AN UPDATE ON BEST PRACTICES ONBOARD FRENCH TROPICAL TUNA PURSE SEINERS OF THE ATLANTIC OCEAN

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SUMMARY

During the last decades, the issue of mortality of sensitive species incidentally caught by fishing vessels has become a major concern for the sustainability of fisheries. In 2012, the collaboration with French scientists of the French Institute for Research and Development (IRD) and Ifremer resulted in the first manual of safe handling and releasing techniques for sharks, whale sharks, rays and sea turtles (Poisson et al., 2012, 2014b). In 2020, a comprehensive assessment of the application of Best Practices onboard French and associated flag purse seiners of the Atlantic and Indian Oceans was carried out (Maufroy et al., 2020). This study was used to identify avenues for improvement, make changes to the OCUP observation program and implement new projects. This document (i) provides an overview of the evolution of best practices onboard these vessels (ii) presents the current approach to train fishing crews on best practices and (iii) presents the current approach to monitor best practices with onboard observers in the frame of the OCUP program.

RÉSUMÉ

Au cours des dernières décennies, la question de la mortalité des espèces sensibles accidentellement capturées par les navires de pêche est devenue une préoccupation majeure pour la durabilité des pêches. En 2012, la collaboration entre les scientifiques français de l'Institut français de recherche et développement (IRD) et de l'Ifremer a donné lieu au premier manuel sur les techniques de remise à l'eau et de manipulation en toute sécurité des requins, requins-baleines, raies et tortues marines (Poisson et al., 2012, 2014b). En 2020, une évaluation exhaustive de l'application des meilleures pratiques à bord des senneurs français et sous pavillons associés de l'océan Atlantique et de l'océan Indien a été réalisée (Maufroy et al., 2020). Cette étude a permis d'identifier des voies d'amélioration, d'apporter des modifications au programme d'observation OCUP et de mettre en œuvre de nouveaux projets. Le présent document (i) fournit un aperçu de l'évolution des meilleures pratiques à bord de ces navires, (ii) présente l'approche actuelle pour former l'équipage de pêche aux meilleures pratiques et (iii) présente l'approche actuelle pour surveiller les meilleures pratiques avec des observateurs à bord dans le cadre du programme OCUP.

RESUMEN

En las últimas décadas, la cuestión de la mortalidad de las especies sensibles capturadas incidentalmente por los buques pesqueros se ha convertido en una de las principales preocupaciones para la sostenibilidad de la pesca. En 2012, la colaboración con científicos franceses del Instituto Francés de Investigación y Desarrollo (IRD) e Ifremer dio lugar al primer manual de técnicas seguras de manipulación y liberación de tiburones, tiburones ballena, rayas y tortugas marinas (Poisson et al., 2012, 2014b). En 2020, se llevó a cabo una evaluación exhaustiva de la aplicación de las mejores prácticas a bordo de los cerqueros de pabellón francés y asociados de los océanos Atlántico e Índico ((Maufroy et al., 2020). Este estudio se utilizó para identificar vías de mejora, introducir cambios en el programa de observación OCUP y poner en marcha nuevos proyectos. Este documento (i) ofrece una visión general de la evolución de las mejores prácticas a bordo de estos buques (ii) presenta el enfoque actual para formar a las tripulaciones de pesca en las mejores prácticas y (iii) presenta el enfoque actual para supervisar las mejores prácticas con observadores a bordo en el marco del programa OCUP.

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KEYWORDS

Tropical tuna purse seiners, Atlantic Ocean, sensitive species, Best Practices

1. Introduction

During the last decades, the issue of mortality of sensitive species incidentally caught by fishing vessels has become a major concern for the sustainability of fisheries. Over time, numerous guidelines, Codes for Responsible Fisheries, Conservation and Management Measures (CMMs) and Action Plans have been adopted worldwide at the global (FAO, 1995, 2011), regional (European Commission, 2009; ICCAT, 2018; IOTC, 2017) or fisheries (Goujon, 2015; Grande *et al.,* 2019; Hutchinson *et al.,* 2015; ISSF, 2016; ORTHONGEL, 2011; Poisson *et al.,* 2012) level to address these issues.

In the case of tropical tuna purse seiners of the Atlantic Ocean, the rates of bycatch are generally low and bycatch is dominated by teleost fish (Amandè *et al.,* 2010). Incidental catches comprise particularly vulnerable species of sharks, rays, mobulids rays and sea turtles (Amandè *et al.,* 2010, 2012; Ruiz *et al.,* 2018). These sensitive species incidentally caught by tropical tuna seiners are in most cases classified on the IUCN Red List and are also listed in Appendices I or II of CITES. For example, the silky shark *Carcharhinus falciformis* (FAL) is listed on the IUCN Red List as "Vulnerable" and is listed on the Appendix II of CITES.

In 2012, to improve the survival of such sensitive species, the Producer Organization ORTHONGEL and scientists of the French Institute for Research and Development (IRD) and Ifremer published the first manual of safe handling and releasing techniques for sharks, whale sharks, rays and sea turtles (Poisson *et al.* 2012, 2014b). Over time, the implementation and monitoring of Best Practices has gradually improved onboard French purse seiners of the Atlantic Ocean. This document (i) provides an overview of the evolution of Best Practices onboard these vessels (ii) present the current approach to train fishing crews to Best Practices and (iii) presents the current approach to monitor Best Practices with onboard observers in the frame of the OCUP program.

2. From the development of a manual of Best Practices to Best Practices 1.0

2.1 Sharks project for the future (2010-2012)

In 1999, FAO adopted an International Action Plan for the Conservation and Management of Sharks (FAO, 1999) that was followed in 2009 by the implementation of a similar Action Plan at the scale of the European Union (European Commission, 2009). Among others, the objectives of these action plans were to ensure that sharks are sustainably managed and that their bycatches are properly regulated. The implementation of the EU Action Plan for Sharks encouraged French and associated tropical tuna purse seine fleets to develop efficient and adapted techniques to release sharks alive.

