Photo: Fabien Forget

Skippers' Guidebook to Sustainable Purse Seine Fishing Practices

Fourth Edition | December 2025

An International Seafood Sustainability Foundation (ISSF) Publication
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ISSF INTERNATIONAL SEAFOOD SUSTAINABILITY FOUNDATION

Contents

Chapter 1: **Sustainable Purse Seine Tuna Fisheries**

INTRODUCTION

Welcome to the International Seafood Sustainability Foundation's guide to best practices in purse-seine tuna fishing. Our goal is to share the state of the art in responsible and sustainable fishing operations, review vessels' reporting requirements and other obligations to Regional Fisheries Management Organizations (RFMOs), and inform participants about the related ISSF Conservation Measures for the management of tuna and its larger marine ecosystem.

About ISSF

The International Seafood Sustainability Foundation (ISSF) — a global coalition of seafood companies, fisheries experts, scientific and environmental organizations, and the vessel community — promotes science-based initiatives for long-term tuna conservation, FAD management, bycatch mitigation, marine ecosystem health, capacity management, and illegal fishing prevention. Helping global tuna fisheries meet and maintain sustainability criteria to achieve the Marine Stewardship Council certification standard is ISSF's ultimate objective.

CHAPTER OBJECTIVES

1. **Introduce ISSF's mission and approach**
2. **Provide examples of ISSF's ongoing activities and outreach**
3. **Provide information about ISSF's Participating Companies**

ISSF APPROACHES TO IMPROVING TUNA SUSTAINABILITY

ISSF is a science-driven organization focused on the continuous improvement of global tuna fishery sustainability. We seek to achieve this by:

- Advancing tuna fisheries science
- Implementing direct industry improvements

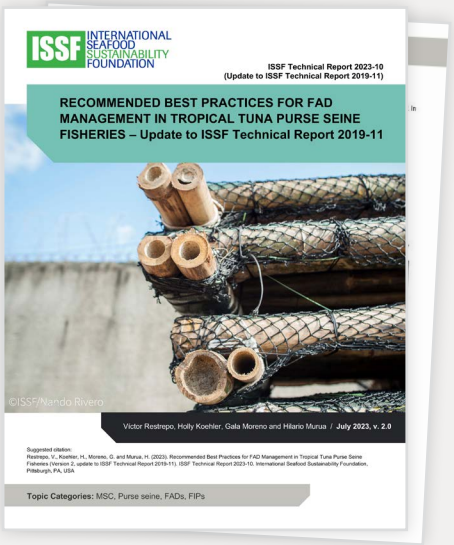
ISSF's mission is to undertake and facilitate science-based initiatives to continuously improve the sustainability of global tuna fisheries and the health of the ecosystems that support them.

- Providing scientific guidance and tools
- Working with, and advocating to, RFMOs
- Partnering with supportive organizations and experts

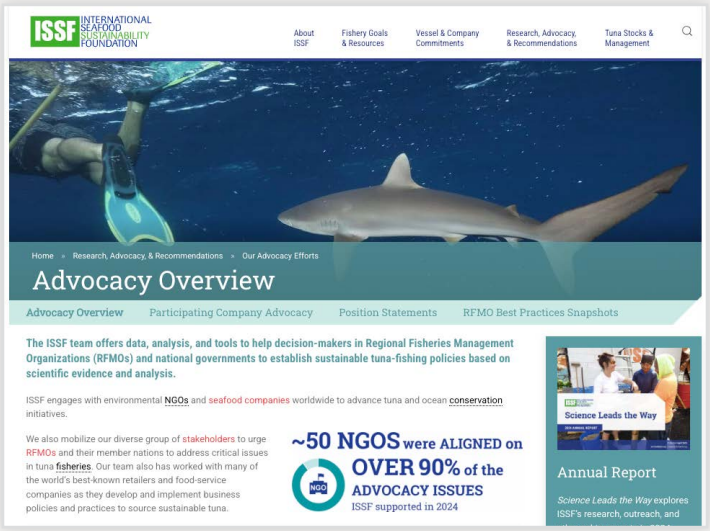
Further, it's important to note:

- ISSF advocacy to RFMOs is grounded in what the best current science requires.
- Simultaneously, ISSF continuously works to improve the science.
- The intended result of our efforts is the adoption and implementation of science-based management measures by industry and RFMOs.
- We recognize that comprehensive and sustainable management requires continuous improvement.

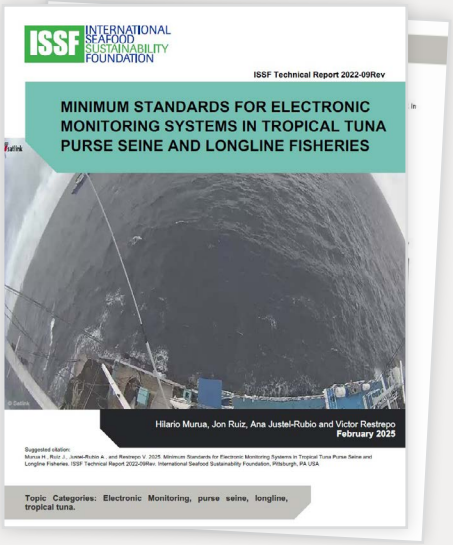
Gallery 1.1



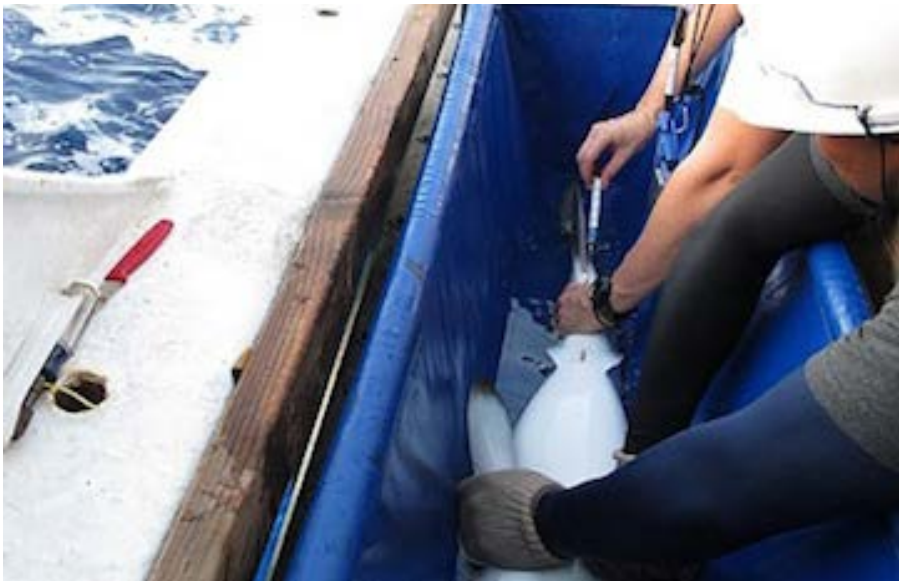
[ISSF Technical Report 2023-10: Recommended Best Practices for FAD Management in Tropical Tuna Purse Seine Fisheries]



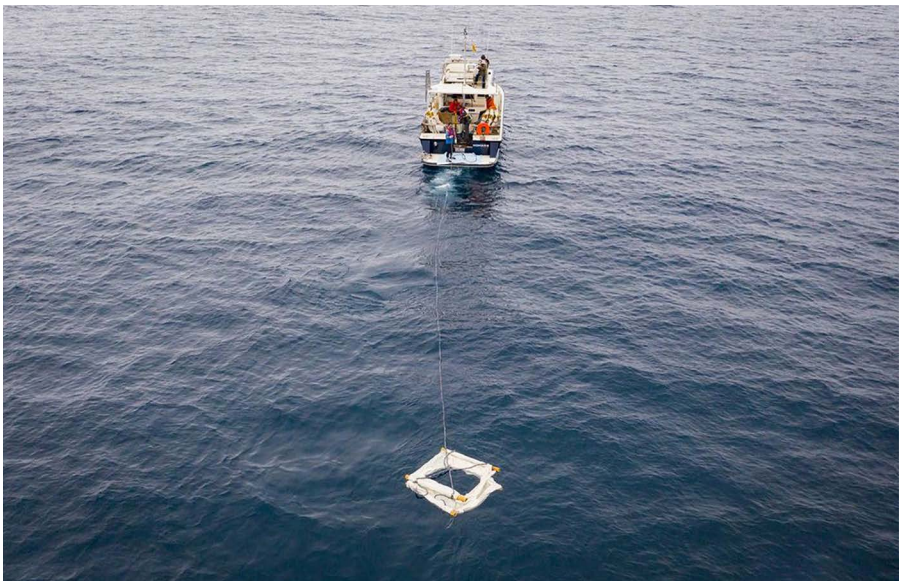
[“Advocacy Overview” webpage]



[Electronic Monitoring Standards developed based on ISSF-sponsored electronic monitoring trials]



Shark tagging on board an ISSF bycatch research cruise



Images from ISSF field research to improve fishing methods and test non-entangling and biodegradable FADs

Photo: Gala Moreno (ISSF)

A skippers workshop where ideas about sustainable fishing techniques are shared between scientists and fishers

ISSF ACTIVITIES

ISSF conducts educational and advocacy activities; funds major research on fisheries to reduce ecosystem impacts, including the reduction of non-targeted species catch and marine pollution through the development of non-entangling biodegradable FADs; and uses direct-market action by its Participating Companies.

