



**Western and  
Central Pacific  
Fisheries  
Commission**

**SCIENTIFIC COMMITTEE  
TWENTIETH REGULAR SESSION**

Manila, Philippines  
14 – 21 August 2024

---

**New best handling and release practice guide for vulnerable bycatch tropical  
species in tropical tuna purse seiners**

---

**WCPFC-SC20-2024/EB-IP-20**

Murua, J., Ferarios, J.M., Grande, M., Ruiz1, J., Cuevas, N., Krug, I., Onandia, I., Zudaire, I.,  
Erauskin-Extramiana, M., Lopetegui-Eguren, L., Salgado, A., Santiago, J.

# **New best handling and release practice guide for vulnerable bycatch tropical species in tropical tuna purse seiners.**

Murua<sup>1</sup>, J., Ferarios<sup>1</sup>, J.M., Grande<sup>1</sup>, M., Ruiz<sup>1</sup>, J., Cuevas<sup>1</sup>, N., Krug<sup>1</sup>, I., Onandia<sup>1</sup>, I., Zudaire<sup>1</sup>, I., Erauskin-Extramiana<sup>1</sup>, M., Lopetegui-Eguren<sup>1</sup>, L., Salgado<sup>1</sup>, A., Santiago<sup>1</sup>, J.

<sup>1</sup>AZTI, Marine Research, Basque Research and Technology Alliance (BRTA), Basque Country, Spain.

## **Abstract**

Novel research has led to improvements in best handling and release practices (BHRP) for tuna purse seiners, some of which have not yet been incorporated in conservation measures of tuna regional fisheries management organization (tRFMO). The new tools and techniques are aimed at increasing crew safety and post-release survival rates of endangered, protected, and threatened (ETP) species, which can complement or improve existing recommended practices. Because most BHRP recommended by RMFOS are based on scientific work conducted a decade ago, we suggest updating BHRP by including these new bycatch release devices (BRDs) that include hoppers with ramps, shark velcros, lower deck gutters for sharks or sorting grids for mobulid rays. This equipment reduces direct contact between crew and dangerous species and simultaneously foments bycatch survival opportunities due to faster release times. Most described BDRs in the new guide are suitable for use in a variety of purse seiners, but larger devices might require specific vessel characteristics for their implementation (e.g., large free space on deck). Several fleets operating in all oceanic regions are actively participating in the refinement of BRD prototypes and employing them regularly during their commercial fishing operations. As BHRP evolve with new solutions and technologies, recommended guidelines should also be regularly updated to provide state-of-the-art bycatch mitigation advice to managers and industry.

**Keywords:** bycatch release device; best handling and release practices; vulnerable species; tuna purse seiner; elasmobranchs; post release survival; fishers; bycatch mitigation.

## **Introduction**

Marine megafauna such as sharks, rays, and sea turtles, have experienced marked global population declines in recent decades due to anthropogenic activities, particularly fishing (Dulvy et al., 2014; Oliver et al., 2014; Pacoureaux et al., 2021). K-strategy life histories characterised by slow growth, low fecundity and late maturation, makes these species especially susceptible to overfishing (Couturier et al., 2012; Croll et al., 2016; Stewart et al., 2018; Jorda et al., 2022). To prevent this negative trend mitigation steps

can be adopted before, during and after fishing operations (Hall and Roman, 2013; Booth et al., 2020). In mixed species fisheries, probably the most implementable of these mitigation actions is the application of best handling and release practices (BHRP) once bycatch species arrive on deck. Many fisheries, both artisanal and industrial, have guidelines on BHRP that describe methods to try to minimize bycatch mortality arriving on deck. To maximize post-release survival (PRS) rates a fast and smooth release operation ensuring minimum possible exposure to physiological stress on deck (e.g., air exposure, handling stress, etc.) (Madelman et al., 2022) is key. Release methods must be customized to the needs and characteristics of each type of vessel (e.g., purse seine, longline, trawling, etc.). In many cases fishers are assisted by bycatch release devices (BRDs) to increase safety and release success (Jenkins et al., 2013; Hammer et al., 2015; Poisson et al., 2016).

Several release practices, mostly manual, have long been established, but others are more recent or still under development to improve operational aspects. Bycatch mitigation operations are not static and new selective fishing technology and protocols are being designed and tested on a regular basis (Poisson et al., 2022; Murua et al., 2023a). Fishing gear technologists and scientists, frequently in cooperation with the fishing industry, undertake trials to test new solutions that can reduce bycatch mortality (Restrepo et al., 2018). For example, agencies such as the National Oceanographic and Atmospheric Administration (NOAA) have ongoing specific bycatch reduction engineering programs. Similarly, funders such as the EU have been actively supporting the development of bycatch mitigation technologies. It is paramount to update BHRPs guidelines that include scientifically proven latest advances so that the state-of-the-art solutions are being implemented. Given the critical status of some bycatch groups such as the elasmobranchs, postponing the adoption of practices that increase their survival, will affect the recovery of these endangered, threatened and protected (ETP) species.

The largest proportion of tropical tuna catches worldwide originate from a relatively small number of purse seine vessels (700 vessels; Justel-Rubio and Recio, 2023). Although tuna purse seiners show a lower bycatch to target catch ratio than most other tuna fisheries (e.g., Murua et al., 2021; Restrepo et al., 2024), some groups such as sharks, rays, and turtles can be accidentally caught (Amandé et al., 2010; Clavareau et al., 2020). Several of these ETP species such as marine mammals, sea turtles and whale sharks are mostly released from the net (e.g., do not arrive on deck), and in general, show very high levels of PRS (Hall and Roman, 2013; Escalle et al., 2015). However, sharks and mobulid rays exhibit a higher post-release mortality rate, even in sets where recommended manual release methods are applied (Poisson et al., 2014; Hutchinson et al., 2015; Stewart et al., 2018). A proportion of elasmobranchs arriving on deck, can be already dead or in a poor state due to suffocation in the sack due to prolonged lack of movement as they are obligate ram ventilators (Madelman et al., 2022). Best on deck practices can try to increase the survival of those individuals which are still alive during the brailing process, which usually are those found in the first brails. Problems like smaller juvenile sharks accidentally falling to the lower deck or problems to release large mobulids and sharks have been reported (Maufroy et al., 2020). These difficulties to handle large sharks and rays on deck are general across fleets or oceans as described by skippers from diverse regions (Murua et al., 2023a).

Poisson et al. (2012) produced one of the first key guides for BHRP with elasmobranchs in tropical tuna purse seiners which led to improved standards. This work summarized very well the actions to be prohibited (e.g., do not use gaffs, hooks, ropes, leaving animals on deck exposed to sun, etc.) and introduced some novel techniques such as the use of canvases/cargo nets to assist with on deck mobulid liberations. This work was a milestone in best release practices at the time, being a major reference document for all RFMOs with regards to BHRP recommendations adopted in the last decade.

Nevertheless, in the last ten years considerable research advances in BRD design and construction have taken place to assist with safe handling and release efficiency (Grande et al., 2019; Moreno et al., 2023; Murua et al., 2020, 2021 b,c, 2022, 2023 a,b,c). In this document we present a new BHRP guide for tropical tuna purse seiners that includes some of the BRDs that have been designed, tested, and adopted by several fleets in recent times. Such information can help industry and managers with their options to reduce post-release mortality of ETP species.

