings.

At Yawri Bay MPA, the mitigation measures identified are:

- enforcement of regulations protecting sea turtles;
- awareness and involvement of communities;
- reduction of interactions with sea turtles.

**SENEGAL**

This study revealed the existence of targeted catches of sea turtles in Joal-Fadiouth. This situation had been described by several studies (Sabinot, 2003; Mbaye, 2006; Diallo et al., 2009; Diallo, 2011). Between 1995 and 2000, hundreds of green turtles were reportedly caught in this region (Sabinot, 2003). Currently, at least 50 sea turtles are caught per week (Karim Sall, pers. com.). Orders for sea turtles even happen between fishermen and consumers in Joal-Fadiouth.

A beach monitoring allowed to count nearly 200 green turtle nests and to monitor them until the emergence of baby turtles in 2020 on all MPAs beaches in Senegal, confirming their importance for the survival of sea turtles.

Given the threats and pressures, and their bioecological and socio-economic role, Joal-Fadiouth MPA, the Saloum Delta National Park (in the broad sense, i.e., including Sangomar MPA), Langue de Barbarie National Park with Saint-Louis MPA as a satellite, Abene MPA with Kalissaye Ornithological Reserve which is a continuation of it, but which is not (yet) a member of RAMPAO, should be prioritized for the implementation of the following mitigation measures:

- reduction of interactions with sea turtles;
- awareness and involvement of communities;
- enforcement of regulations protecting sea turtles.

---

1 Karim Sall is the President of the management committee of Joal-Fadiouth MPA.
The best way to reduce interactions with sea turtles is to avoid them. This seems difficult because the productive areas, favorable to fishing, constitute feeding grounds for sea turtles (FAO, 2013). The intensity of artisanal fishing activities in the coastal strip and the presence of sea turtles in this area, especially during the nesting season, leads to accidental catches. Achieving this objective will reduce mortalities induced by human activities such as capture (targeted or accidental) and poaching for eggs, meat, fat, shell, etc.

4.3.2. Action plan for the implementation of mitigation measures

4.3.2.1. Objectives

**General objective**

The general objective is to mitigate sea turtles by-catch in artisanal fisheries. Achieving the general objective requires reducing direct and indirect interactions between fishing activities and sea turtles, raising community awareness, and enforcing regulations protecting sea turtles.

**Specific objectives**

The measures identified can be turned into specific objectives:

- reduce interactions with sea turtles;
- enforce regulations protecting sea turtles;
- raise awareness and involve communities.

4.3.2.2. Outcomes and activities

**Specific objective 1: Reduce interactions with sea turtles**
Outcome 1: Areas of presence of sea turtles are identified and known

The identification, the knowledge and the delimitation of the areas where sea turtles are present will allow to avoid them and reduce interactions.

Activity 1: Mapping areas of importance for sea turtles

Areas of importance to sea turtles will be identified and mapped; whether they are spawning sites, growth areas, feeding areas or migration corridors. Leveraging community knowledge will allow the activity to be conducted in an inclusive manner and the results to be sustainable.

Activity 2: Secure key areas

Once the areas identified and materially demarcated and their roles for sea turtles are well defined, they will be secured with regular monitoring activities in which communities will need to be fully involved. Depending on the means available, the delimitation can be done with beacons or simply artisanal buoys.

Activity 3: Disseminate the results of studies and research on sea turtles

The results obtained following studies and research on the sites will be the subject of restitution and sharing during workshops, formal or informal meetings for a good popularization. The participation of local associations and NGOs, where appropriate, will provide additional resources if needed.

Outcome 2: Interactions with sea turtles are reduced

The fewer interactions with sea turtles, the fewer mortalities induced by human activities such as targeted or incidental capture and poaching. Space-time planning will contribute, among other things, to the achievement of this outcome.
**Activity 1: Erect sea turtles sanctuaries**

A zonation may be established with exclusion zones or zones prohibited to any human activity, except for scientific research activities which should enjoy a special status. Certain activities which are essential for communities and which do not constitute a danger to sea turtles may be subject to special permits so as not to affect their livelihoods.