Gallery 1.2

ISSF-sponsored scientist observing fish behavior during a bycatch research cruise in the Indian Ocean

Photo: Fabien Forget (ISSF)

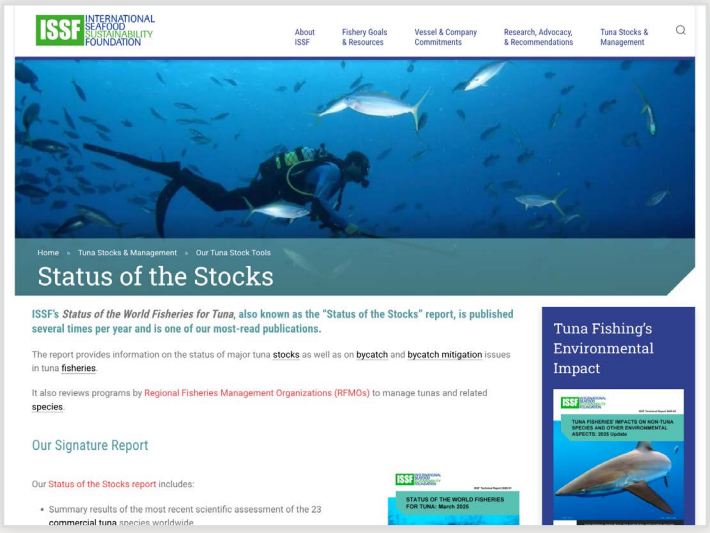
ISSF-sponsored scientist tagging a tuna during a bycatch research cruise in the Western Pacific Ocean

ISSF skippers workshops, where scientists and fishers share ideas to improve the sustainability of tuna purse seine and longline fisheries

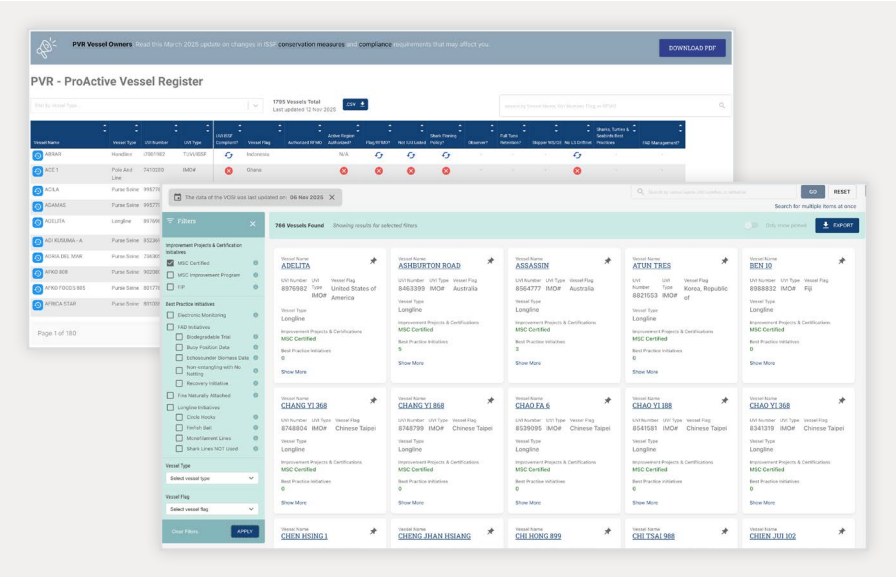
Advocating for science-based conservation and management of the tuna stocks and their ecosystems at the meetings of the tuna RFMOs

Photo: Hilario Murua (ISSF)

Sponsoring, in addition to skippers workshops, symposiums for scientists and fisheries managers to share information on fisheries and bycatch research



Publishing a regularly updated "Status of the Stocks" report, with information on stock status including abundance and fishing mortality for every major tuna population



Working with the tuna industry to encourage the adoption of best fishing practices by tuna fleets through the ISSF ProActive Vessel Register (PVR) and the ISSF Vessels in Other Sustainability Initiatives (VOSI) tool

ISSF PROACTIVE VESSEL REGISTER (PVR)

The ProActive Vessel Register, or PVR, is one of the public vessel lists that ISSF provides to foster transparency in tuna fishing. This list connects responsible fishers and seafood companies. Fishing vessels can register on the PVR to show how they are following practices that support sustainable tuna fisheries.

The PVR tracks detailed vessel information, including with respect to certain fishing activities as well as compliance with ISSF Conservation Measures. MRAG Americas, a third-party independent auditor, audits all vessels that join the PVR.

Purse-seine vessels that register on the PVR also need to ensure that their skippers complete one of the following:

- Review this purse-seine skippers guidebook, which is available as a downloadable PDF (multiple languages) or online (English only) at issfguidebooks.org. The guidebooks contain information on bycatch handling and mitigation, non-entangling and biodegradable FADs, mitigating tuna purse seine fishing's ecosystem impacts, RFMO requirements, and other useful information about fishing sustainably **OR**

- Attend an in-person and/or online ISSF skippers workshop on sustainable fishing practices **OR**
- Attend an in-person skippers workshop conducted by a trainer that has been accredited by ISSF to conduct these workshops **OR**
- View an ISSF skippers workshop video online

ISSF Skippers Workshop Videos

Explore our playlist on YouTube

If you skipper a purse-seine vessel on the PVR, ISSF's PVR list webpage lists the actions that the vessel has committed to undertake as part of joining the PVR.

These actions, known as ISSF Conservation Measures, are detailed in the following section.

ISSF VESSELS IN OTHER SUSTAINABILITY INITIATIVES (VOSI)

Vessels in Other Sustainability Initiatives (VOSI) is a transparency tool for the public, including seafood companies, that want to understand which tuna vessels have made public voluntary commitments to more sustainable fishing beyond the commitments reflected on the PVR.

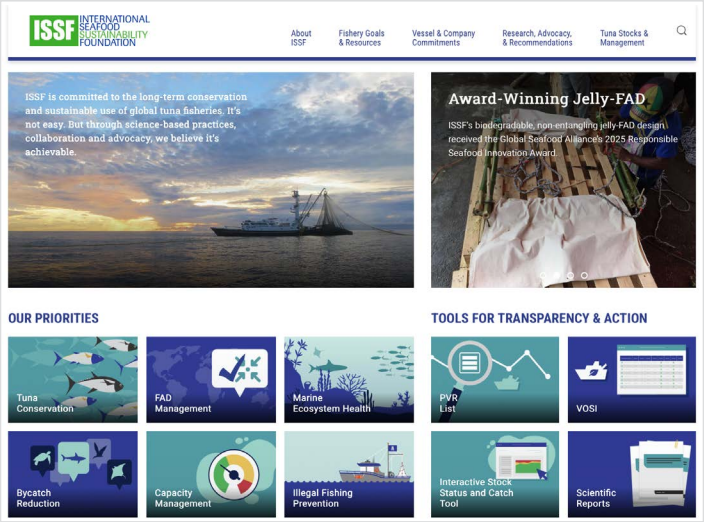
For example, the VOSI is the only publicly available tool identifying tuna fishing vessels that are part of a Fishery Improvement Project or fishing in an MSC-certified fishery. Information about other voluntary efforts by fishing vessels — such as having Electronic Monitoring Systems (EMS) that meet ISSF minimum standards, participation in biodegradable and fully non-entangling FAD trials or FAD recovery programs, and provision of FAD position and biomass data — are also displayed.

VOSI is a tuna-sourcing tool for seafood companies. ISSF invites vessels to learn more about VOSI. Information about eligibility and the application process is available on the ISSF site.

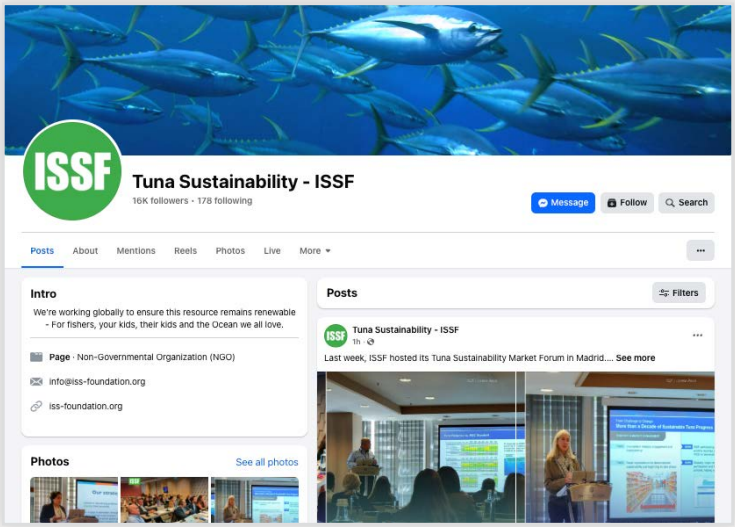
OTHER ISSF PUBLIC VESSEL LISTS

- **Record of Large-Scale Purse Seine Vessels (LSPSR):** The LSPSR lists all large-scale purse-seine vessels fishing for tuna that are compliant with ISSF capacity conservation measures. This consolidated global view of the large-scale purse-seine fleet supports both ISSF and RFMO efforts to prevent overfishing.
- **Tuna Vessel IMOs and Other UVI Numbers (IMO/UVI):** This comprehensive list shows tuna vessels with either International Maritime Organization (IMO) or other Unique Vessel Identifier (UVI) numbers. IMO and UVI numbers help to reduce illegal fishing activities.