## **New Best Handling and Release Guidelines**

The best BHRP covered in the new manual are organized by different ETP groups, which include sharks, mobulid rays, turtles and whale sharks and large cetaceans. As mentioned before, past best practice guidelines mostly highlight the actions that should be avoided (i.e., the do not's) but offered few alternatives to deal with the problem of releasing those animals in a safe and fast way. For instance, with large sharks fishers often would tie a rope around the shark's caudal peduncle to extract it quickly and safely from the brail. However, this practice is not recommended as it may injure the tail of the animal. While this practice should be clearly prohibited, expecting crew to lift heavy and dangerous sharks embedded in a mass of tunas inside the brail is possibly irresponsible. Numerous reports of fishers sustaining severe injuries when trying to carry out this manual extraction from the brail have been documented over the years. Thus, alternative solutions need to be developed that are safe and quick to apply in this situation. In recent years, several prototypes of lifting aids with cushioning and a quick release velcro (named "Shark velcros") can be wrapped around the shark's caudal peduncle, instead of a rope, and represent a new method to extract them from the brail with no apparent injury. Although the sample size is still small, satellite tagged sharks released with "shark velcros" have shown 100% percent PRS so far.

Another release equipment which minimizes contact time between sharks and crew are release ramps which go from the brail resting location on deck, along the starboard, to the water. These ramps are inclined and effectively work as "water slides" in which bycatch species quickly move by gravity without manual assistance. The ramps prevent practices such as having to transport sharks by hand across the deck. They also result in lower stress for the sharks as there is no need to tightly hold them for so long. Animals move quickly and smoothly by sliding with their body fully rested on the ramp's base. The ramps are custom built (e.g., shape, size, and width) for best fit of individual vessel characteristics. Different ramp designs have been tested in fleets of the Atlantic, Pacific and Indian Oceans (Murua et al., 2023a). When constructing ramps practical aspects such as lightness, durability and storage should be considered. Ramps are simple to build, unexpensive, and can be easily implementable in almost any vessels.

Larger sized BRDs, such as hoppers with ramps, have also been tested on purse seiners. Hoppers with large enough trays to spread out brailer contents and spot bycatch, and with a door mechanism to stop non-target species from going to the lower deck are very effective for quick releases from the top deck (Murua et al., 2021b). Different hopper designs exist and their location on deck can vary (i.e., port side, centred over the loading hatch, starboard). These characteristics will be determined by the vessel's deck configuration and the skipper's preference. Hoppers can be to some extent scaled to the size of the working deck space and brail size of a vessel, but in some cases, it may be complicated to incorporate them to purse seiners with limited deck space. The addition of a ramp to the hopper helps with release operations, but also takes up space on the deck.

Some modern purse seiners are fitted with a gutter, or opening door, to release bycatch entering the lower deck. If releasing bycatch directly from the brailer (i.e., no hopper) it is complicated to spot bycatch hidden in between the large mass of tuna (e.g., brailer size 6-12 tonnes). Studies in vessels applying best manual handling practices in the upper deck and with a gutter in the lower deck have shown average PRS of 40% for silky sharks (Onandia et al., 2021), which approximately doubled that of vessels without gutters and no other BRDs. Most purse seiners with double conveyor belts and gutters had them fitted at vessel construction. Installation of gutters in already constructed vessels can be a problem due to safety permits and expensive. Purse seiners with a gutter in the lower deck still need to prioritize releasing as much bycatch as possible from the upper deck.

For mobulid rays the guide still maintains the don'ts (e.g., do not use hooks or punch holes) and previously described methods such as cargo nets or canvases to lift mobulid rays, but in addition the manual includes newer BRDs such as sorting grids. These grids are an improvement over previous techniques as mobulids do not require any more to be extracted by hand from from the brail as is the case with canvases and cargo nets (Murua et al., 2024). Currently, many vessels in different fleets are voluntarily adopting mobulid sorting grids which can be employed directly on the unloading hatch or on the hopper if needed. Release times are reduced with the grid, which is a critical factor directly correlated with post-release survival. Because fishers no longer need to manipulate manually the mobulids, which increases crew safety and avoids poor handling situations with mobulids (e.g., holding by gill slits, cephalic lobes). The construction of the sorting grids is simple and cheap, only requiring a metal frame and some ropes to form the grid. Versions of different shapes (e.g., square, circular) and designs (e.g., hinged at the middle for easier storage) have been successfully trialled.

For sea turtles, BHRP are included in the document, which consist primarily of already known manual techniques covered in prior best practice guides (e.g., Poisson et al., 2012). Because sea turtles are safe and easy to handle, they do not need special tools for release. In the guide fishers are reminded of basic handling mistakes, such as manipulating sea turtles by the flippers or resting them on deck with their ventral side up, to avoid. For whale sharks and large cetaceans, survival after release from the net with current techniques is very high (Escalle et al., 2016, 2019), so no new methods have been included in the guide. Most large individuals escape either by making a hole in the purse seine net in the case of whales or swimming over the net cork line in the case of whale sharks.

In the last section of the new guide, it includes some words of support for fishers, scientists, and managers to continue cooperating to improve BHRP practices that can contribute to the objective of sustainable fisheries.

## **Discussion**

In recent years substantial effort has gone into bycatch mitigation research in tropical tuna purse seine fisheries, particularly in BHRP once ETP species arrive on deck, and RFMO recommendations should seek to promote fisher tested and scientifically validated solutions in a timely manner. The objective of the new BHRP guide is to keep best practices proven to work in the past and incorporate novel BRDs that assist fishers with some of the most problematic release situations, especially with large sharks and mobulids. The intention of these guidelines is to provide current state-of-the-art release methods, but BHRP must be revised on a regular basis given the ongoing research by different fisheries technologist and scientific groups.

An important element of ETP bycatch mitigatory options researched in the last decade has focused on bycatch avoidance or release from the net (e.g., Restrepo et al., 2018), but trial success has been low because of the associated difficulties of bycatch avoidance protocols in multi-species FAD aggregations (i.e., mixed target and non-target species of different sizes). Nevertheless, from a hierarchical mitigation approach perspective this research should continue to be a priority, as the bycatch is still alive before the sacking up operation. Still, numerous participatory workshops with fleets worldwide have shown low acceptance by fishers for protocols that involve actions prior or during the set, as they are concerned that such activities can disturb tuna schools causing them to escape. Instead, fishers show a better disposition towards mitigatory actions on deck once the tuna have been caught (Murua et al., 2023d). Knowing this, scientific groups have been working on identifying weak points in bycatch handling and release protocols to develop solutions that can correct them.

Observer data clearly indicates that in the case of safe and easy to manipulate ETP species, such as sea turtles, fishers readily release them. Conversely, with large sharks arriving on deck, releases can be problematic and slow (i.e., until the animal becomes less active) or poor practices may be employed, such as the use of ropes to lift them by the caudal peduncle. From a fishers' perspective, the number one priority is often to bring onboard the tuna and store it in the wells as quickly as possible, because they risk the catch being unmarketable if there it reaches high histamine levels. This is critical to why BHRP with manual handling techniques are at times not applied. If fishers consider that bycatch release processes will considerably delay the tuna loading operation, even if it only a few minutes per haul, they are more likely resort to poor practices. Because large and dangerous species are the most difficult and time consuming to handle, the rate of poor practices tends to be higher (e.g., use of nooses, hooks, etc. to lift animals with the crane). If BHRPs developed are not practical and delay normal fishing operations, fishers and ship-owners are likely to be unsupportive of their implementation. On the contrary, release protocols that minimize risk for crew and speed up bycatch release process so that the tuna can be quickly stored is key for voluntary adoption.