From 2010 to 2012, ORTHONGEL and its member fishing companies worked in collaboration with scientists of the IRD and Ifremer in the frame of the *Sharks* Project for the Future and the European Union MADE project (Mitigation Adverse Ecological Impacts of open ocean fisheries). As a result of this collaboration, the first manual of safe handling and releasing techniques for sharks, whale sharks, rays and sea turtles was published in 2012 (Poisson *et al.* 2012, http://www.orthongel.fr/docs/publications/GoodpracticesGuide_LDef.pdf). The manual contains a set of recommendations to safely release specimens of sensitive species, while enhancing their survival. These recommendations have been adapted to the case of other tropical tuna purse seine fleets (e.g., Grande *et al.* 2019) and are currently used by the International Sustainable Seafood Foundation (ISSF) to inform skippers on Best Practices (ISSF 2016).

Following the release of the manual of safe handling and releasing techniques, training sessions were organized at port from June 2012 to July 2013 onboard each purse seiner operating in the Atlantic or the Indian Ocean. Interviews with purse seine crews, discussions during training sessions and analyses of the configuration of purse seiners had highlighted the need for adapted Best Practices equipment, that would both improve the survival of specimens of sensitive species and the security of the crews. A set of potential solutions was therefore proposed as a complement to the manual of Best Practices.

2.2 Selectivity project for the future (2013 – 2015)

In 2013, ORTHONGEL implemented the *Selectivity* Project for the Future to test the solutions proposed by fishers and scientists in the frame of the *Sharks* Project for the Future, better inform purse seine and support vessel crews on ORTHONGEL's various Projects for the Future (i.e., projects to improve the sustainability of the fishery), and develop practical solutions for non-entangling and biodegradable FADs and issues of bycatch reduction and utilization.

From April 2013 to May 2015, specific sharks and rays handling equipment were selected with fishing companies and tested onboard by purse seine crews. Unfortunately, none of the proposed solutions received the full support of crews, as they were often too difficult to use in real fishing conditions. In addition, ORTHONGEL and its member fishing companies were dedicating considerable energy to other projects developed at the same time (e.g., OCUP, see 2.2), which slowed down the progress made in the frame of the Selectivity project. Nevertheless, summary sheets on Best Practices, non-entangling FADs (NEFADs) and programs of scientific observation were prepared and data collection on Best Practices started during the *Shark* Project for the Future. In addition, from 2015 to 2019, ISSF skipper's workshops have been organized each year in France to inform captains, second captains, bosuns, fleet managers and fleet representatives on the latest developments regarding Best Practices. The organization of such yearly ISSF skippers' workshops, that was suspended due to the Covid-19 pandemic, will resume in 2023.

2.3 Best Practices 1.0 (2014 – 2020) and OCUP (since 2013)

In 2013, ORTHONGEL implemented the OCUP program to facilitate the boarding of scientific observers of coastal countries in collaboration with Bureau Veritas Living Resources (BVLR), IRD and 10 countries of the Atlantic and Indian Oceans (Goujon *et al.* 2017a; Goujon *et al.* 2017b), with the aim of reaching an exhaustive observer coverage of its member fishing vessels. The observer coverage rate has rapidly increased in the Atlantic Ocean, offering the opportunity to monitor the application of Best Practices on most fishing trips.

From 2012 to 2015, as the various Projects for the Future were still ongoing, observers only filled a simple questionnaire to report on their perception of the application of Best Practices onboard French and associated purse seiners. They could also suggest improvements based on their own observations or on discussions with purse seine crews.

A dedicated observation form (F form) was then implemented in 2016 and routinely used by onboard observers in the frame of the OCUP program. In 2020, a comprehensive assessment of the application of best practices on board French and associated flag purse seiners was carried out (Maufroy *et al*. 2020) using the information collected since 2016. This analysis indicated that Best Practices were more easily applied for sea turtles and whale sharks than for small sharks that are not easily detected on the upper deck, and for dangerous / large individuals of sharks and large rays that cannot be easily handled with Best Practices. Results also suggested differences in the exhaustivity and objectivity of the data collected between observers.

Based on these observations, ORTHONGEL initiated in 2021 a new phase of Best Practices (Best Practices 2.0) whose objectives are to (i) further improve the monitoring of the application of Best Practices, (ii) support observers in the monitoring of Best Practices and (iii) support fishing crews in the application of Best Practices. Depending on the species and the issues detected in 2020, the actions taken to achieve these objectives in the frame of the Best Practices 2.0 program is different (**Figure 1**). Such actions will be further discussed in the section 3 of the present document.

3. Best Practices 2.0: improving data collection on Best Practices

3.1 Improving the Best Practices data collection form

The Best Practices observation form (F form) is routinely used since 2016 by onboard observers to monitor the application of recommended handling practices on sharks, whale sharks, sea turtles, small rays and large rays. The comprehensive assessment of Best Practices data carried out in 2020 revealed that the form required an in-depth revision to improve the objectiveness of the data collected by observers. It also highlighted the need to revise the structure of the form, so as to facilitate the routine analysis with automatized tools (Maufroy *et al*. 2020). The F form structure was therefore completely revised by ORTHONGEL in 2021 with the help of the OCUP coordination team, OCUP observers and IRD.

Revision 1: groups of species

The handling of individuals is strongly linked to the size of the individual, the ease of handling the individual, the behaviour of the individual, the frequency of capture and the ease of detecting the individual in the net and onboard. Since these parameters are strongly linked to the type of animal that is handled by fishing crews, it was decided to separate the F form into 4 groups of species: sharks, whale sharks, rays and turtles.

Revision 2: types of handling practices

It is essential that the types of handling practices that may be used by fishing crews are perfectly clear to facilitate data collection by observers. In addition, it is critical that observers are not required to judge the work of fishing crews, since observers are not controllers and should collect information in an objective manner.

For a given group of species, the different types of handling practices were therefore organized per observation location: (i) individuals in the net (whale sharks), (ii) individuals entangled in the net, (iii) individuals handled on the upper deck and (iv) individuals handled in the lower deck. This modification clarifies the structure of the form for the observer and facilitates the collection of exhaustive information.