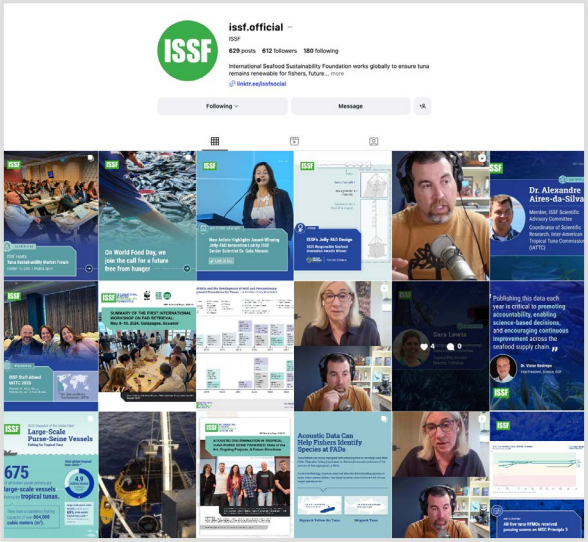
Gallery 1.3



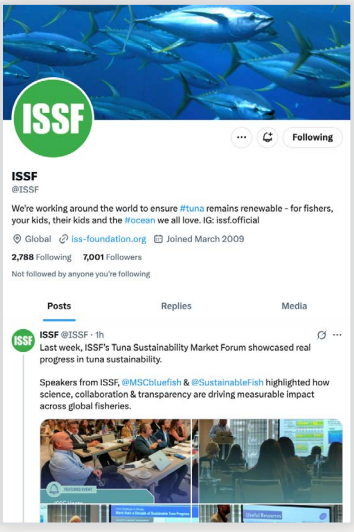
ISSF website: iss-foundation.org



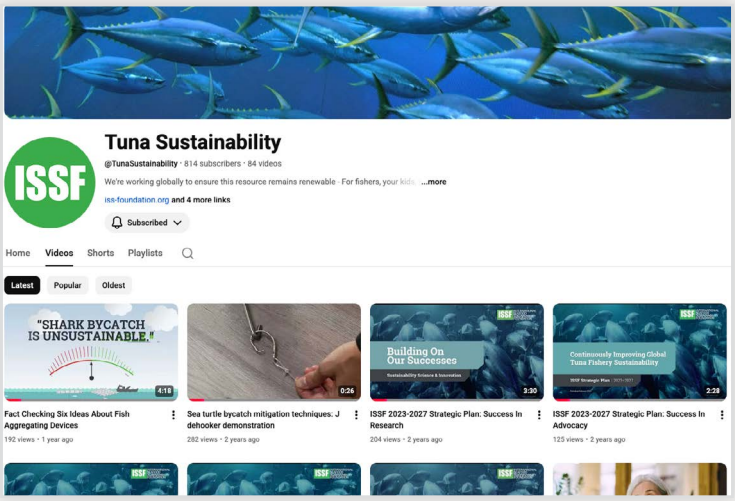
ISSF Facebook page:
facebook.com/TunaSustainability



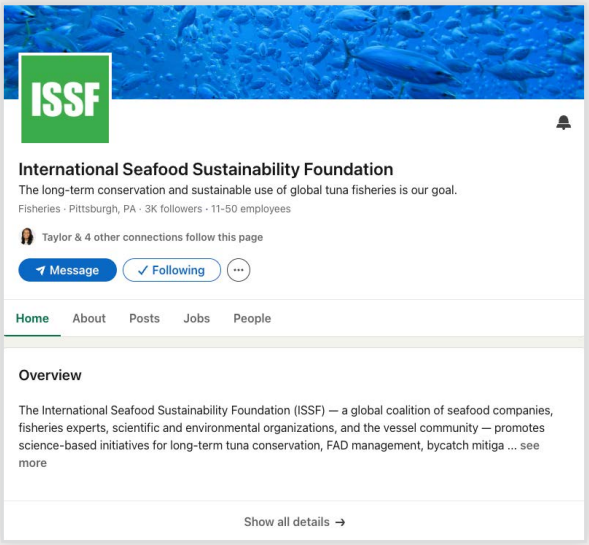
ISSF Instagram page:
instagram.com/issf.official



ISSF X page:
x.com/issf



ISSF YouTube page: youtube.com/user/TunaSustainability



ISSF LinkedIn Page: linkedIn.com/company/International-Seafood-Sustainability-Foundation

ISSF PARTICIPATING COMPANIES

ISSF Participating Companies are tuna processors or traders (primarily purchasers of raw tuna for processing, or purchasers of raw tuna or finished tuna products for resale) that are members of the International Seafood Sustainability Association (ISSA).

The Participating Companies can purchase tuna only from vessels (and vessel-owning companies) that are compliant with the relevant ISSF Conservation Measures.

CONSERVATION MEASURES

To be compliant, **all PVR-listed vessels** must:

- Not appear on an IUU List
- Have an IMO number (when meeting IMO minimum requirements)
- Have a company policy prohibiting shark finning and requiring sharks be landed with fins naturally attached, if retained
- Not have been found conducting shark finning and/or landing sharks without their fins naturally attached, if retained, within the past 2 years
- Be on an RFMO authorized record, if required
- Be flagged to an RFMO member or Cooperating Non-Member (CNM)
- Not use large-scale pelagic driftnets

Conservation Measures for Purse-Seine Vessels

Purse-seine vessels listed on the PVR also must:

- Have been actively fishing for tuna by December 31, 2012 or if a new construction, have replaced existing capacity
- Have a Unique Vessel Identifier (UVI), if applicable
- Be able to prove 100% observer coverage of large-scale vessels (human or electronic)
- Retain all caught tunas
- Ensure that their skippers are trained in best practices and responsible fishing operations for tuna purse seine fisheries, as described above
- Be required to implement a Company public policy on purse seine FAD Management best practices, including the following elements:

(a) Comply with flag state and RFMO reporting requirements for fisheries statistics by set type

(b) Report additional FAD buoy data (FAD daily position data and echosounder acoustic records) for use by RFMO science bodies

(c) Support science-based limits on the overall number of FADs used per vessel and/or FAD sets made

(d) Use only non-entangling FADs without netting to reduce ghost fishing

(e) Mitigate other environmental impacts due to FAD loss including through the use of biodegradable FADs and FAD recovery policies

(f) For silky sharks (the main bycatch issue in FAD sets) implement further mitigation efforts

- Engage in no transshipment on the high seas

Chapter 2: **FADs**

INTRODUCTION

A Fish Aggregating Device (FAD) is a human-made floating object specifically designed to aggregate fish, such as tuna, by mimicking natural floating debris. FADs can be anchored to the ocean floor (anchored FADs) or set to drift in the open ocean (drifting FADs, or DFADs).

FADs are a widely used fishing strategy due to their high efficiency for catching tuna. About 38% of the global tuna catch, which totaled 5.2 million tonnes in 2023, is made with FADs. In recent years, in most regions, fleets have increasingly adopted the use of FADs, shifting their fishing strategies to FADs accordingly. But with this growth in FAD use comes new concerns — both real and perceived — particularly regarding sharks, juvenile tunas, and other bycatch. In addition, a FAD structure has impacts on vulnerable marine ecosystems due to strandings, ghost fishing, and marine debris and pollution. Scientists, together with fishers and managers, have begun addressing these issues by modifying FAD designs, researching how to enhance species selectivity, strengthening data collection and monitoring efforts, and advocating the adoption of management measures at RFMO level.

CHAPTER OBJECTIVES

1. **Outline the major issues with FAD fishing**
2. **Provide guidance on best practices for FAD management, including FAD design and use, to mitigate those impacts**