The new guidelines integrate protocols and tools tested at sea in commercial fishing operations that can help reduce poor handling and release practices. Novel BRDs like the shark velcros to eliminate the use of nooses, release ramps to minimize shark contact time with crew members, or sorting grids to readily lift and release mobulids, are included. These three BRDs are inexpensive and adaptable to almost any purse seiner's deck configuration. Other larger and more complex BRDs such as hoppers with ramps and lower deck gutters with double conveyor belts are also shown in the guide, as both have proven to significantly increase PRS in sharks. These BRDs may not be implementable in all vessels and need to be considered case by case. In the future, the inclusion of these BRDs in newly constructed vessels would be highly advisable, as their full integration with the rest of the fishing equipment onboard would be much simpler and efficient.

We encourage fishers to continue their involvement in the design and trial process of the BRDs that will go on their vessels, so that the new equipment can be customized to their needs. Importantly, exchanges between fishers and scientists through workshops or other means (e.g. ISSF skippers' workshops, Code of Good Practice workshops, vessel visits with BRD research projects), can help inform industry about trial results across different vessels and fleets to raise awareness and acceptance of these new protocols. We also would like to request ship-owners to consider introducing BRDs in their vessels as they will minimize crew injury chances, limit risk of non-compliances and fines due to poor practices and increase the sustainability of their fishing operations. For example, BRDs can help fishing companies in FIPs or eco-certification programs to achieve their objectives of reducing their impact on ETP species (e.g., Principle 2 in Marine

Stewardship Council standards). Finally, the voluntary adoption of BRDs by many purse seine companies has greatly advanced in the last three years, but the support of RMFOs, for example through inclusion of these specific tools in their handling and release conservation measures, would accelerate their implementation.

## Acknowledgements

Special thanks to all tuna purse seine fishers, companies, and associations (OPAGAC, ANABAC, TUNACONS, ATUNEC, ATA) taking part in trials with BRDs. Development and testing of BRDs have been financed by several projects from Next Generation Funds from the European Union, Eusko Jaurlaritza, Secretaría General de Pesca, NOAA, IATTC and ISSF.

## References

- Amandè, M. J., Ariz, J., Chassot, E., Chavance, P., Gaertner, D., Murua, H., Pianet, R., Ruiz, J., and Chavance, P. 2010. Bycatch of the European purse seine tuna fishery in the Atlantic Ocean for the 2003–2007 period. *Aquatic Living Resources* 23, 4, 353-362. DOI: 10.1051/alr/2011003
- Booth, H., Squires, D., and E. J. Milner-Gulland. 2020. The mitigation hierarchy for sharks: A risk-based framework for reconciling trade-offs between shark conservation and fisheries objectives. *Fish and Fisheries* 21, 2, 269-289. DOI: <https://doi.org/10.1111/faf.12429>.
- Clavareau L, Sabarros, P., Escalle, L., Bach, P., Abascal, F., Lopez, J., Murua, H., Pascual Alayon, P., Ramos, M., Ruiz, J. and Mérigot, B. 2020. Elasmobranch bycatch distributions and mortality: Insights from the European tropical tuna purse-seine fishery. *Global Ecology and Conservation* 24. e01211, ISSN 2351-9894, <https://doi.org/10.1016/j.gecco.2020.e01211>.
- Couturier, L. I. E., Marshall, A. D., Jaine, F. R. A., Kashiwagi, T., Pierce, S. J., Townsend, K. A., Weeks, S. J., Bennett, M. B. and Richardson, A. J. 2012. Biology, ecology, and conservation of the Mobulidae. *J. Fish. Biol.*, 80, 1075-1119. doi 10.1111/j.1095-8649.2012.03264.x
- Croll, D. A., Dewar, H., Dulvy, N. K., Fernando, D., Francis, M. P., Galván-Magaña, F., Hall, M., Heinrichs, S., Marshall, A., McCauley, D., Newton, K. M., Notarbartolo di Sciara, G., O'Malley, M., O'Sullivan, J., Poortvliet, M., Roman, M., Stevens, G., Tershy, B. R. and White, W. T. 2016.
- Dulvy, N. K., Fowler, S. L., Musick, J. A., Cavanagh, R. D., Kyne, P. M., Harrison, L. R., et al. 2014. Extinction risk and conservation of the world's sharks and rays. *eLife*. 3, e00590, <https://doi.org/10.7554/eLife.00590>.
- Escalle L, et al. 2015. Cetaceans and tuna purse seine fisheries in the Atlantic and Indian Oceans: interactions but few mortalities. *Mar Ecol-Prog Ser* 522:255-268, doi:10.3354/meps11149
- Grande, M., Murua, J., Ruiz, J., Ferarios, J. M., Murua, H., Krug, I., Arregui, I., Zudaire, I., Goñi, N. and Santiago, J. 2019. Bycatch mitigation actions on tropical tuna purse

seiners: Best practices program and bycatch releasing tools. IATTC 9 Meeting of the Working Group on Bycatch. San Diego, California.

Hall, M. and Roman, M. 2013. Bycatches and non-tuna catches in the tropical tuna purse seine fisheries of the world. FAO Fisheries and Aquaculture Technical Paper No. 568. Food and Agricultural Organization of the United Nations, Rome, Italy.

Hamer, D.J., Childerhouse, S.J., McKinlay, J.P., Double, M. C. and N.J. Gales. 2015. Two devices for mitigating odontocete bycatch and depredation at the hook in tropical pelagic longline fisheries, *ICES Journal of Marine Science*, 72, 5, 1691–1705, <https://doi.org/10.1093/icesjms/fsv013>

Hutchinson, M. R.; Itano, D. G.; Muir, J. A.; Holland, K. N., 2015. Post-release survival of juvenile silky sharks captured in a tropical tuna purse seine fishery. *Mar. Ecol.-Prog. Ser.*, 521,143-154.

Jenkins, L. and Garrison, K. 2013. Fishing gear substitution to reduce bycatch and habitat impacts: An example of social–ecological research to inform policy. *Marine Policy* 38, 293-303. DOI: 10.1016/j.marpol.2012.06.005.

Juan-Jordá, M.J. et al. 2022. Seventy years of tunas, billfishes, and sharks as sentinels of global ocean health. *Science* 378, eabj0211(2022). DOI:10.1126/science.abj0211.

Justel-Rubio, A. and Recio, L. 2023. A Snapshot of the Large-Scale Tropical Tuna Purse Seine Fishing Fleets as of June 2023 (Version 11). ISSF Technical Report 2023-04. International Seafood Sustainability Foundation, Pittsburgh, PA, USA.

*Mandelman, J.W., Kneebone, J.R., Morgan, A., Murua, J., Jones, E. 2022. “Strategies to Reduce Fisheries Bycatch Mortality in Chondrichthyans”. Biology of Sharks and Their Relatives Third Edition, edited by Carrier, J. C., Simpfendorfer, C. A., Heithaus, M. R., & Yopak, K. E. CRC Press, 2022.*

Maufroy, A., Gamon, A., Vernet, A.-L., & Goujon, M. 2020. 8 years of Best Practices onboard French and associated flags tropical tuna purse seiners: an overview in the Atlantic and Indian ocean. IOTC-202-WPEB16-11, p.19.