**Activity 2: Establish fishing calendars**

The establishment of planned fishing calendars will allow the regulation of fishing trips according to the seasons of high presence of sea turtles.

**Outcome 3: Incidentally caught sea turtles are released**

Bycatch is a real threat to the survival of sea turtles. Releasing incidentally caught sea turtles will contribute to the recovery of populations.

**Activity 1: Establish a compensation and incentive program for the release of sea turtles**

Encouraging the release of bycatch with an incentive can contribute to the reduction of catches. However, this activity may have perverse effects.

**Activity 2: Collect sea turtle catch and stranding data**

The establishment of a system for the collection of targeted, incidental, and stranded catch data will provide a good idea of the importance of these catches. The involvement of fishermen would be a major asset. For the proper management of turtle populations, it is crucial to have catch, stranding and nesting data based on a harmonized collection protocol at the subregional level.

**Activity 3: Set up a sustainable monitoring program for the spawning of marine turtles**

This activity is essential because it allows to have a good estimate of the nesting population. Regular counting of ascent traces is a simple tool to implement, and which gives good results. Teams will crisscross the potential beaches every night to record the tracks. Basic training is required.

**Outcome 4: Consumption of sea turtles and their products is reduced**

The trade in sea turtle meat and other derived products, such as eggs, fat, shell is one of the threats to the survival of sea turtle populations. Reducing the use of sea turtles and their products will help contribute to the preservation of species. Alternative and income-generating activities could be developed.
Activity 1: Identify sea turtles commercial chains

Proximity surveys will allow to know the commercial channels and, if applicable, the actors involved in order to eradicate this illegal trade.

Activity 2: Assess the economic value of sea turtles and their products thereof

Knowledge of the economic value of sea turtles and derived products is important to know if alternative activities are to be set up. Studies should be conducted in each of the identified areas.

Activity 3: Identify and implement alternative activities to the capture of sea turtles

The development of micro-conversion projects may be an option to explore. For example, in Joal-Fadiouth, a former turtle fisherman has been converted for the transport of tourists.

Specific objective 2: Enforce regulations protecting sea turtles

Investigations have revealed that fishermen generally know that turtles are protected, but do not know why. It would be important to popularize the legislation protecting sea turtles through communication and information campaigns and regular meetings between the administration and stakeholders. Communication supports will make it possible to reach the public.

Outcome 1: Regulations protecting sea turtles are known

Knowledge of the regulations will facilitate their implementation and avoid conflicts that could arise from misunderstandings.

Activity 1: Disseminate regulations protecting sea turtles

The use of local languages during outreach campaigns will help get the message across.

Activity 2: Raise awareness among communities on the existence of regulations protecting sea turtles

This activity must be continuous because of the turn-over of park managers and the arrival of new stakeholders.

Activity 3: Raise awareness among communities on the importance of protecting sea turtles

Information, awareness, and communication sessions will focus on the role and importance of marine turtles in the ecosystem. If communities realize that sea turtles contribute to the equilibrium of the marine ecosystem and that their disappearance can affect certain species of fish, they will be more inclined to protect them.
Outcome 2: Regulations protecting sea turtles are implemented

The implementation of the regulations requires the strengthening of the capacities and means available to law enforcement officers.

Activity 1: Establish joint surveillance brigades

The establishment of mixed or joint brigades with good community involvement will facilitate monitoring operations that are essential for the reduction of catches.

Activity 2: Penalizing infringers

In the case of targeted catches of sea turtles, especially in the case of recidivism, penalties must be applied to deter those who might be tempted. Fines must be high enough to be a deterrent. A mechanism should allow all or part of the money from the fines to go back to the brigades in charge of surveillance and to the AMP concerned.

Specific objective 3: Raise awareness and involve communities

To ensure good ownership and sustainability, communities must be continuously sensitized and involved as much as possible at all stages, namely planning, implementation, decision-making, including the development and implementation of participatory research programmes.

Outcome 1: Communities are actively involved in the planning and implementation of activities

Trained and well equipped, communities can be of great recourse and support MPAs managers.