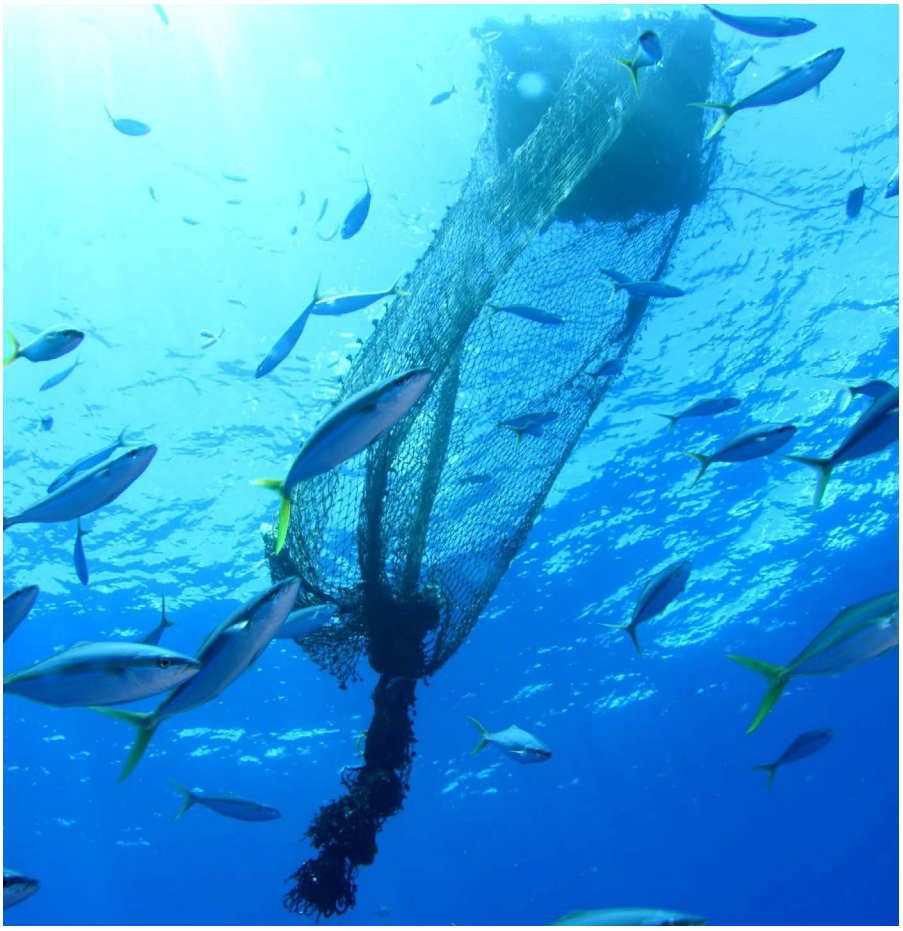
FAD CHALLENGES AND CONCERNS

FADs have become increasingly popular among the global tropical tuna purse-seine fleet. Fishing efficiency has improved through reduced operational costs and by enabling more efficient fishing in comparison to free schools. Today, sets on dFADs account for approximately 40% of global tuna catches. Given high and rising vessel fuel costs, the

utilization of dFADs has become a necessary aspect of tuna production for the global canning industry.

Unfortunately, the rapid increase in FAD use has created several challenges for the fishing industry, primarily the need to understand and mitigate the negative impacts on both target and non-target species, such as higher bycatch rates. In addition, environmental concerns have emerged related to marine pollution and the stranding of lost, abandoned, or discarded dFADs in sensitive coastal and marine habitats.

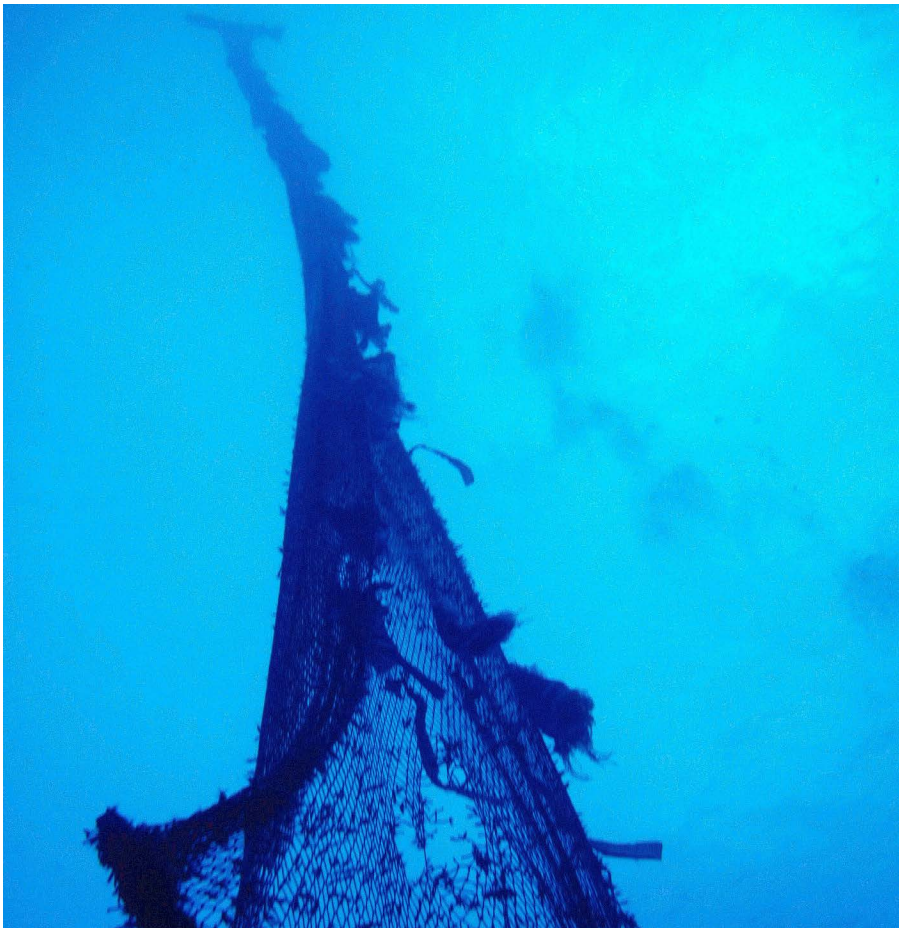
Continuing education on this topic can help fishers to effectively apply improvements to maximize the benefits, and minimize the negative concerns, of FAD fishing. This knowledge could also prove useful in responding to recent anti-FAD campaigns promoted by certain environmental groups, who use both real and perceived problems of FAD fishing to encourage consumers to buy only free-school or pole-and-line-caught tuna.



Higher bycatch in associated sets (e.g., FAD sets, sets on floating logs) as compared to unassociated sets

Photo: Fabien Forget (ISSF)

Tuna RFMOs have made significant progress in adopting conservation and management measures related to FADs. At the same time, fishers have been actively engaged for years in testing and implementing solutions, including the development and trial of improved FAD designs to reduce the devices' ecological footprint.



The entanglement hazard posed by some FADs, which affects sensitive species such as sharks and turtles

Photo: David Itano (ISSF)

Traditional FAD tail built with non-biodegradable, plastic materials

Photo: Gala Moreno (ISSF)

FAD FISHING MANAGEMENT

ISSF has compiled lists of the elements it considers most important for effective FAD management:

a. Complying with flag state and RFMO reporting requirements by set type

b. Voluntarily reporting additional FAD buoy data for use by RFMO science bodies

c. Supporting science-based FAD limits

d. Using non-entangling FADs to reduce ghost fishing

e. Mitigating other environmental impacts due to FAD loss including through the use of biodegradable FADs and FAD recovery policies

f. Implementing further mitigation efforts for silky sharks

The following sections expand upon the above six elements of management that ISSF considers to be of utmost importance for proper dFAD management. The different elements could be merged in broader categories, such as:

(i) FAD data collection and monitoring, including a-c

(ii) FAD structure impacts, including d and e

(iii) FAD bycatch as in f

We provide practical examples that fleets could implement on those broader categories to improve FAD fishery sustainable practices.

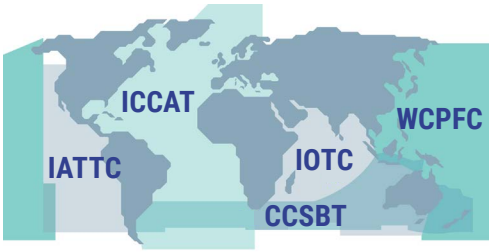
ISSF adopted a Conservation Measure 3.7 on Transactions with Vessels or Companies with Vessel-based FAD Management Policies that requires ISSF participating companies to conduct transactions only with those purse-seine vessels whose owners develop and make public FAD Management Policies that include the activities purse-seine and supply vessels are undertaking on those six elements above.

FAD DATA COLLECTION AND MONITORING

RFMOs and flag states are already taking action to monitor or regulate FAD use — including mandating 100% observer coverage, closing areas to FAD fishing, requiring submission of specific FAD-related data, and developing FAD marking strategies and registers. FAD data collection and monitoring, including the numbers of FAD deployments and FADs in the water, enable the development of a practical, science-based approach to FAD management as well as a better understanding of FAD impact on both tuna and bycatch stocks, and on the environment.

- All four tropical tuna RFMOs have increasingly adopted mandatory requirements for the collection and reporting of specific FAD data by vessel operators. The types of general fishery data required for dFADs include nominal catch and catch-and-effort data by set type (e.g., catch by dFAD set, number of dFAD sets) collected through observers and/or logbooks. In the IATTC and WCPFC, these data are required in set-by-set form, while in the IOTC and ICCAT they are required as aggregated data.
- Similarly, FAD-related fishing activities such as deployments, visits, sets, loss, and retrievals, as well as dFAD structural characteristics (e.g., design and construction materials), must be reported to IATTC and WCPFC on a set-by-set basis through observers and/or log sheets. The IOTC and ICCAT currently require this information to be reported in aggregated form.

In addition, three of the tuna RFMOs require the submission of buoy data related to FAD tracking — including information on buoy inventory and activity (e.g., buoy type, deployment time and position, daily positions and buoy activation and deactivation events), though the formats and requirements vary:



CCSBT: Commission for the Conservation of Southern Bluefin Tuna

IATTC: Inter-American Tropical Tuna Commission

ICCAT: International Commission for the Conservation of Atlantic Tunas

IOTC: Indian Ocean Tuna Commission

WCPFC: Western and Central Pacific Fisheries Commission

- For example, the IATTC requires the submission of both positional and biomass data from echosounder buoys for all dFADs operated by a vessel.
- The IOTC requires a vessel to submit one position per day of all FADs for compliance purposes, while ICCAT requires the same information in aggregated form.
- Although the WCPFC has not adopted similar FAD reporting requirements, the Parties of Nauru Agreement (PNA) does require buoy position data from vessels operating in PNA Economic Exclusive Zones (EEZs) under the PNA Vessel Day Scheme (VDS).