Moreno, M, Cronin, M., Murua, J., Murua, H., Ferarios, J.M., Onandia, I., Lezama-Ochoa, N., Swimmer, Y., and Restrepo, V. 2023. Progress in addressing key research to inform Mobulid ray conservation in the Pacific Ocean. Scientific Committee 19th Regular Session. Koror, Palau16 – 24 August 2023, WCPFC-SC19-2023/EB-IP-09.

Murua, H., Dagorn, L., Justel-Rubio, A., Moreno, G. and Restrepo, V. 2021a. Questions and Answers about FADs and Bycatch (Version 3). ISSF Technical Report 2021-11. International Seafood Sustainability Foundation, Washington, D.C., USA.

Murua, J., Grande, M., Ferarios, J.M., Lezama-Ochoa, N., Martinez, U., Onandia, I., and Santiago, J. 2020. Improving Mobulid release methods and survival estimates in purse seiners in the Atlantic Ocean. ICCAT, SCRS/2020/053

Murua, J., Grande, M., Onandia, M., and Santiago, J. 2021b. Improving on deck best handling and release practices for sharks in tuna purse seiners using hopper with ramp devices. Seventeenth Regular Session of the Scientific Committee, WCPFC, SC17-EB-IP-13.

Murua, J., Ferarios, J.M., Grande, M., et al. 2021c. Developing solutions to increase survival rates of vulnerable bycatch species in tuna purse seine FAD fisheries. In: IOTC - 2nd ad hoc Working Group on FADs. IOTC-2021-WGFAD02-11\_rev1, Online.



Murua, J., Ferarios, J.M., Grande, M., Onandia, I., Moreno, G., Murua, H., Santiago, J. 2022. Developing bycatch release devices in tropical tuna purse seine fisheries to improve elasmobranch release. SCRS/2022/108. Collecto. Vol. Sci. Pap. ICCAT, 79(5): 212-228.

Murua, J., Ferarios, J.M., Moreno, G., Grande, M., Murua, H. 2023a. ISSF Workshop on Deck Bycatch Reduction Devices (BRDs) for Vulnerable Species in Tropical Tuna Purse Seiners. ISSF Technical Report 2023-11A, International Seafood Sustainability Foundation, Pittsburgh, PA, USA

Murua, J., Ferarios, J.M., Lopez, J., Moreno, G., Roman, M., Grande, M., Murua, H., Hutchinson, M., Altamirano, E., Restrepo, V., Santiago, J. 2023b: Testing bycatch release devices for vulnerable elasmobranch species in tropical tuna purse seiners. Document EB-01-INF-B. IATTC Working Group on Ecosystems and Bycatch 1<sup>st</sup> Meeting, La Jolla, California (USA), 11-12 May 2023.

Oliver, S., M. Braccini, M., Newman, S. J., and E. S. Harvey. 2015. Global patterns in the bycatch of sharks and rays. *Marine Policy* 54, 86-97, DOI: <https://doi.org/10.1016/j.marpol.2014.12.017>

Onandia, I., Grande, M., Galaz, J.M., Uranga, J. Lezama-Ochoa, N., Murua, J., Ruiz, J., Arregui, I., Murua, H., Santiago, J. 2021. New assessment on accidentally captured silky shark post-release survival in the Indian Ocean tuna purse seine fishery. IOTC-2021-WPEB17(DP)13,1-10.

Murua, J, G. Moreno, L. Dagorn, D. Itano, M. Hall, H. Murua, and Restrepo, V. 2023d. Improving sustainable practices in tuna purse seine fish aggregating device (FAD) fisheries worldwide through continued collaboration with fishers. *Frontiers in Marine Science* 2023 Vol. 10. <https://doi.org/10.3389/fmars.2023.1074340>

Murua, J., Ferarios, J.M., Maitane, M., Cuevas, N., Moreno, G., Murua, H., Santiago, J. 2024. Selective sorting grids for improved best handling and release practices of large mobulid rays in the tropical tuna purse seiners. IATTC, Second Meeting of the Permanent Working Group on Ecosystems and Bycatch, 5-6 June 2024, La Jolla, USA.

Pacoureau, N., Rigby, C. L., Kyne, P. M., Sherley, R. B., Winker, H., Carlson J. K., et al. 2021. Half a century of global decline in oceanic sharks and rays. *Nature*, 589, 7843, 567-571. DOI: [10.1038/s41586-020-03173-9](https://doi.org/10.1038/s41586-020-03173-9)

Poisson, F., Vernet, A. L., Séret B., Dagorn L., 2012. Good practices to reduce the mortality of sharks and rays caught incidentally by the tropical tuna purse seiners. EU FP7 project #210496 MADE, Deliverable 6.2, 30p.

Poisson, F., B. Séret, A.-L. Vernet, M. Goujon, and L. Dagorn. 2014. Collaborative research: Development of a manual on elasmobranch handling and release best practices in tropical tuna purse-seine fisheries. *Marine Policy* 44:312-320.

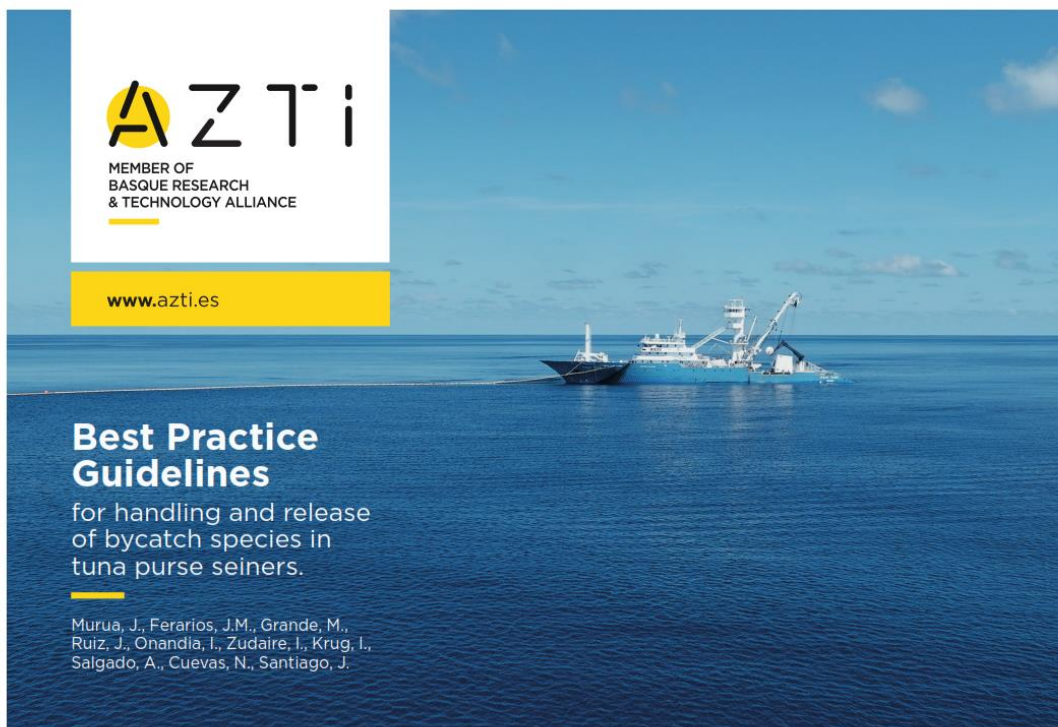
Poisson, F., Abascal, F., Ellis, J.R., et al. 2016. Technical mitigation measures for sharks and rays in fisheries for tuna and tuna-like species: turning possibility into reality. *Aquatic Living Resources*, 29, 4, 402. DOI: <https://doi.org/10.1051/alr/2016030>.