Activity 1: Organize awareness and communication campaigns

Communication is key to success for the conservation of sea turtles. Information, awareness and communication campaigns must be organized regularly because of the turnover of managers and the arrival of new stakeholders. Depending on the country and the zone, the activities to be carried out may be different, but they all revolve around raising the awareness of communities according to age groups and professional categories. Thus, it will be necessary to develop educational material, communication material (banners, T-shirts, caps, etc.), education kits, conduct outreach campaigns, organize traditional evenings, wrestling fights, podiums., radio and television broadcasts, etc. On each of these occasions, messages on the conservation of marine turtles will be delivered.

Activity 2: Organize basic knowledge training sessions on sea turtles

Investigations have revealed a poor knowledge of the different species of sea turtles. This confusion can generate many errors of assessment and misunderstanding. Trainings should cover mainly species identification (systematic) and some basic bio-ecology elements.

Activity 3: Organize capacity building sessions

Capacity building for both MPAs managers and communities will provide a pool of resources to deal with unexpected and specific situations. Customized programmes for target groups may be developed.

Activity 4: Identify and empower relays within communities

Facilitators with good attitudes can be identified within communities and work in close collaboration with managers. They will be able to participate in all activities, including monitoring, surveillance, data collection, etc.
Outcome 2: Communities benefit directly from protecting sea turtles

By making profit and seeing that turtle conservation pays off, communities will be encouraged to participate fully in the various activities because «a living turtle is more valuable than a dead one» (Jacques Fretey dixit).

Activity 1: Identify and implement alternative activities to the sale and consumption of sea turtles

It will be about finding alternatives to the sale and consumption of turtles. For example, actors who were active in the sale of turtle meat were converted with butcher stalls, others were supported and set up chicken coops. It will be necessary to proceed beforehand with the identification and census of actors.

Activity 2: Develop ecotourism activities based on sea turtles

Sponsoring turtle nests, helping to secure nests, or witnessing the emergence of baby turtles are activities that can generate resources if properly supervised and managed. Indeed, it allows to generate resources, especially with ecotourism, depending on the area and the potential influx of tourists. Tourist sponsorship of nesting females or nests can bring resources to the community.

4.3.2.3. Implementation strategy of the action plan

Le plan d’action est générique, il devra être mis en œuvre dans chaque pays selon la priorisation des objectifs spécifiques. Sur chaque site, une structure devra être mise en place pour exécuter, suivre, évaluer et mettre à jour le plan d’action au besoin. Il peut s’agir de l’organisme de gestion de l’AMP.

The action plan is generic; it should be implemented in each country according to the prioritization of specific objectives. On each site, a structure should be in place to execute, monitor, evaluate and update the action plan as needed. This may be the management body of the MPA. It will include government officials, representatives of communities, marine turtle conservation associations if they exist, NGOs, RAMPAO, etc. A meeting to clarify, take ownership of the action plan, planning and budgeting should be organized by RAMPAO in each country with a view to its integration into the management plan.

Implementation must be inclusive and participatory to ensure tangible and sustainable results. While it is well established and even documented that bycatch is one of the greatest threats to sea turtles, obtaining data to quantify the phenomenon remains a challenge. The participation of government officials, representatives of communities, conservation organizations, NGOs will create an atmosphere of confidence in obtaining sensitive data. It will also ensure that there are enough human resources to perform all the tasks.

Ongoing training sessions should be organized on a regular basis to build the capacity not only of communities but also of government officials. NGOs could play a major role in this, thanks to their ability to mobilize people and financial resources when needed.

The results of studies and research on a given site must be reported, shared, and disseminated during information and communication sessions.