Best Practices Snapshots

ISSF publishes an "RFMO Best Practices Snapshot" reviewing FAD management best-practice implementation by tuna RFMOs. The latest version can be found on ISSF's RFMO Best Practices Snapshots page.

FAD STRUCTURE IMPACTS

Drifting Fish Aggregating Devices (dFADs), which consist of a surface or subsurface raft and a submerged appendage, are most often made of plastic materials such as nylon canvas, plastic buoys, and polypropylene ropes. The submerged appendages are typically composed of different material, including netting until recently, and can reach depths of up to 50 meters for some fleets operating in the Pacific Ocean. It was estimated that approximately 100,000 dFADs were deployed annually by fleets operating in the Indian, Atlantic, and Pacific Oceans (Gershman et al. 2015). The impacts of dFADs can be categorized into two major components:

1. Ghost fishing due to entanglement (Filmalter et al. 2013) when FADs are constructed with surplus purse-seine netting, as was common in the fishery until recently
2. Marine debris, including the accumulation of plastic at sea when dFADs are lost or abandoned, as well as their impacts on coastal habitats when stranded ashore

Until recently, one of the most concerning FAD impacts was ghost fishing, caused by the entanglement of marine fauna in the netting that was commonly used to

construct FADs. The sub-surface material of FADs, when constructed using mesh or netting material and hanging in panels suspended below the raft, can potentially entangle animals, including sensitive species such as sharks and turtles, and cause ghost fishing.

"Ghost fishing" was identified as a significant source of shark mortality, particularly in the Indian Ocean in 2012, when most FADs were constructed using netting material (Filmalter et al., 2013). Since 2013, beginning with the IOTC, tuna RFMOs have adopted management measures promoting the use of alternative, non-entangling designs. Currently, starting in 2025, all tropical tuna RFMOs mandate the use of only fully non-entangling FADs, without any netting in any components, including both the raft and the tail. Thus, vessels should comply with these measures and deploy only fully non-entangling FADs without netting or mesh material. If correctly implemented and verified, the use of fully non-entangling FADs without netting can effectively minimize FAD-related ghost fishing. The transition to fully non-entangling FADs represents a major step forward, made possible through the collaboration of fishers like you as well as the scientists and managers who supported the adoption of this measure in various ways. Fisher use of fully non-entangling FADs is another ISSF global priority that has been achieved through collaboration.

ISSF also requires its participating seafood companies — through its Conservation Measure 3.7 on Transactions with Vessels or Companies with Vessel-based FAD Management Policies — to conduct transactions only with vessels that deploy or redeploy fully non-entangling FADs, without any netting in any components.

Additionally, marine debris from lost and abandoned FADs, as well as impacts on sensitive areas and habitats caused by stranded FADs, are receiving increased attention in recent years. While originally dFADs were constructed using natural materials such as bamboo, currently FADs

Ghost Fishing

"Ghost fishing" was identified as a significant source of shark mortality, particularly in the Indian Ocean in 2012, when most FADs were constructed using netting material.

(Filmalter, et al., 2013)

Nowadays, however, this is not considered to be a problem because all tropical tuna RFMOs mandate the use of only fully non-entangling FADs without any netting in their components.

are made from petroleum-derived products like plastic, PVC, and nylon nets, along with metals. Over time, petroleum-based materials degrade into macro- and microplastics, contributing to ocean pollution. To address these issues, ISSF advocates for the use of non-entangling and biodegradable FADs. These alternatives are gaining traction among tuna RFMOs. As of November 2025, three out of four tropical tuna RFMOs have adopted timelines for transitioning to biodegradable FADs.

A number of research projects have investigated alternative FAD designs that not only reduce the incidental entanglement and catch of sharks and sea turtles but also are constructed using biodegradable materials, which reduce the impacts of lost and abandoned FADs while maintaining the FAD's ability to aggregate fish. Gallery 2.1 and Gallery 2.2 below illustrate the do's and don'ts of non-entangling and biodegradable FAD design. ISSF also produced a guide summarizing the recommendations on non-entangling and biodegradable FAD construction.

In response to the challenge for fleets of transitioning to FADs made from organic materials, which are in general less durable than plastic-based alternatives currently in use, ISSF has developed the "jelly-FAD" — a new non-entangling and biodegradable FAD design. Inspired by the neutral buoyancy of jellyfish, the jelly-FAD is a lighter, simpler structure than other FAD designs — including previous biodegradable designs — that have been used to attract tuna. Jelly-FADs are constructed using bamboo, cotton, abacá, and other organic materials. To build jelly-FADs for their vessels, tuna fishers can consult ISSF's Jelly-FAD Construction Guide.

Non-Entangling and Biodegradable FADs Guide

In 2019, ISSF produced a guide summarizing the recommendations on non-entangling and biodegradable FAD construction.

Jelly-FAD Construction Guide

To build jelly-FADs for their vessels, tuna fishers can consult ISSF's Jelly-FAD Construction Guide, produced in 2024.

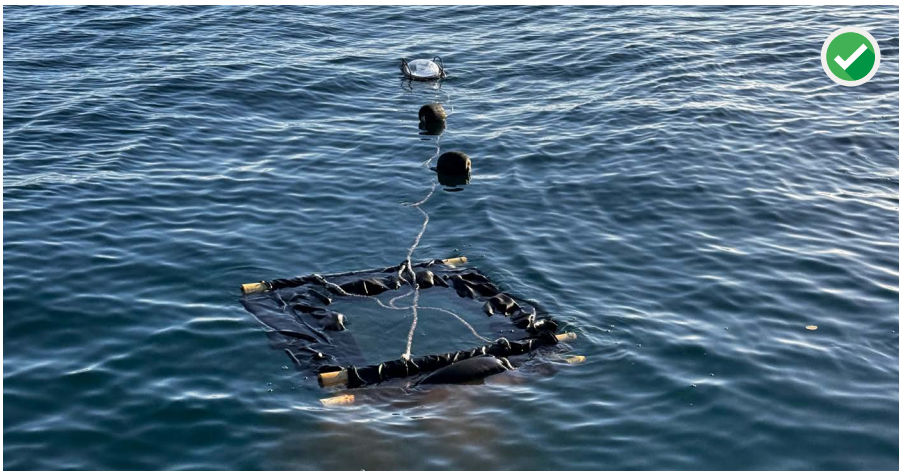
Video: The Non-Entangling and Biodegradable Jelly-FAD

Watch a video about the non-entangling and biodegradable jelly-FAD: Jelly FAD: A Paradigm Shift in Biodegradable Fish Aggregating Device (FAD) Design

FAD Do's — Gallery 2.1

To reduce the amount of marine debris from conventional FAD materials, fishers can use natural or biodegradable materials (such as natural fiber rope, palm fronds, and logs) instead.

Photo: Nando Rivero (ISSF)



Use a raft (or equivalent floating portion) that is either uncovered or covered in a non-mesh material that is tightly attached to the raft.

Photo: Gala Moreno (ISSF)

When assembling the submerged section of the FAD, use materials such as loose rope, non-mesh fabric, or biodegradable materials that will not entangle animals.

Photo: Gala Moreno (ISSF)

To discourage turtles from resting on top of FADs, use log-shaped (cylindrical) or spherical floating objects.

Photo: Unknown

Example: FAD design substituting a net with organic biodegradable materials

Photo: Unknown

Example: Non-entangling and biodegradable FAD made with organic materials

Photo: Unknown

Example: Non-entangling and biodegradable FAD constructed with biodegradable materials including palm fronds cover and small-mesh jute netting

Photo: ANABAC/AZTI

Example: Non-entangling and biodegradable jelly-FADs constructed with organic materials

Photo: Gala Moreno (ISSF)

Photo: Nando Rivero (ISSF)

FAD Don'ts — Gallery 2.2

DO NOT use mesh or netting material because they pose an entanglement hazard. Instead, avoid covering the raft, or choose non-mesh or non-netting small-mesh or non-mesh fabric to cover.

Photo: Unknown

DO NOT use tangled ropes; they can entrap turtles.

Photo: FADIO/IRD-Ifremer/M. Taquet

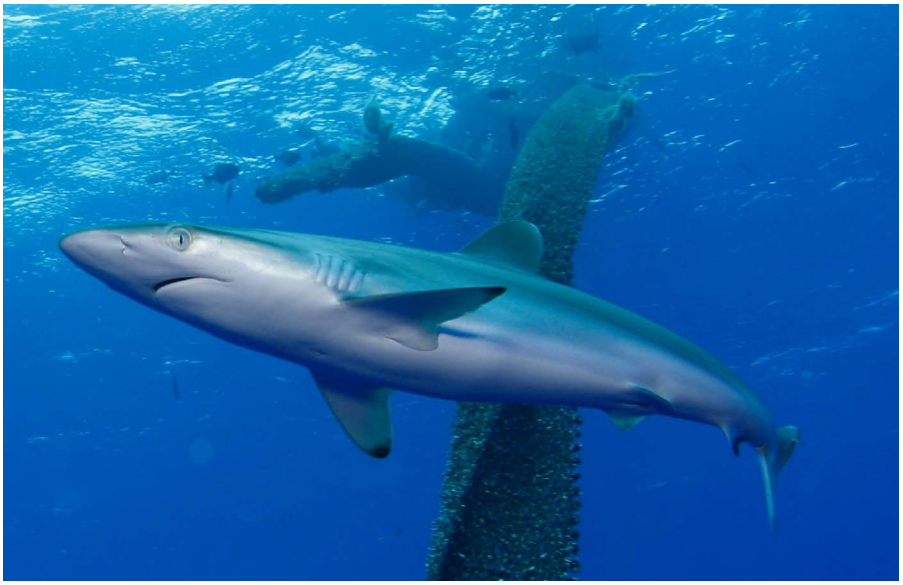
DO NOT use underwater panels of loose, large-mesh netting or mesh material; they pose an entanglement hazard.