Poisson, F., Budan, P., Coudray, S., Gilman, E., Kojima, T., Musyl, M., & Takagi, T. 2022. New technologies to improve bycatch mitigation in industrial tuna fisheries. *Fish and Fisheries*, 23, 545–563. <https://doi.org/10.1111/faf.12631>

Restrepo, V., H. Murua, A. Justel and H. Koehler. 2024. Tuna Fisheries' Impacts on Non-Tuna Species and Other Environmental Aspects: 2024 Summary. ISSF Technical Report 2024-03Rev. International Seafood Sustainability Foundation, Pittsburgh, PA, USA.

Stewart JD, Jaine FRA, Armstrong AJ, Armstrong AO, Bennett MB, Burgess KB, Couturier, LIE, Croll DA, Cronin MR, Deakos MH, Dudgeon CL, Fernando D, Froman N, Germanov ES, Hall MA, Hinojosa-Alvarez S, Hosegood JE, Kashiwagi T, Laglbauer, BJL, Lezama-Ochoa N, Marshall AD, McGregor F, Notarbartolo di Sciara G, Palacios, MD, Peel LR, Richardson AJ, Rubin RD, Townsend KA, Venables SK, Stevens GMW. 2018. Research Priorities to Support Effective Manta and Devil Ray Conservation. *Frontiers in Marine Science* 5 doi 10.3389/fmars.2018.00314.

**Annex I** – Best practice guidelines for handling and release of bycatch species in tropical tuna purse seiners.





# Best Practice Guidelines

for handling and release of bycatch species in tuna purse seiners.

Murua, J., Ferarios, J.M., Grande, M., Ruiz, J., Onandia, I., Zudaire, I., Krug, I., Salgado, A., Cuevas, N., Santiago, J.  
©AZTI

## Index

Introduction	5
Sharks	6
Sea turtles	14
Mobulids and rays	18
Whale sharks and large cetaceans	22
General Notes	27
Acknowledgements	29

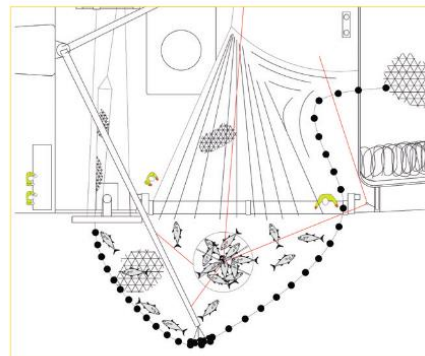
Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

## Introduction

Programs to improve tuna fisheries sustainability, such as the Code of Good Practices of OPAGAC and ANABAC, promote the development and implementation of more selective fishing operations. All fisheries generate some type of unwanted bycatch. The tropical tuna purse seine fishery, despite having a low percent of bycatch per ton of tuna (1-3%, ISSF, 2023), it has certain impact on megafauna species such as sharks and mobulids, both belonging to the elasmobranch family.

Elasmobranch populations are especially susceptible due to their biology such as late maturation and low rate of reproduction, complicating the recovery from fishery impacts. Increasingly more shark and mobulid populations are in a critical situation, therefore it is important to make an effort to reverse this tendency. The conservation measures adopted by the Regional Fisheries Management Organizations (RFMOs) are important to protect these vulnerable species.

This guide of best handling and release practices pretends to update the best options available at this time to maximize the survival of bycatch species accidentally captured, always having crew safety as the principal condition. Many

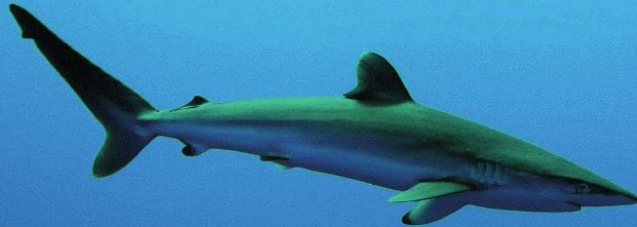


of the new release devices shown are the result of collaborations between fishers and scientists.

The guidelines will be renewed in the future as new solutions are developed to avoid the catch or facilitate a more efficient release of bycatch species.



## SHARKS



© Itano/ISSF

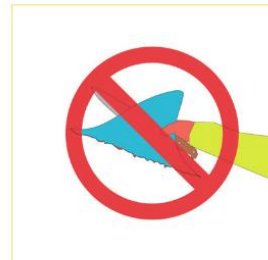
**Best practice Guidelines** for handling and release of bycatch species in tuna purse seiners

### Sharks

While the number of sharks incidentally caught by purse seiners is not significant when compared to the number of individuals caught by other gears, it can be reduced by applying suitable handling and release protocols.

The intentional retention of any shark is forbidden, being strict and inflexible regarding the practice of shark finning. All shark fins must be naturally attached to any unintentionally retained shark.

If any sharks are discovered when the catch is being hauled on board, and following RFMOs recommendations, they must be released from the deck or lower deck as quickly and carefully as possible (provided that they can be handled safely) to avoid harming the animals. The necessary precautions must always be taken to maintain crew safety during the release process of dangerous animals.



## Sharks

Particularly, manipulating sharks by the caudal peduncle and one fin (pectoral or dorsal) is suggested (Fig.1) and **avoid holding only from the caudal peduncle**, unless it is done with an adequate device such as a padded velcro (Fig.2) (if the RFMO allows it), **or by the gills**, to avoid physical harm to the animal, as well as dangerous reactions towards the crew.

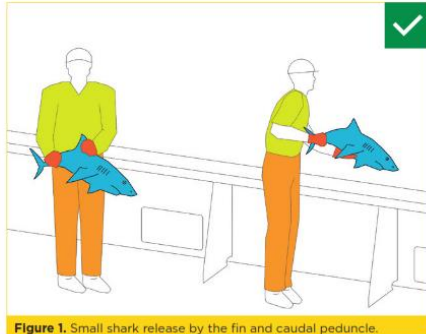


Figure 1. Small shark release by the fin and caudal peduncle.

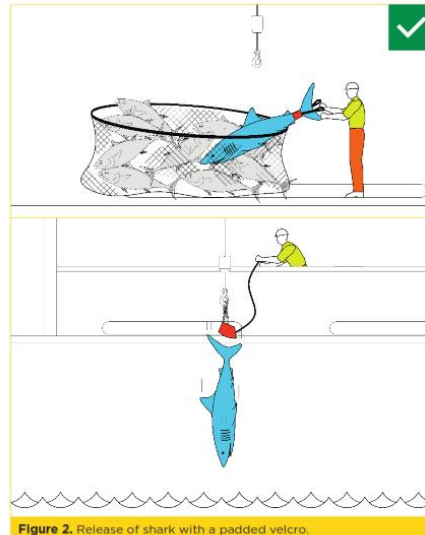


Figure 2. Release of shark with a padded velcro.

8

Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

## Sharks

Also, gaffs and nooses may not be employed (Fig. 3 and 4) to release sharks that appear on deck. If sharks are found inside the purse seine net, crew must attempt to get them out of the net using the brail employed to bring the catch on board, even if a certain amount of target fish (e.g., 2-3 tonnes) is lost.