For a given observation location, the types of handling practices were also classified either as (i) recommended practices (i.e. type of manipulations, in the strict sense, which improves the individual's chances of survival) (ii) second chance practices (i.e. type of manipulations, used in the lower deck, which improves the individual's chances of survival when the individual could not be detected on the upper deck), (iii) unsuitable practices (i.e. type of manipulations, in the strict sense, that decreases the individual's chances of survival). This modification emphasizes the importance of releasing individuals of sensitive species from the upper deck, where their chances of survival are higher, while allowing documenting the efforts made by fishing crews in the lower deck (Poisson *et al.* 2014a).

Revision 3: exhaustive data collection per individual

In its previous version, the F form only allowed reporting information on handling practices for several individuals at the same time. It was therefore impossible to properly calculate the proportion of individuals which were handled with a given technique. The structure of the form has therefore been modified, so as to fill one row per individual and report the full sequence of recommended, second chance and unsuitable practices that the crew may have used to release a given individual.

Revision 4: recommended practices vs conformity

Until the revision of the F form, observers were requested to collect information on *Good* and *Bad* Practices and therefore, to judge by themselves of the work of the fishing crew. The change of terminology from *good/bad* to *recommended/second chance/unsuitable* practices address this issue. For the same reason, it was decided that the *conformity* of sequences of handling techniques should not be assessed by observers themselves, but by data analysts based on objective criteria.

Since the application of recommended practices may not be possible under certain conditions, that are independent from the fishing crew, the notion of context has therefore been added to the form. This makes it possible to put the manipulations in the context specific to the situation at the level of the vessel (lack of appropriate handling gear, technical issue ...), the individual (dangerous, in large numbers ...) or external elements (weather ...) and to identify which unsuitable situations could or could not have been avoided by the fishing crew. This revision allows to separate *conform* sequences of handling practices from *non-conform* sequences. Any handling of an individual with at least an unsuitable practice, that cannot be related to a given context, will be classified as *non-conform* during the analysis of the data by ORTHONGEL, so as to draw recommendations to the fishing crew for next fishing trips, and to the fishing companies if improvements should be made on the configuration of the vessel or the availability of appropriate handling equipment on board.

After a phase of test by observers in 2021, the revised F form has been deployed in January 2022 in the frame of the OCUP-program. Collected data are analysed by ORTHONGEL at the end of each fishing trip. These analyses and conclusions are shared both with fishing crews and observers in a logic of progress (respectively in their application of recommended practices or their data collection in the F form and advice to the crew during the fishing trip).

3.2 Improving data collection by observers

Of course, revising the structure of any data collection form requires training observers to this new form. In 2022, observers have attended refresher training sessions in the frame of the OCUP program, which included, among others, a training to the new F form. Since 2023, training sessions of new observers also include a training module on the new F form. During these training sessions, advice is also given on the appropriate attitude that onboard observers should adopt with fishing crews (e.g., no judgement, as it is the responsibility of ORTHONGEL and the fishing company to assess the conformity of the work done by the fishing crew). In 2022 and 2023, respectively 30 and 5 observers were trained to this new form.

Once onboard observers have received the initial training on the F form, a continuous training is provided by ORTHONGEL, in collaboration with the OCUP coordination team. On their return, onboard observers debrief the data collected with ORTHONGEL in order to close data gaps or correct the data if necessary. An individual follow-up of observers, with objective criteria on their use of the F form, has also been set up to assess their progress and provide adequate individualized training.

4. Best Practices 2.0: supporting fishing crews in the application of Best Practices

4.1 At port training of fishing crews

Since 2022, fishing crews attend training sessions on Best Practices, preferably onboard in the port of Abidjan, so that all nationalities of fishers can attend these sessions. The training, provided by ORTHONGEL, allows the crew to be shown the recommended manipulations (Poisson 2012). A particular emphasis is put on sharks, rays and mobulid rays during training sessions, since these species were identified as those for which improvements were needed during the implementation of Best Practices 1.0. In particular, information on the biology and injuries that may be caused by unsuitable handling techniques is provided and the higher chances of survival after a release from the upper deck are recalled.

Training sessions besides allow to present the role of observers and the data collected in the framework of the OCUP project. A first training session was organized in the Atlantic Ocean (Abidjan) in April 2022, 5 purse seiners and 6 crews followed the training. Crew training will be done routinely from 2023 with regular sessions onboard. Finally, these trainings are also an opportunity to exchange with the crews on Best Practices. These exchanges are important to identify needs and improvements (e.g., releasing gear, content of training sessions, etc).

4.2 Individualized follow-up and recommendations to fishing crews

The revision of the F form with clear and objective information allows a routine monitoring of Best Practices at the scale of the fishing crew shift, so as to provide each crew adequate and individualized training. In May 2022, ORTHONGEL started a routine analysis of the data collected in the F form by observers. Based on this analysis, ORTHONGEL provides the fishing crew a follow-up report that (i) assesses the application of Best Practices during their previous fishing trip and (ii) makes recommendations for the next fishing trip.

4.3 Results obtained for whale sharks and sea turtles in 2022

As in the frame of the Best Practices 1.0 from 2016 to 2020, the safe release and the monitoring of whale sharks and sea turtles did not present particular difficulties in 2022 in the Atlantic Ocean. Information on individuals arrived alive onboard were systematically collected in the frame of the OCUP program (100% coverage of fishing sets in 2022). Sea turtles were the second group of species reported in Best Practices forms in the Atlantic Ocean in 2022 with 177 individuals. The main species observed for these groups was the Olive ridley turtle *Lepidochelys olivacea* (LKV, 94%). 11 whale sharks *Rhincodon typus* (RHN) were reported in Best Practices forms in the Atlantic Ocean in 2022. 100% of these individuals were released alive.