Photo: Unknown

BYCATCH ON FAD ASSOCIATED SETS

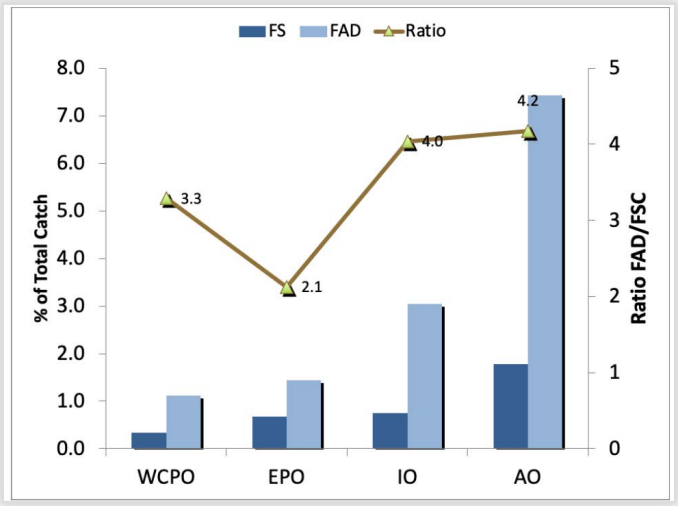
There is a greater number and variety of bycatch species in FAD-associated sets than in unassociated sets, including small yellowfin and bigeye tuna, sharks, turtles, billfish, and bony fish. By weight, the primary impact of FAD fishing is largely on non-targeted, small tuna. This represents 5% to 68% of a total bycatch, while it corresponds to between 0.06% and 5% of the total catch.

Other species of fish, sharks, and other marine life are also captured; the bycatch amount of each species can vary widely depending on the region, time of the year, vessel, crew experience, and other factors. Typically, bycatch in associated sets is made up of other fish, sharks, and rays, averaging about 5% of the total catch, ranging from 1.1% to 7.4% depending on the ocean. For comparison, unassociated sets result in less bycatch, ranging on average from 0.3% to 1.8%.



Bycatch underneath a conventional FAD

Photo: Fabien Forget (ISSF)



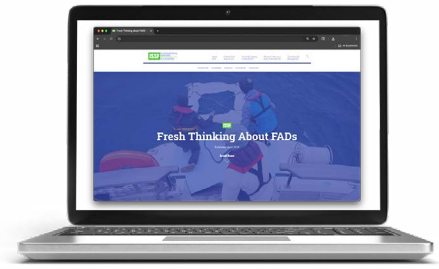
Non-tuna bycatch rates in purse-seine fisheries, as shown in ISSF Technical Report 2021-11

Research is ongoing to investigate additional FAD fishing techniques that can reduce the bycatch attracted to, or the catch associated with, FADs. The current best practices to mitigate FAD-related bycatch will be presented in Chapter 3.

SUMMARY

FAD fishing plays a major role in tuna purse-seine fishing. While purse seining is an efficient fishing method, it also presents several challenges, including bycatch, ghost fishing, and marine pollution, which cannot be overlooked. For FADs to remain a viable tool — considering the ecological and political factors — adaptations must be made. Incorporating the guidelines on FAD data collection, monitoring, and construction provided in this chapter is a necessary first step towards the sustainable management of FADs and the reduction of their associated impacts.

Fresh Thinking About FADs



ISSF's visual story "Fresh Thinking About FADs" shares ISSF's research to develop more sustainable fish aggregating devices (FADs) for healthier tuna fisheries and oceans, and it answers key questions about FAD management.

View the web feature

Chapter 3: **Bycatch Mitigation and Handling**

INTRODUCTION

Bycatch and discards in fisheries have become a serious issue in recent years, both because of their impact — particularly on sensitive species — and consumers' increasing awareness, which creates demand for sustainable seafood choices. In addition to bycatch being a major sustainability issue for the tuna-buying public, RFMOs are increasingly interested in applying an "ecosystem approach" to fisheries management, which includes reducing the mortality of non-target species.

Understanding Bycatch Mitigation Steps or Hierarchy

Bycatch in purse-seine fisheries presents a significant challenge to sustainable fishing. To address this issue effectively, a hierarchical — or step-by-step — approach can be adopted at various stages of the fishing operation. **This means prioritizing actions that prevent or avoid bycatch before fishing begins, rather than relying solely on post-catch measures that are more likely to result in unwanted bycatch mortality.** Different actions can be implemented during different stages of the fishing process. Below, we outline the tiers of the bycatch mitigation hierarchy, with practical examples relevant to purse-seine fisheries.

1. Avoid Bycatch: Before Fishing or Setting the Net

The first and most effective step is to avoid bycatch entirely. This involves preventing bycatch before a vessel even reaches a fishing area or approaches a Fish Aggregating Device (FAD). Strategies include, for example, using fully non-entangling FADs, which

CHAPTER OBJECTIVES

1. **Provide background information on the purse-seine bycatch species of greatest concern**
2. **Summarize best practices for each of the bycatch mitigation hierarchy steps to avoid and reduce bycatch**
3. **Describe techniques for the safe handling and release of bycatch**

reduce the risk of entangling vulnerable species such as sharks and turtles (see section FAD structure impacts); avoiding known bycatch hot spots through adaptive time-area closures; and employing acoustic species discrimination technologies. The latter enables fishers to remotely assess, via echosounder buoys, the species and size composition of tuna aggregations beneath a FAD, allowing them to avoid both navigating to and setting on FADs where undesired species or sizes are present.

Scientist studying fish behavior. ISSF bycatch research cruise in the western Pacific, 2014.

Photo: Fabien Forget (ISSF)

2. Minimize the Risk of Capture: During Fishing

If bycatch cannot be completely avoided, the next best step is to reduce the likelihood of catching it during the fishing set. Techniques include modifying fishing gear or maneuvers to facilitate the escape of non-target species. Examples include the backdown maneuver that allows dolphins to swim out of the net, which could potentially be adapted for other species such as sharks; actively removing and releasing sharks from the net before they reach the deck; attracting sharks out of the net before the final stages of the set; or targeting bigger FAD school sets to reduce shark bycatch.

These techniques have been tested to some extent but require further development. In general, their implementation may interfere with fishing operations, making experimental testing and adoption more

challenging. However, some maneuvers, such as the release of dolphins using the backdown technique, have proven effective and have been in use for many years, which encourages fishers and scientists to continue exploring similar escape options for other vulnerable species, such as sharks.

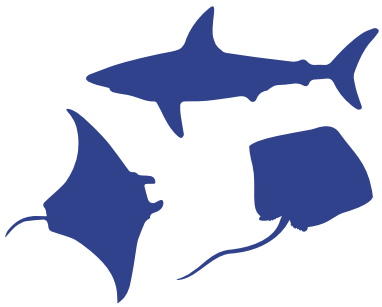
3. Reduce Bycatch Mortality: On the Deck After Catching

If bycatch animals reach the deck, it may still be possible to safely release them alive. This step focuses on careful handling and timely release to maximize the chances of survival. Reducing stress and injury during handling increases the likelihood that threatened species can survive after being returned to the sea.

4. Offset Unavoidable Bycatch Mortality

If bycatch impacts cannot be avoided, minimized, or mitigated during fishing, the final step is to compensate for the damage. This may include funding or supporting conservation initiatives, such as turtle protection programs, to offset the ecological impact of unavoidable bycatch mortality.

1. Sharks and Rays



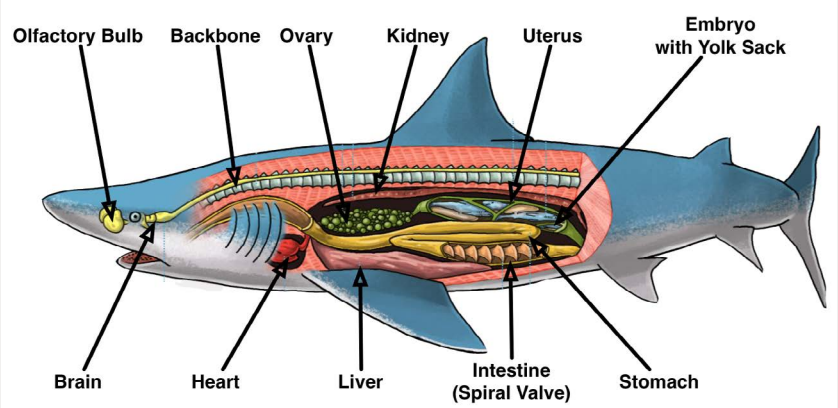
While not the most common bycatch in tuna purse-seine fishing, sharks and rays are the most vulnerable to its effects. Several aspects of their biology make them less resilient and highly susceptible to overfishing, including:

1. Slow growth rates
2. Late maturation
3. Long pregnancies
4. Low fertility
5. Long life spans

It is not true that sharks and, to a lesser extent, rays are hardy and able to withstand rough handling or prolonged