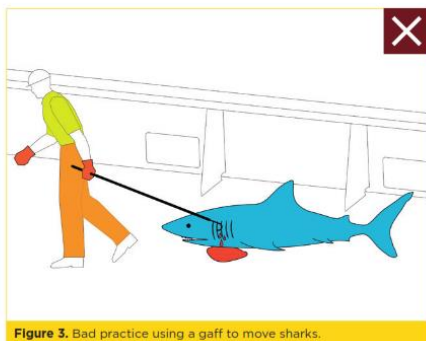


Figure 3. Bad practice using a gaff to move sharks.

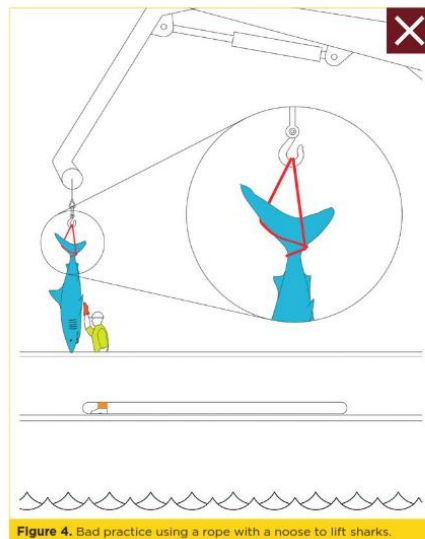
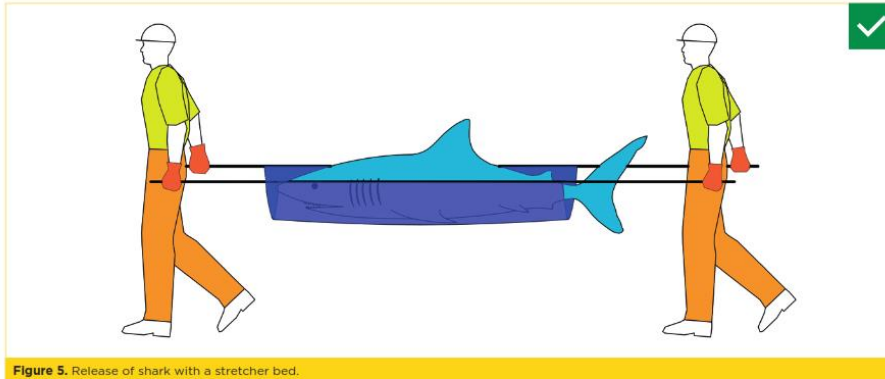


Figure 4. Bad practice using a rope with a noose to lift sharks.

9

**Sharks**



**Figure 5.** Release of shark with a stretcher bed.

Otherwise, use some cradle-like device, such as canvases or stretchers (**Fig. 5**) to avoid the possibility of injury. Likewise, if sharks cannot be released immediately from deck, it is recommended to keep the animals wet, in the shade and if possible, breathing freely, by introducing a water hose into the mouth for example. Vessels are **vessels should have a**

**net carrier, a stretcher or a canvas on board and/or similar equipment** alongside the rail so sharks found on deck can be handled more easily when detected on deck.

10

Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

**Sharks**



**Figure 6.** Ramp to release bycatch species.

The use of **selective devices on deck that facilitate releases and reduce direct contact with the crew, such as release ramps for sharks**, are recommended. (**Fig. 6**).

11

**Sharks**

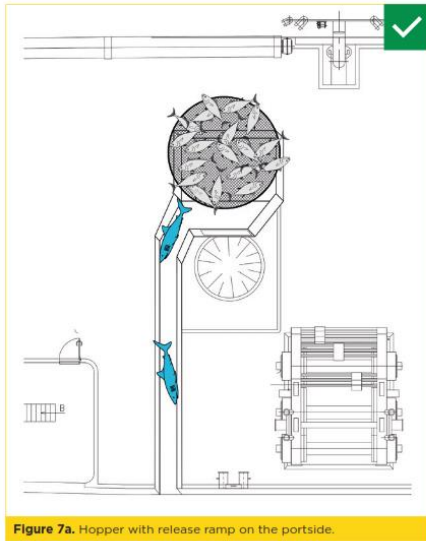


Figure 7a. Hopper with release ramp on the portside.

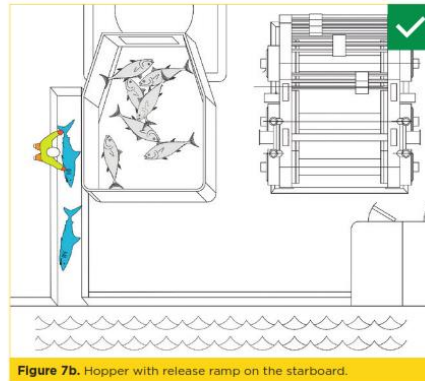


Figure 7b. Hopper with release ramp on the starboard.

Also, the **installation of hoppers (integrated, on portside, on starboard) with ramps is recommended in vessels with sufficient space on deck**, to maximize the fast and efficient release of sharks and other bycatch species from the upper deck, largely avoiding they end up in the lower deck (Fig. 7).

12

Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

**Sharks**

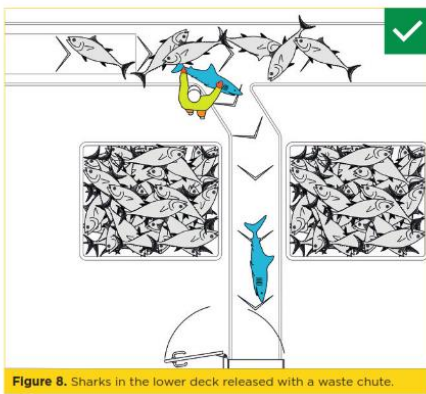


Figure 8. Sharks in the lower deck released with a waste chute.

Likewise, in vessels in which it is possible, **the installation of a waste chute is recommended (Fig. 8) in the lower deck**, where tuna is stored in well, to facilitate and expedite the best release of the animals that could not be released from the upper deck and accidentally fell into the lower deck, where the tuna is stored in the wells (Fig. 9).

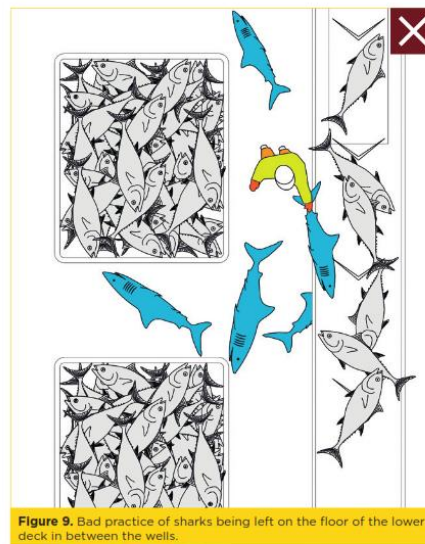


Figure 9. Bad practice of sharks being left on the floor of the lower deck in between the wells.

13



## SEA TURTLES



Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

### Sea turtles

Following the recommendations of the 4 RFMOs on sea turtles, despite the fact that interactions with sea turtles are unusual, crew must attempt by all means to release every turtle caught in FADs or in the purse seine net.