In 2022, 92% of sea turtles were released from the upper deck and 8% arrived on the lower deck and were brought back on the upper deck to be released. Sea turtles were handled with all three types of practices (**Figure 2b**). Recommended practices were the major type of practices reported in the Best Practices forms (82%). Second chance and unsuitable practices each represented 9% of the practices reported in 2022 in the Atlantic Ocean. The main handling techniques used on sea turtles was “released by hand from the upper deck” (recommended practice) which represented 75% of the practices used.

In 2022, all the whale sharks were released from the net. Whale sharks were mainly handled with recommended practices (85% of the cases) (**Figure 2a**). In 85% of cases, the crews sank the net in order to release the whale sharks (**Figure 2a**). On two occasions, unsafe practices for the crew were reported in the forms. These unsafe practices were considered as unsuitable practices since crew safety is a priority of the Best Practices program.

4.4 Results obtained for sharks, rays and mobulid rays in 2022

In 2022, sharks were the main group of species incidentally caught by French purse seiners in the Atlantic Ocean. 1 643 individuals were reported in Best Practices data. It is important to note that Best Practices are only collected for individuals which arrived onboard alive. The main species observed for these groups were the silky shark *Carcharinus falciformis* (FAL,92.5%), the smooth hammerhead shark *Sphyrna zygaena* (SPZ,4.1%) and the scalloped hammerhead shark *Sphyrna lewini* (SPL,1.3%).

In 2022, 57% of sharks were released from the upper deck and 43% arrived in the lower deck, suggesting an improvement compared with Best Practices 1.0 (Maufroy *et al.* 2020). Of these sharks arrived in the lower deck, 37% were brought back on the upper deck to be released and 6% were released from the discard belt. Sharks were handled with unsuitable practices in the majority of cases (44%, **Figure 3a**). Recommended and second chance practices represented respectively 29% and 27% of the practices used in 2022. The main handling techniques used on sharks were "released by hand from the upper deck" (recommended practices) which represented 25.7% of the practices used and "released by hand from the lower deck" (second chance practices) which represented 26.5% of the practices used. Unsuitable practices were mainly individuals suspended by hand or with an equipment present onboard (e.g., shark lifted with the crane) by the tail, head or gill slits. Such practices represented respectively 13.2 and 10.3% of observed cases.

In 2022, rays were the third group of species incidentally caught by French purse seiners in the Atlantic Ocean with 84 individuals reported in Best Practices forms. For small rays, the main species observed was the pelagic stingray *Pteroplatytrygon violacea* (PLS; 39%). For large rays, the main species observed were the sicklefin devil ray *Mobula tarapacana* (RMT; 33.3%) and the devil fish *Mobula mobular* (RMM; 23.8%).

In 2022, 76.2% of rays and mobulid rays were released from the upper deck and 23.8% arrived in the lower deck. Of these rays arrived in the lower deck, 21.4% were brought back to the upper deck to be released and 2.4% were released from the discard belt or the waste chute. The rays arrived in the lower deck were mainly small rays, only one large ray arrived in the lower deck. Rays were handled with all three types of practices Rays were handled with recommended practices in the majority of cases (64%, **Figure 3b**). Second chance and unsuitable practices represented respectively 21% and 15% of the practices used in 2022 in the Atlantic Ocean. The main handling techniques used on rays were "release with a specific equipment (e.g., tarp, flat straps, net) from the upper deck" which represented 28.8% of the practices used and "released by hand from the upper deck" which represented 26% of the practices used. Unsuitable practices were mainly individuals suspended by hand by the tail, head or gill slits or individuals for which the release has been delayed. The two practices represented each 5.8% of the practices used.

The analyses of the 2022 data showed that challenges remained with the release of sharks and rays. The issues highlighted by this analysis were (i) the passage through the lower deck of a significant number of individuals and (ii) the use of non-recommended practices. The improvement of the data collection form within the framework of the Best Practices 2.0 program made it possible to collect additional information to explain these issues.

4.5 Understanding the issues encountered for sharks, rays and mobulid rays in 2022

4.5.1 Why have sharks and rays arrived in the lower deck?

The size of sharks' individuals handled in the lower deck was between 52 and 450 cm (**Figure 4**). 69.5% of these individuals were relatively small (size < 150cm). The size of these individuals could therefore have reduced the ability of the crew to detect these sharks on the upper deck. However, for the individuals larger than 150 cm, which are in principle more easily detected on the upper deck, the reasons explaining their handling in the upper deck must be further investigated. If needed, complementary training will be provided (individual follow-up reports, onboard training) and adapted handling gears will be identified.

The small rays handled in the lower deck measured between 38 and 150 cm (**Figure 5**). As for sharks, the size of these individuals could therefore have reduced the ability of the crew to detect these rays on the upper deck.

4.5.2 Why have unsuitable practices been used on sharks and rays?

Information on the context was retrieved from the Best Practices form and investigated to understand if issues were encountered by fishing crews when handling sharks and rays. Indeed, some circumstances, independent of the crew, can render the handling of these individuals difficult or dangerous. This may include (i) technical issues, (ii) individuals with a dangerous behaviour, (iii) a large number of individual arriving at the same time onboard or even (iv) bad weather conditions. These elements of context make it possible to understand whether the use of an unsuitable handling technique could have been avoided by the crew (conform vs non-conform handling).

In 2022, 91% of unsuitable practices on sharks were not explained by a particular context (**Figure 6a**). The main reported element of context was the individual dangerousness and the presence onboard of a large number of individuals to be released at simultaneously, explaining each 4.2% of the unsuitable practices.

In the case of large rays, 46,7% of unsuitable practices were not explained by a particular context either (**Figure 6b**). The main reported contexts were the "large number of individuals" and the "Other" context, respectively 26,7% and 20%. Debriefings indicated that observers inadequately used the "Other" context to report on individuals of large size and weight for which the release is difficult.

The results we obtain for sharks and large rays may be explained by several factors:

(i) The training of the crews, since only 34% of fishing crews were trained in Abidjan in 2022.