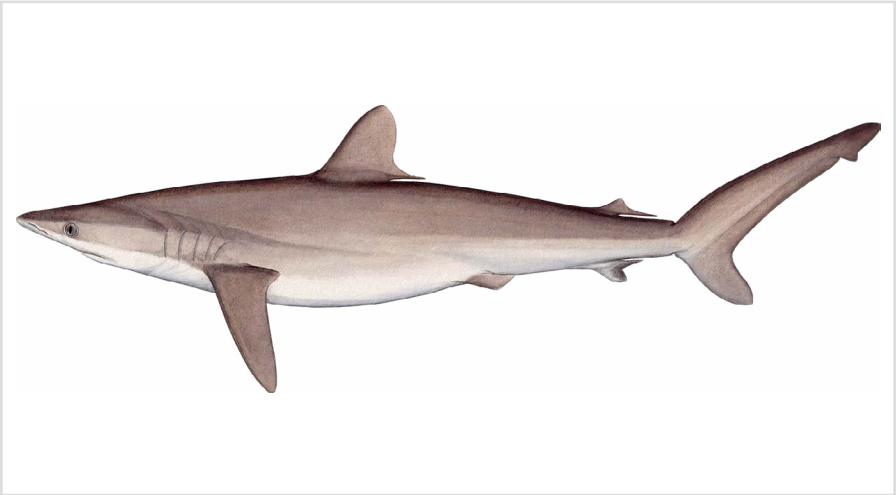
exposure and still survive when returned to the sea. In fact, initial studies suggest both sharks and rays have a survivability rate of only 50%, even if they appear healthy upon release. The low survival rate is most probably due to severe stress and/or injury sustained during the fishing and handling process.

This high mortality rate of bycaught sharks and rays is likely influenced by several biological characteristics. Unlike other fish, these animals lack a hard bony skeleton to protect their internal organs. When the animals are out of water, the tissues that hold their organs in place can tear, and the force of gravity can cause organs to become crushed or damaged. This same connective tissue also supports the spinal cord and vertebrae, making sharks and rays especially susceptible to irreversible injury when handled by the head or tail. Additionally, a shark's head contains numerous sensitive and fragile organs used for detecting preys. If these are damaged during handling, then the shark – once released– may be unable to locate prey and could starve.



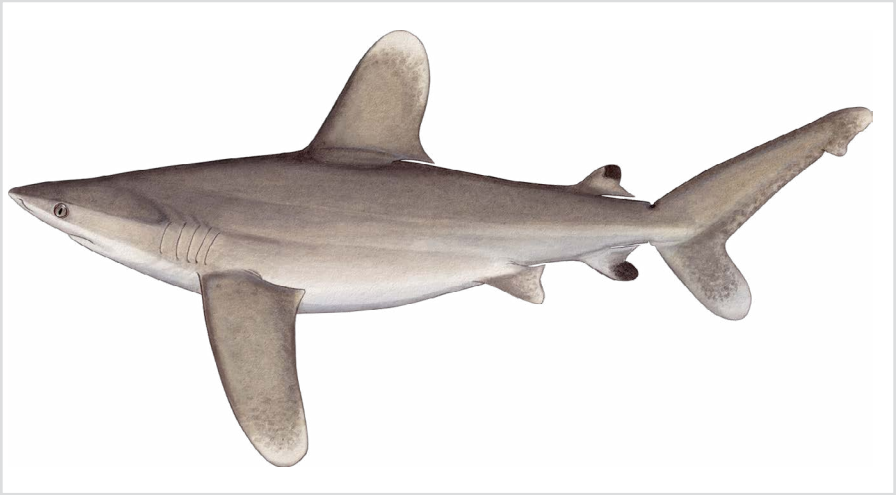
Shark anatomy

Sharks and Rays Commonly Encountered



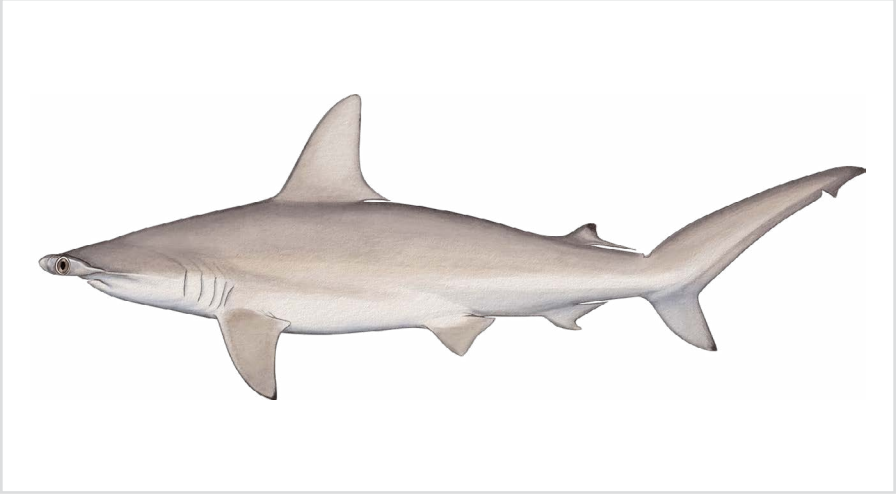
Silky Shark

Illustration: Lindsay Marshall © Pacific Community (SPC)



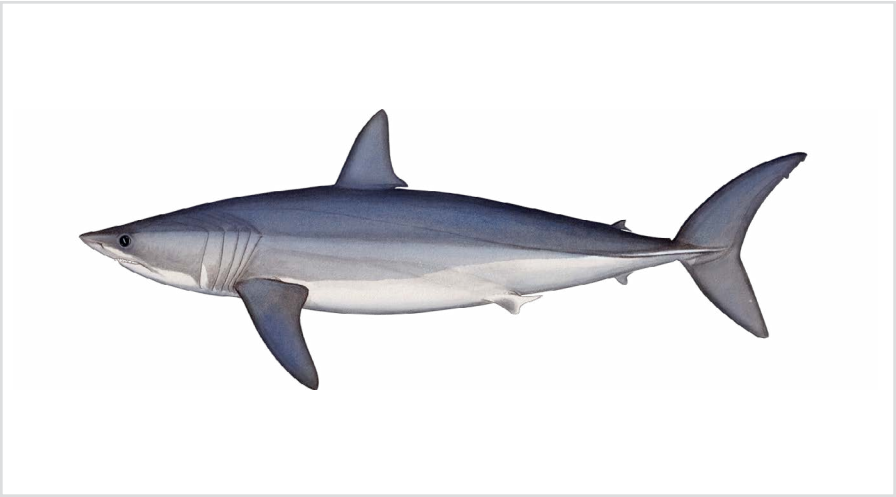
Oceanic Whitetip Shark

Illustration: Lindsay Marshall © Pacific Community (SPC)



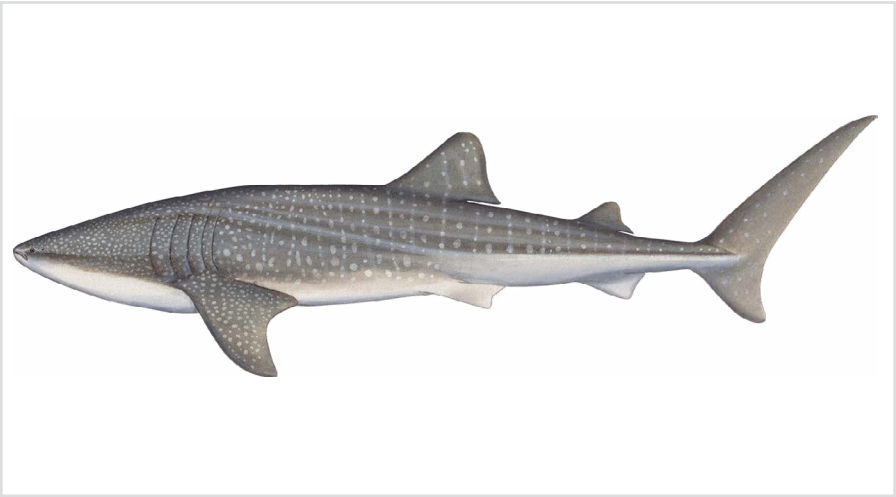
Scalloped Hammerhead Shark

Illustration: Lindsay Marshall © Pacific Community (SPC)



Shortfin Mako Shark

Illustration: Lindsay Marshall © Pacific Community (SPC)



Whale Shark

Illustration: Lindsay Marshall © Pacific Community (SPC)

Giant Manta Ray

Illustration: Lindsay Marshall © Pacific Community (SPC)

Chilean and Giant Devil Ray

Illustration: Lindsay Marshall © Pacific Community (SPC)

REDUCING SHARK AND RAY BYCATCH

While several strategies are currently being tested, there are still relatively few proven techniques for reducing the catch of sharks in purse-seine fishing.

However, ISSF continues to sponsor bycatch research cruises to study the most promising strategies, including deterrents and attractors to avoid catching sharks. Further developments in this field will be included in future versions of this guidebook.

Avoidance Measures

Using fully non-entangling FADs without netting will avoid shark entanglement and could be considered a passive avoidance measure to prevent shark bycatch (see section FAD structure impacts).