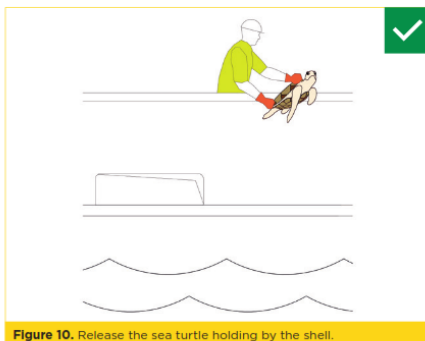
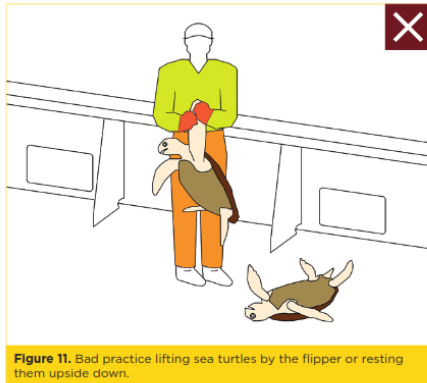


Figure 10. Release the sea turtle holding by the shell.

**If a caught sea turtle is found in the net, the net hauling operation must be stopped immediately so that the animal does not accidentally go through the power-block.** As soon as possible, the crew must release all turtles they find inside the net, trying to prevent any injury. If an animal is accidentally injured in any way during the operation, it must be kept on board in a wet, cool place, and it must completely recover before it is released. If the turtle is carrying any plastic items or bits of net on it, or if it has any longline hooks embedded, the foreign items must be removed and/or disentangled, even if these materials do not originate from the vessel. Likewise, **if crew find a trapped sea turtle when visiting a FAD, they must unravel the sea turtle and release it** using the same procedures. To handle a sea turtle, crew must hold the animal by the shell but avoiding just the head area, to protect from catching their hands if the sea turtle should retract its head in (Fig. 10).





**Figure 11.** Bad practice lifting sea turtles by the flipper or resting them upside down.

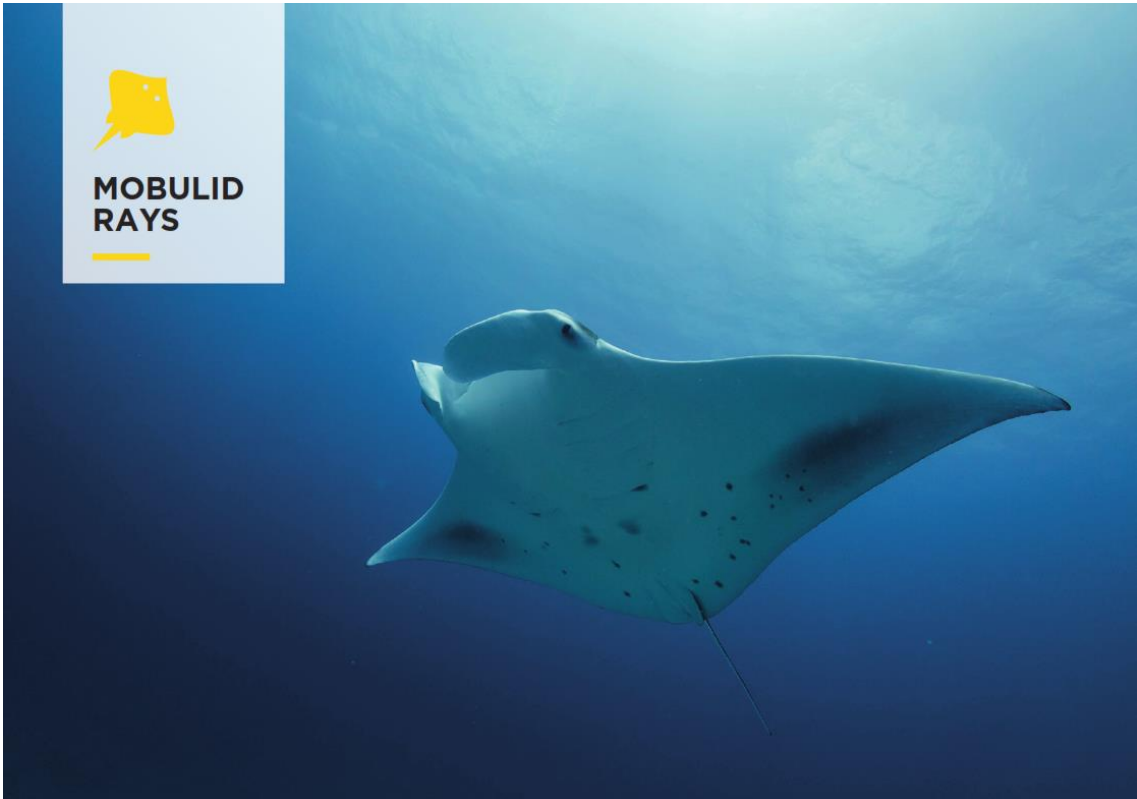
It is important not to hold the animal by its flippers, because turtles' flippers are sensitive and could be dislocated (Fig. 11). If a sea turtle appears not to respond to stimuli or is inactive, it is recommended, if necessary, to place it in the resuscitation position to help it recover more easily. To place a turtle in the resuscitation position, crew must lift the animal by its rear legs about 15 cm, with its head pointing

downwards, and place something beneath it to maintain the sea turtle in this position (e.g., tyre, coiled rope). The crew must wet the sea turtle from time to time and keep it out of direct sunlight. If these practices are followed the mortality of sea turtles in purse seine fisheries is practically null.





## MOBULID RAYS



Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

### Mobulid rays

Although very few skates and rays are involved in purse seine sets, very simple and safe protocols are in place for their release, in line with RFMO recommendations. This procedure is based on trying to get the animal out of the purse seine either using the brail employed to bring the catch on board, even if a certain amount of (2-3 tonnes) is lost or using some cradle-like device or specific equipment like canvases or sorting grids, to minimise any possible injury. If the animal is not detected or cannot be released before it is brought on board, it must be released from the deck. The use of gaffs, hooks, or ropes to lift the mobulid rays by the gills or wings is prohibited (Fig. 12).

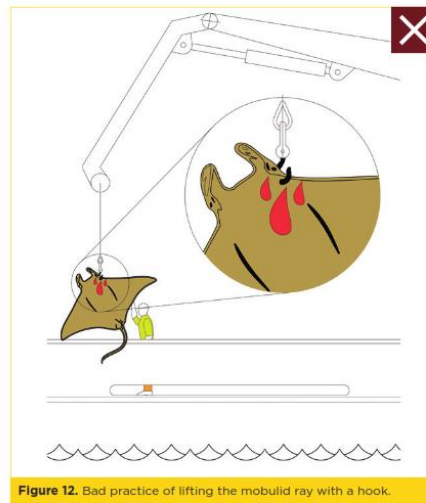
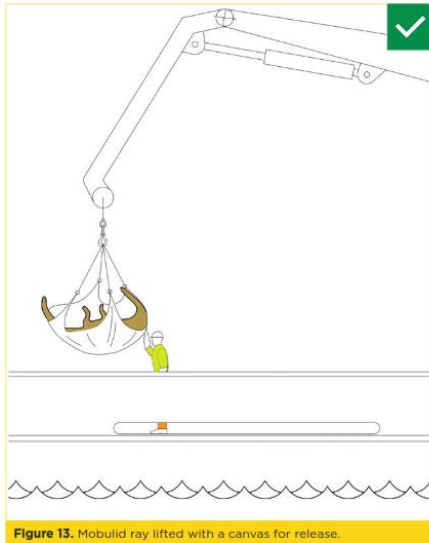


Figure 12. Bad practice of lifting the mobulid ray with a hook.