(ii) The adequacy of the Best Practices forms to report on the context and the training of observers, as for example, reporting on the absence of adequate releasing gear onboard is not possible yet in the form or the difficulty to judge the dangerousness of an individual.

5. Next steps and future objectives of the program

Since 2020, important changes have been made in the frame of the Best Practices 2.0 program, including (i) an in-depth revision of the Best Practices data collection form, (ii) refresher training sessions training of the crews and observers (iii) individual follow-up reports per fishing trip and (iv) systematic debriefings with onboard observers. Experience with Best Practices since 2013 and the analysis of the data reported in Best Practices forms in 2022 both indicate that the perfect application of Best Practices requires a stepwise approach with gradual improvements.

Since difficulties in the application and the monitoring of Best Practices onboard French tuna tropical purse seiners of the Atlantic Ocean still exist, the work carried out by ORTHONGEL, crews, fishing companies and observers will continue on the 3 objectives previously identified but also on new objectives.

Action 1: Further improving the data collection form

Even if the new form is more comprehensive and allows the collection of additional data, improvements can still be made. These improvements should, in particular, aim at better collecting the elements on the context around the handling techniques used by fishing crews. Indeed, at this stage, the lack of reported context may not allow to assess the conformity of the manipulations properly. This is especially visible for sharks, for which 46.0% of individuals were handled with unsuitable handling techniques, but no specific context was provided to understand these observations (**Figure 7**). In the absence of proper elements to assess the conformity with Best Practices, it is difficult to conclude if insufficient efforts have been made to release sharks with recommended practices or if there was really no other choice to grant the security of the fishing crew.

One potential missing element of context that requires to be added to the form is the "absence of specific equipment onboard". Indeed, for large or dangerous individuals, it seems difficult to set up recommended and safe handling for the crews if no equipment is available onboard the vessel. Consequently, and with the current data, certain manipulations were classified as non-conform without being possible to verify whether the necessary equipment was available onboard.

Another context on which we must work is the dangerousness of individuals. Indeed, this context is very subjective. For examples, some observers note this context when a shark moves a little, but others note it only for very agitated sharks. We plan to define a scale of dangerousness which would take into account, among other things, the size of the individual.

Action 2: Further improving data collection by observers

The changes made to the forms will lead to refresher training sessions for observers. The continuous trainings, debriefing and individual follow-up will continue as a routine to continue improving the quality of the data collected.

Action 3: Further supporting fishing crews and fishing companies in the application of Best Practices

As for action 2, the work with the crews and the fishing companies set up in 2022 will continue on a routine basis to monitor the application of Best Practices and work on persistent difficulties.

Action 4: Identify and equip all vessels with the specific equipment needed to release sensitive species

Exchanges during training sessions and analysis of the data collected in the F form provide important feedback on the applicability of recommended handling practices. It is expected that this improved communication between fishers, fishing companies, observers and ORTHONGEL will provide new insights on the needs of fishing crews onboard, including on the development of new releasing gear, or on the improvement of vessel configuration to release sensitive species easily and safely.

In addition, the analyses carried out on Best Practices have shown that there are still difficulties in handling and releasing large and/or dangerous individuals (e.g., sharks or large rays). For these two groups, handling by hand is not always possible because the individuals are too heavy, too large or too dangerous. It is therefore necessary to identify equipment to handle these individuals in a safe manner for the crews.

The identification of proper releasing gear is currently ongoing. Light solutions, that can quickly be installed and do not require a large storage space will be preferred and solutions adapted to the configuration of the vessels will be identified.

For example, since 2022 some of the French tuna tropical purse seiners of the Atlantic Ocean have been using flat straps (**Figure 8**) for the release of large rays. These straps are placed under the individual and are then lifted using the vessel's crane to release the individual. These straps cannot be generalized to the entire fleet since some vessels do not have a crane and would therefore not be able to use them. An alternative solution is therefore required for such vessels.

The identification of specific equipment for the release of large rays and sharks also requires to be properly tested to assess the technical feasibility of using these solutions and the contribution to the survival of these individuals. Depending on the availability of funding, next steps will include the tagging of sharks and large rays in the Indian and Atlantic Oceans with the objectives (i) to test new release equipment, (ii) to estimate post-release survival rate, (iii) to study the habitat of these species and (iv) to update the Best Practices guide launched in 2012.

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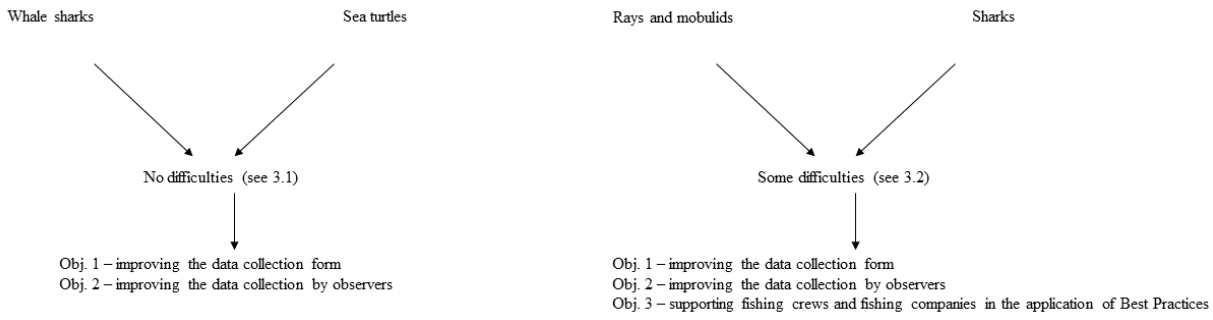

Figure 1. Objectives of the Best Practices 2.0 program per group of species.