Like the international community, special events (sea turtle day or week) should be organized on a regular basis in the different countries concomitantly or successively for proper ownership of sea turtle conservation.
<table>
<thead>
<tr>
<th>Specific objectives</th>
<th>Outcomes</th>
<th>Activities</th>
<th>Actors</th>
</tr>
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<tbody>
<tr>
<td><strong>Outcome 1:</strong> Areas of presence of sea turtles are identified and known</td>
<td>Activity 1: Map areas of importance to sea turtles</td>
<td>Authorities and communities</td>
<td></td>
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<tr>
<td></td>
<td>Activity 2: Secure key areas</td>
<td>Authorities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activity 3: Disseminate the results of studies and research on sea turtles</td>
<td>Authorities, associations, NGOs</td>
<td></td>
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<tr>
<td><strong>Outcome 2:</strong> Interactions with sea turtles are reduced</td>
<td>Activity 1: Erect sea turtles sanctuaries</td>
<td>Local authorities, communities, associations, NGOs</td>
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<td></td>
<td>Activity 2: Establish fishing calendars</td>
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<td></td>
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<tr>
<td></td>
<td>Activity 2: Collect sea turtle catch and stranding data</td>
<td>Authorities, associations, ONGs</td>
<td></td>
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<tr>
<td></td>
<td>Activity 3: Set up a sustainable monitoring program for the spawning of marine turtles</td>
<td>Local authorities, communities, associations, NGOs</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome 4:</strong> Consumption of sea turtles and their products is reduced</td>
<td>Activity 1: Identify sea turtles commercial chains</td>
<td>Authorities, NGOs</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Activity 3: Identify and implement alternative activities to the capture of sea turtles</td>
<td>Authorities, communities, associations, NGOs</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome 1:</strong> Regulations protecting sea turtles are known</td>
<td>Activity 1: Disseminate regulations protecting sea turtles</td>
<td>Authorities, associations, NGOs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Activity 2: Raise awareness among communities on the existence of regulations protecting sea turtles</td>
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<tr>
<td></td>
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<tr>
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<td></td>
<td>Activity 2: Penalizing infringers</td>
<td>Authorities</td>
<td></td>
</tr>
<tr>
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<td>Authorities, associations, NGOs</td>
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<td></td>
<td>Activity 2: Organize basic knowledge training sessions on sea turtles</td>
<td>Authorities</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Activity 4: Identify and empower relays within communities</td>
<td>Authorities, communities</td>
<td></td>
</tr>
<tr>
<td><strong>Outcome 2:</strong> Communities benefit directly from protecting sea turtles</td>
<td>Activity 1: Identify and implement alternative activities to the sale and consumption of sea turtles</td>
<td>Local authorities, communities, associations, NGOs</td>
<td></td>
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<td></td>
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<td>Local authorities, communities, associations, NGOs</td>
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</table>
BIBLIOGRAPHICAL REFERENCES


ANNEXES
**SURVEY QUESTIONNAIRE / MPA MANAGERS**

**BYCATCH OF MARINE TURTLES BY ARTISANAL FISHERIES**

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<table>
<thead>
<tr>
<th>Country:</th>
<th>Investigator:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPA Name:</td>
<td>Local:</td>
<td>Interviewee:</td>
</tr>
</tbody>
</table>

Date of creation of the MPA: Date of joining RAMPAO:

Nature of the management body:

Are monitoring activities carried out in the MPA? **Yes** **No**

If Yes, which ones? **___________________________________________**

Which associations / NGOs collaborate with MPA? **___________________________________________**

Is the presence of sea turtles reported in the MPA? **Yes** **No**

If Yes, which species, sex, maturity, period

<table>
<thead>
<tr>
<th>Species</th>
<th>Sex</th>
<th>Maturity</th>
<th>Month/Season(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
<tr>
<td>Loggerhead</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
<tr>
<td>Leatherback</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
<tr>
<td>Olive ridley</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
<tr>
<td>Hawksbill</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
<tr>
<td>Kemp’s ridley</td>
<td>M</td>
<td>F</td>
<td>J S A</td>
</tr>
</tbody>
</table>

(M=male / F=female / J=Juvenile / S=Subadult / A=Adult)

Can you give the frequency and abundance of the species? (1=low / 2=medium / 3=high)

<table>
<thead>
<tr>
<th>Species</th>
<th>Frequency</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>/___</td>
<td>/___</td>
</tr>
<tr>
<td>Loggerhead</td>
<td>/___</td>
<td>/___</td>
</tr>
<tr>
<td>Leatherback</td>
<td>/___</td>
<td>/___</td>
</tr>
<tr>
<td>Olive ridley</td>
<td>/___</td>
<td>/___</td>
</tr>
<tr>
<td>Hawksbill</td>
<td>/___</td>
<td>/___</td>
</tr>
<tr>
<td>Kemp</td>
<td>/___</td>
<td>/___</td>
</tr>
</tbody>
</table>

Are there any incursions into the MPA? **Yes** **No**

**Incursions of fishermen?** **Yes** **No** **Incursions poachers?** **Yes** **No**

If fishing is authorized, list the fishing gear used: .................................................................