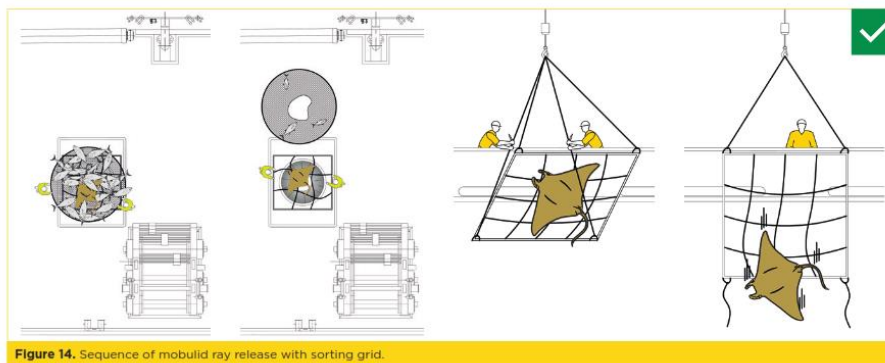
**Mobulid rays**



**Figure 13.** Mobulid ray lifted with a canvas for release.

It is **recommended to have onboard nets, tarps and/or similar equipment alongside the brail (Fig. 13)**, for handling large mobulid rays more easily when they are found on deck, and to release them with the aid of the crane.

**Mobulid rays**



**Figure 14.** Sequence of mobulid ray release with sorting grid.

Also, new methods like sorting grids with wide spaces, which are placed over the unloading hatch or hopper and allow fish to be unloaded while the ray stays on top to be lifted for release with the crane, accelerating the process and preventing direct contact with fishers (Fig. 14). If on the other hand stakes or rays are released by hand, it is recommended that crew avoid handling the animal by its tail,

gills, or the cephalic lobes, to prevent injury and dangerous reactions. It is particularly recommended that crew avoid handling the rear part of stingrays, as many have a poisonous spike at the end of their tail. It is therefore preferable to handle these animals from the front, holding them from the pectoral fins.



## WHALE SHARKS AND LARGE CETACEANS

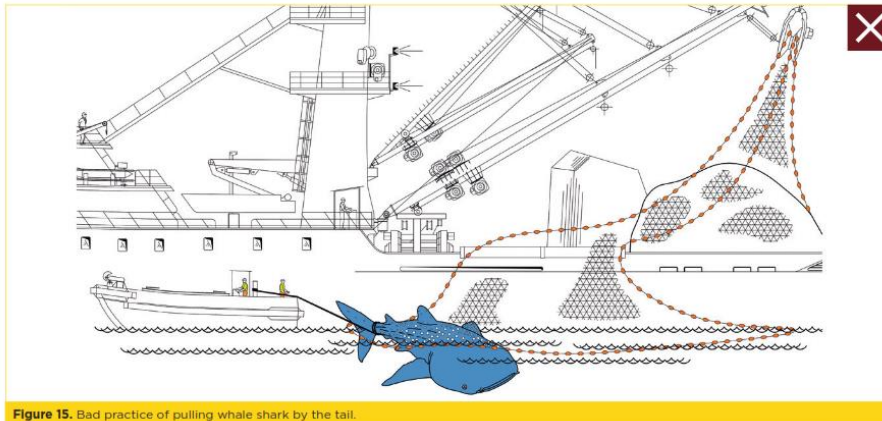


Best practice Guidelines for handling and release of bycatch species in tuna purse seiners

### Whale sharks and large cetaceans

Some RFMOs have implemented measures prohibiting fishing practices that intentionally target setting on whale sharks (*Rhincodon typus*). However, these animals may end up in the net unintentionally because they often swim well below the surface, making it difficult for fishers to detect them before setting the net. Although, the whale shark release manoeuvre is complex, crew must take all precautions to avoid injuring the animal. In the same way, cetacean bycatches are regulated by EU, some RFMOs and bilateral agreements for intentional sets on these species' groups. The interaction with cetaceans, principally baleen whales, is rare and non-intentional. Mainly, these rare interactions occur with large cetaceans (e.g., humpback whale; *Megaptera novaeangliae*) which generally escape the net before its closure or by breaking the net.

**Whale sharks and large cetaceans**

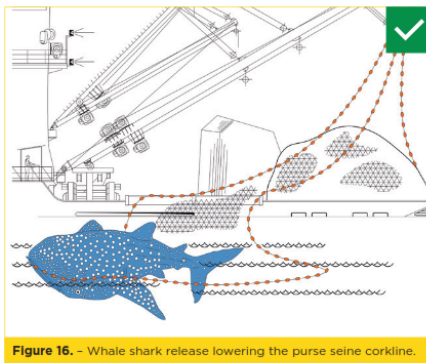


**Figure 15.** Bad practice of pulling whale shark by the tail.

Following recommendations established, with the objective of minimizing impacts on accidentally trapped individuals, and despite the inherent difficulty of the release manoeuvre, if a whale shark or a whale is found in the purse seine, the crew must take all actions to prevent damage

to the animal. The crew should haul the net carefully to isolate the animal in a small area of the bunt. **The use of ropes to pull the animal by the tail to move it out of the net is prohibited (Fig. 15).**

**Whale sharks and large cetaceans**



**Figure 16.** - Whale shark release lowering the purse seine corkline.

If a whale shark or a whale is found in the purse seine, the crew must take all actions to prevent damage to the animal. The crew should haul the net carefully to isolate the animal in a small area of the bunt. After this, crew may take the following measures, depending on the sea conditions and the animal's behaviour. At all times crew safety must be guaranteed.

When the animal is floating on the surface fishers must gradually haul the net to bring the animal towards the closest cork line. The net must always be pulled in a direction from the animal's tail toward its head, along its belly, attempting to make the fish move towards the cork line. If the animal is small (2 metres long or less), it may be released carefully using the brail. **If the animal is bigger, release over the corkline to facilitate the escape, by partially sinking the cork line** and wait for the animal to freely swim out of the net (Fig. 16). The catch may be brought on board only after the animal has been released from the net.



## General notes

Regardless of the circumstances occurred and the measures adopted for the release of these animals, the crew will verify that their behaviour is normal and will record the operation in the logbook.

It is recommended to collaborate in trials with new bycatch release devices designed to facilitate safer handling and increased vulnerable bycatch species survival, including tagging initiatives to assess survival after release.

The collaboration between fishers and scientists to co-develop more efficient measures to limit the mortality of vulnerable species will result in better solutions that will be approved by the fleet. It is important to highlight that fishers are the first ones interested in reducing interactions with species like sharks, sea turtles or mobulid rays. It is also critical that ship-owners invest resources into bycatch release devices to increase crew safety and survival of protected species in their purse seiners, to support sustainable fishing, which currently is in demand by consumers and markets.

## Acknowledgements

This guide has been financed by the Recovery, Transformation and Resilience Plan through Next Generation of the European Union. Other organisms such as the Fishing Department of the Basque Country, the Spanish General Fishing Secretariat, and the International Seafood Sustainability Foundation (ISSF) have collaborated supporting the development of the bycatch release devices. Special thanks to the OPAGAC and ANABAC fleets for participating in experiments with release devices at sea.

### Financed by:



### Supported by:



### Acknowledgements:



**SUSTAINABLE  
DEVELOPMENT  
GOALS**



**Conserve and sustainably use the oceans, seas and marine resources is the responsibility of all of us.**

---