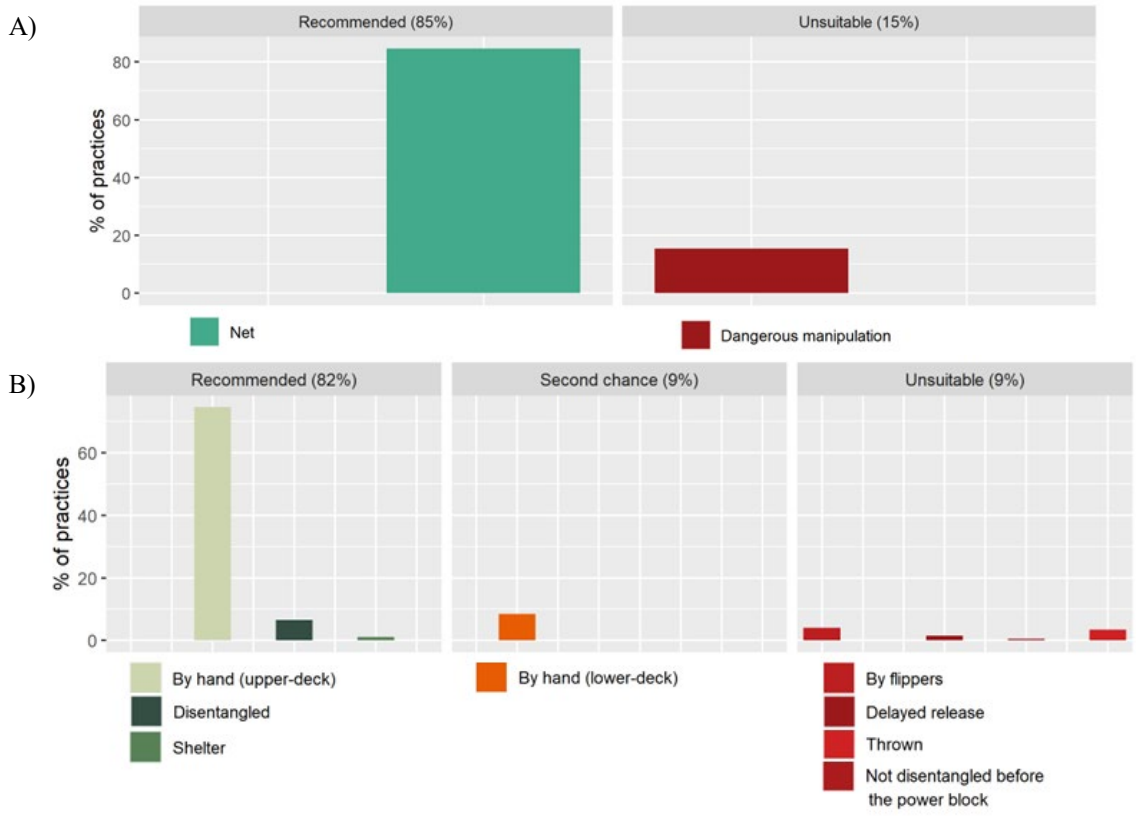

Figure 2. type of practices reported in the Best Practices forms for whale sharks (A) and sea turtles (B) in 2022 in the Atlantic Ocean.