If fishing is non authorized, list the fishing gear involved: ........................................................

**Meat** **Eggs** **Other** **Precise** ........

---

What are the levels of importance and frequency of incursions? (1=low / 2=medium / 3=high)

<table>
<thead>
<tr>
<th>Level of importance by fishermen</th>
<th>1=low / 2=medium / 3=high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of importance by poachers</td>
<td>1=low / 2=medium / 3=high</td>
</tr>
</tbody>
</table>

Frequency of incursions by fishermen: /___

Frequency of incursions by poachers: /___

Month/Season(s): .................................................................

Is there a rescue center or hatchery for sea turtles in the MPA or around? .....................................

What do you recommend to reduce / eradicate marine turtle bycatch? .............................................
### SURVEY QUESTIONNAIRE / FISHERMEN
#### BYCATCH OF MARINE TURTLES BY ARTISANAL FISHERIES

<table>
<thead>
<tr>
<th>Country:</th>
<th>Investigator:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landing site:</td>
<td>MPAs concerned:</td>
<td></td>
</tr>
<tr>
<td>Fisherman interviewed:</td>
<td>Fishing gear:</td>
<td></td>
</tr>
</tbody>
</table>

**Do you catch marine turtles during your fishing trips?**
- Yes [ ]
- No [ ]

If Yes, what is the frequency of these catches?
- Every day [ ]
- Every week [ ]
- Every month [ ]
- Once a year [ ]
- Other [ ]

If Yes, how many turtles do you catch in total?
- Per day / ___ /
- Per week / ___ /
- Per month / ___ /
- Per year / ___ /
- Do not know [ ]

If Yes, which species, sex, maturity and period?

<table>
<thead>
<tr>
<th>Species</th>
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<th>Maturity</th>
<th>Month/Season(s)</th>
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</tbody>
</table>

(M=male / f=female / J=Juvenile / S=Subadult / A=Adult)

Where do you catch them?
- In the MPA [ ]
- Offshore [ ]
- Near the coast [ ]
- On the beach [ ]
- In the bolong [ ]
- Other [ ]

If targeted catches

- Why you target them?

What is the usage of targeted catches?
- Consumption [ ]
- Sale [ ]
- Other [ ]

If non-targeted catches

- What is the usage of non-targeted catches?
- They are released [ ]
- They are landed [ ]

If landed, it’s for
- Consumption [ ]
- Sale [ ]
- Other [ ]

Do they have an impact on your work?

What do you recommend to reduce / eradicate these non-targeted catches?

Do you know that sea turtles are protected species?
- Yes [ ]
- No [ ]

If Yes, by what?

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**Survey Questionnaire / Fishermen**

**Bycatch of Marine Turtles by Artisanal Fisheries**

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This guide allows you to go as far as possible in the discussions, to ask the same question several times or in different forms. The idea is to gather as much information as possible. The listed points serve just to guide the investigator. Responses are normally collected in a notebook. The guide focuses on three key points: catches, protection and conservation measures, and proposals for improvement.

1- **Catches of marine turtles**
- Existence of marine turtles catch
- Species caught
- Catch period (month, season)
- Catch zone, area (it can be in the MPA if certain fishing type/gears are authorized)
- Gear of catch
- Quantities caught (try to get numbers)
- Reasons for catch
- Mode of use of catches (usage of catches)

2- **Conservation and protection of marine turtles**
- Existence of protection measures
- Level of knowledge by the populations of protection measures, which measures
- Level of application of protection measures
- Factors for compliance and non-compliance with measures (why the measures are/are not complied with)
- Frequency of infringements penalized
- Existence of rescue center or hatchery

3- **Improvement proposal**
- Arrangements to be put in place to reduce / eradicate bycatch
- Actors, stakeholders to be involved
- Means of implementation