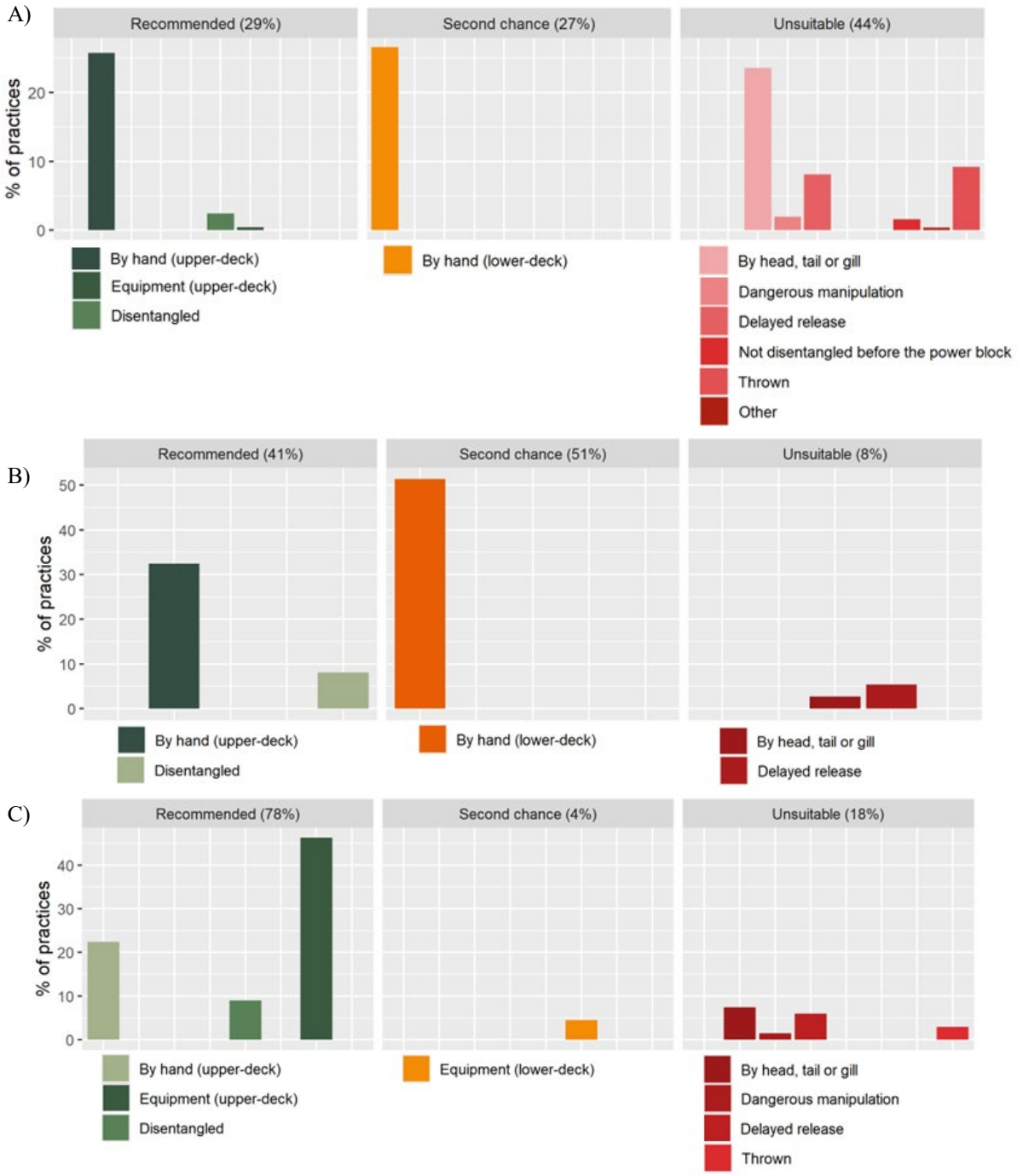

Figure 3. type of practices reported in the Best Practices forms for sharks (A), small rays (B) and large rays (C) in 2022 in the Atlantic Ocean.

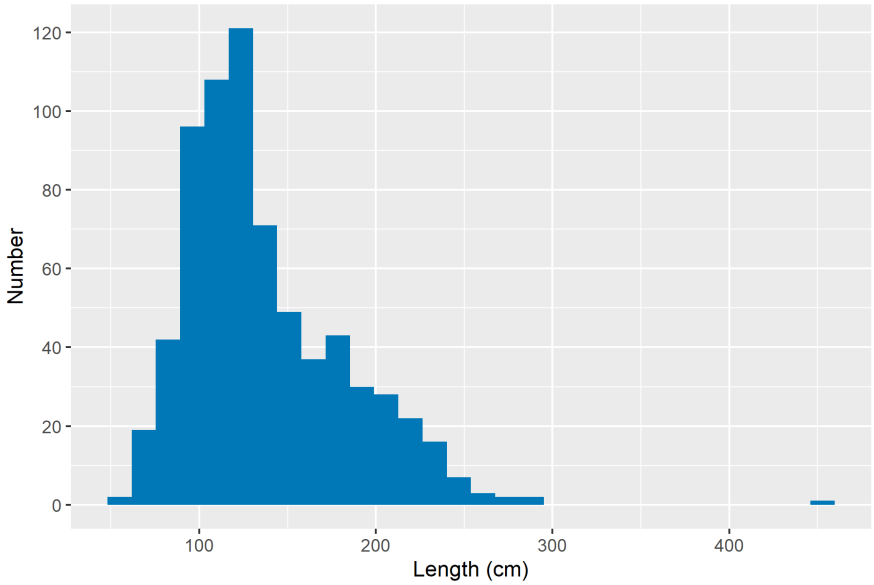

Figure 4. Length of the sharks arrived in the lower deck reported in the Best Practices forms in 2022 in the Atlantic Ocean.

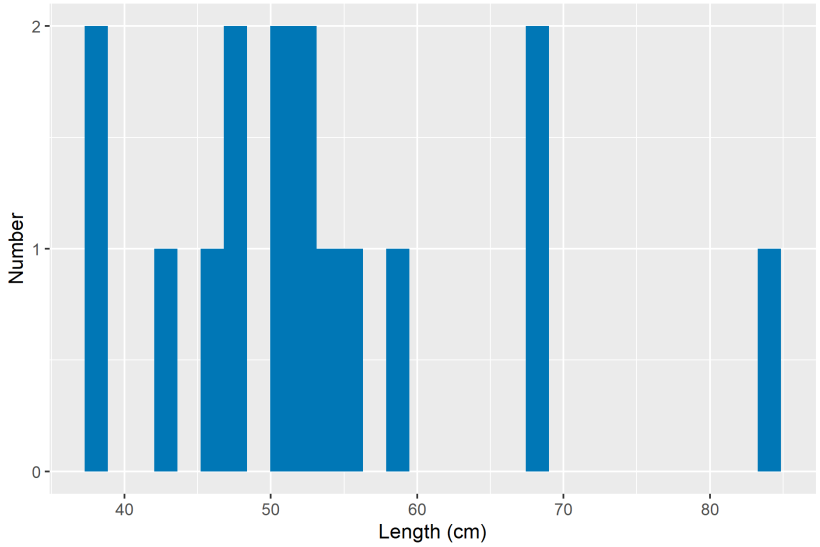

Figure 5. Length of the rays arrived in the lower deck reported in the Best Practices forms in 2022 in the Atlantic Ocean.

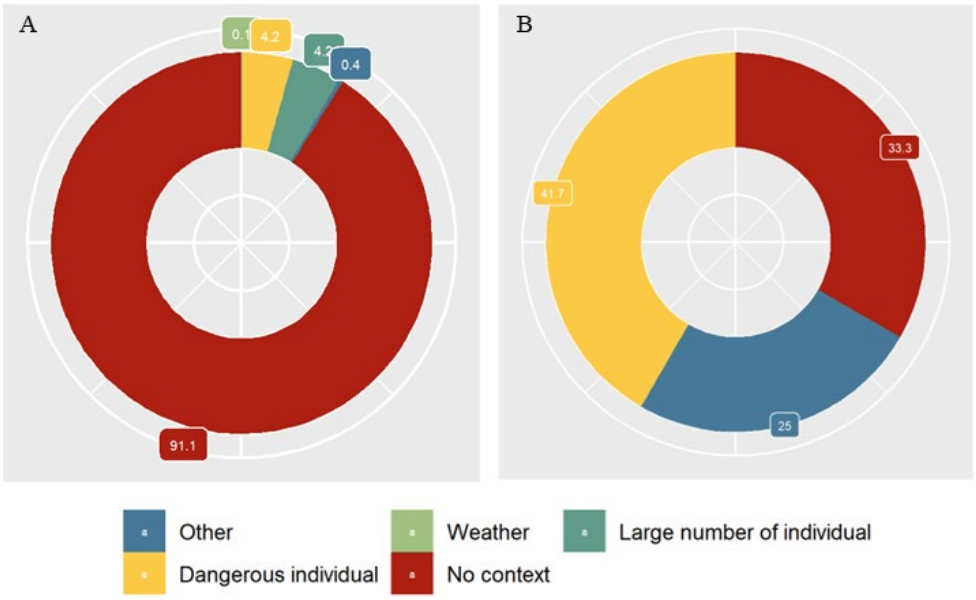

Figure 6. Context reported for sharks (A) and large rays (B) in the Best Practices forms in 2022 in the Atlantic Ocean.

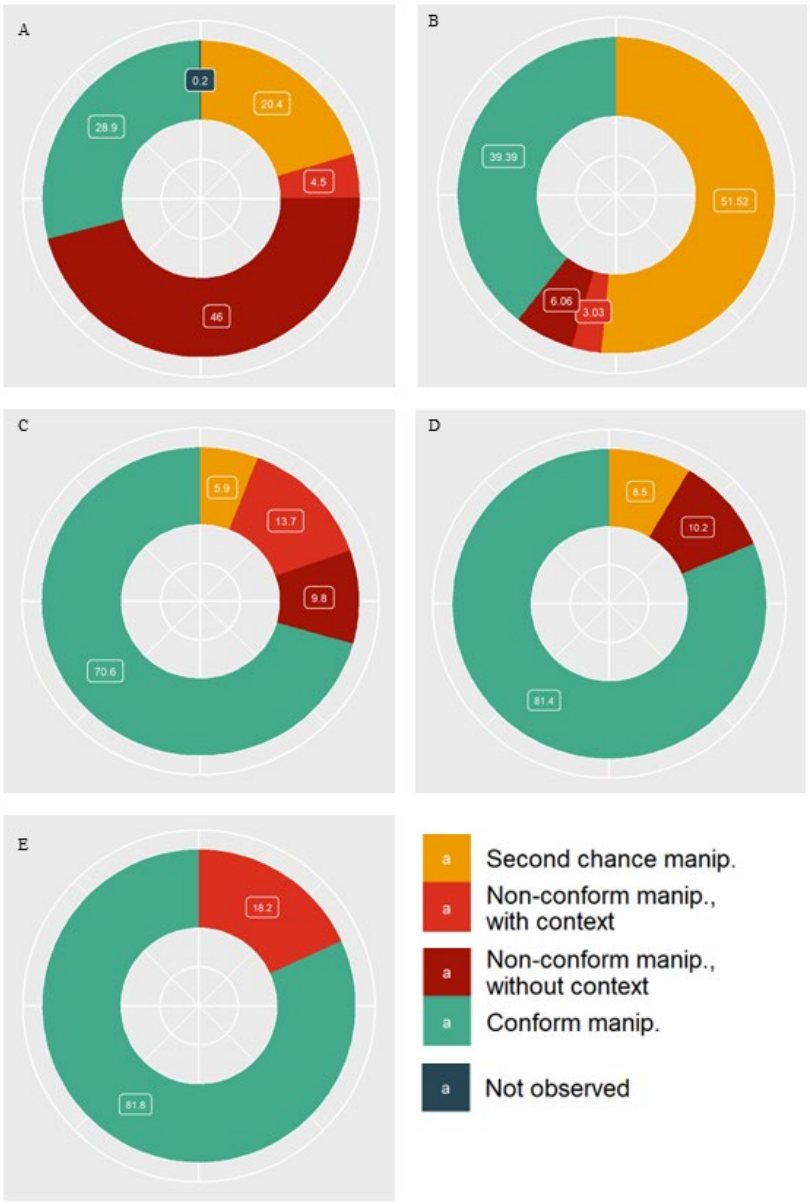

Figure 7. Conformity of the manipulations reported for sharks (A), small rays (B), large rays (C), sea turtles (D) and whale sharks (E) in the Best Practices forms in 2022 in the Atlantic Ocean.

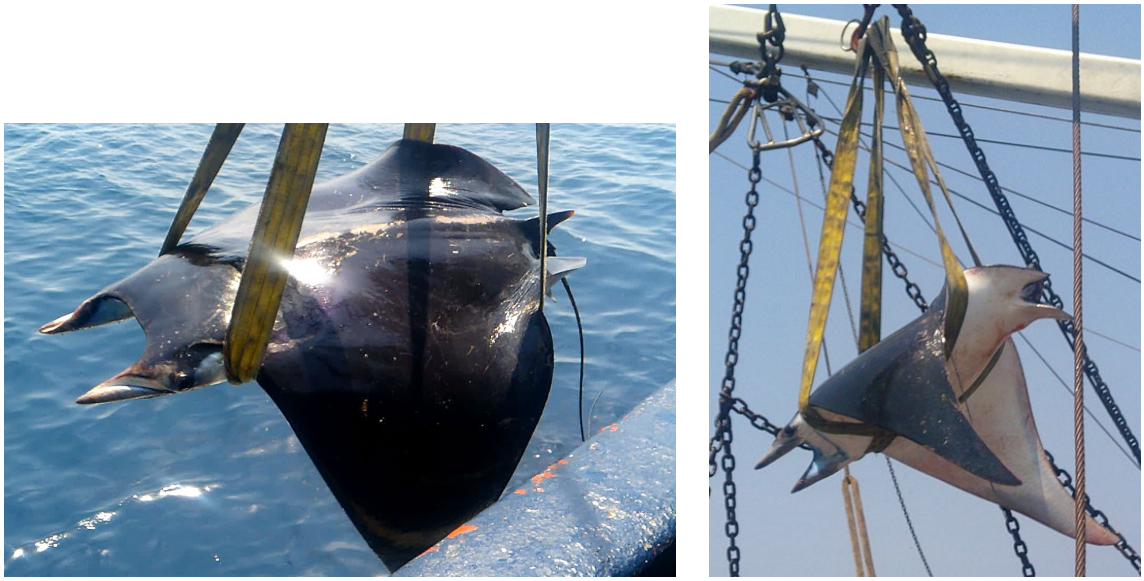

Figure 8. Flat straps for the safe release of large rays