Non-entangling FAD

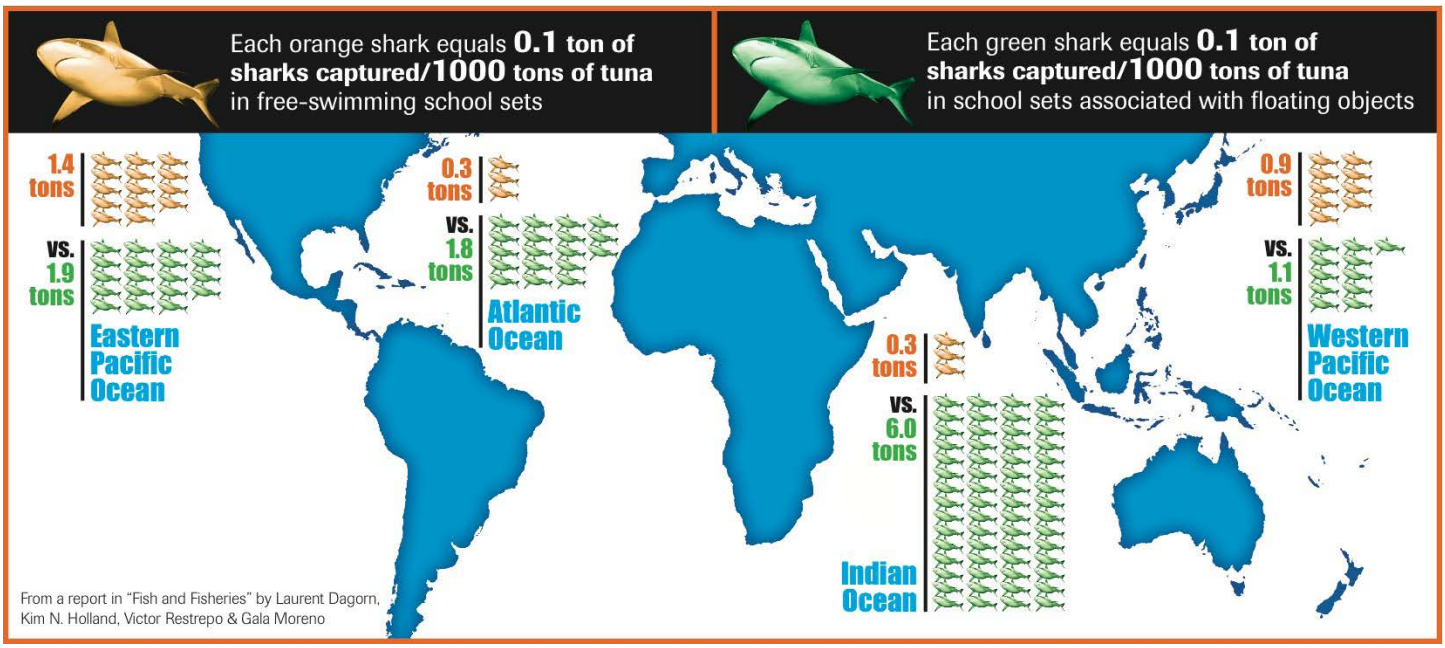
Photo: Nando Rivero (ISSF)

Minimize the Risk of Capture: During Fishing

Target Large Schools

Published science shows that fishers can reduce bycatch of non-tuna species simply by targeting larger schools of tuna. In the *Canadian Journal of Fisheries and Aquatic Sciences*, Dagorn et al. (2012) found that the total amount of bycatch is more dependent on the number of sets than on the total catch of tuna.

Fishers should target schools larger than 10 tons to reduce the total number of silky shark bycatch by 21% to 41%. Overall, using this method will cut the amount of total non-target bycatch by 23% to 43%, depending on the ocean region.



Tons of sharks captured per tons of tuna

Infographic: Dagorn et al. (2012)

Attract Sharks Out of the Net

Another option to reduce bycatch during the fishing operation is to attract sharks with bait or lure (or even using the FADs as an attractor) out of the net before the purse is closed. The results of ISSF shark attraction experiments

indicated that sharks can be attracted away from the FAD up to 500 m using chum or bait, a promising finding that will need further investigation.

Fish Sharks in the Net to Release Them

A bycatch release method tested in the Atlantic Ocean, based on skipper suggestions, involved fishing sharks with baited hooks after they were already encircled by the tuna purse-seine net and then releasing them outside the net. In seven sets, 11 silky sharks (21% of those present) were safely caught and released in good condition, and all tagged individual sharks survived.

The process was simple, posed low risk to both the catch and the gear, and was effective for removing sharks from the net without harming them. However, it also has some practical limitations, such as the time required to fish the sharks or the difficulty of applying the method in rough seas. This technique shows strong potential as a bycatch mitigation tool, although further trials are needed to optimize it for broader use.

Modify Fishing Gear

Within this category of bycatch reduction, measures such as using sorting grids could be used to release species much smaller than tuna, generally bony fish, found near the FAD. Similarly, applying the backdown maneuver to release sharks could represent a promising area of research.

As previously noted, there is a need to further explore and develop strategies that enable the release of non-target species before they are brought on board, where their chances of survival significantly decrease. Onboard handling, especially in the case of sharks, can pose serious risks to crew safety.

Video: ISSF Shark Bycatch Reduction Research

Watch a video about testing a chum lure to avoid catching sharks: ISSF Guidebooks — Sharks

Reducing Shark Bycatch

When purse seine fishers take these steps together, purse seine shark bycatch can be decreased and their survival rate improved.

Video: Fishing Sharks to Release from Net

Watch a video about fishing sharks in the net as a release method: Bycatch Mitigation for Silky Sharks

Reduce Bycatch Mortality: On Deck Safe Handling and Releasing Techniques for Sharks and Rays

Research using shark tagging has shown that, when good release practices are followed, about 15% to 43% of sharks that are caught and brought on deck can survive. This survival rate depends on two key things: first, on the number of sharks that arrive alive on the deck. Around 30% to 60% of the sharks are still alive when they arrive on deck. Second, if those live sharks are released quickly and carefully, about 50% to 70% of them have a good chance of surviving. These figures underscore the critical importance of handling practices and timely release in improving survival outcomes for sharks incidentally caught in purse-seine fishing operations.

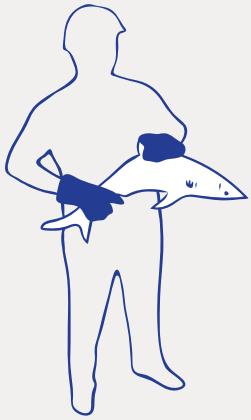
Sometimes, it becomes challenging for the crew to manually handle, lift, and release large animals, which can also compromise crew safety. Therefore, the use of Bycatch Release Devices (BRDs) is recommended, as they allow fishers to handle and release large or dangerous individuals more safely and quickly, thereby increasing the animals' chances of survival.

It is important to have the crew prepared for safe handling prior to net hauling. This includes instructing them on correct handling techniques and ensuring they have the right BRDs at hand, while putting their personal safety first.

The following sections and galleries illustrate safe handling techniques, various bycatch release tools, and do's and don'ts to enhance shark post-release survival.

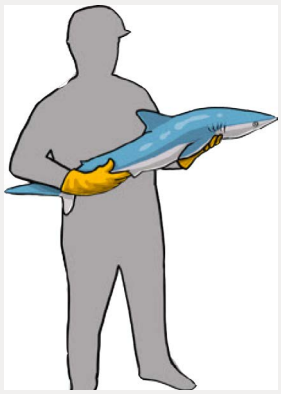
Manual Handling Do's

Manual Handling of Small Sharks (1 Person)



One hand on the dorsal (top) fin and the other holding the body from below

Illustration: Updated from Poisson et al, 2012



Both hands holding the body

Illustration: Poisson et al, 2012

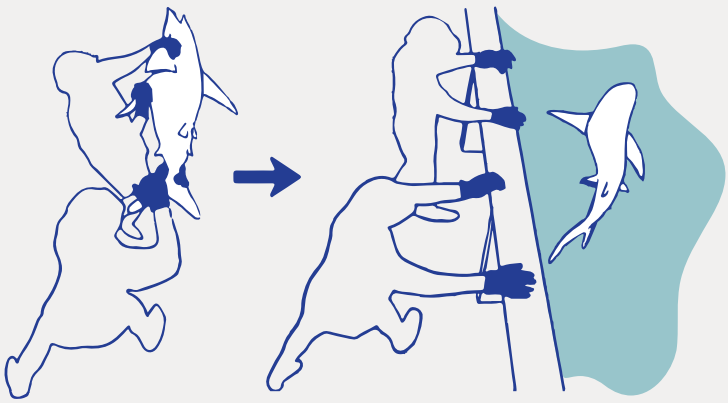
One hand on the pectoral (side) fin and the other holding the tail

Illustration: Poisson et al, 2012

Release the fish by pointing its head down toward the water and dropping it in

Illustration: Updated from Poisson et al, 2012

Manual Handling of Medium Sharks (2-3 People)



One or two people should hold the dorsal and pectoral fins, with the other person holding the tail. Release the shark over the side of vessel by dropping, not throwing, the animal.

Illustration: Updated from Poisson et al, 2012

Handling Stingrays

The ray's stinger is located at the base of its tail. The sting is not very harmful, though it is painful. It is best to avoid the rear of the ray and grasp it near the head. Hold the ray away from the body.

Illustration: Poisson et al, 2012

Handling and Release with Bycatch Release Devices

BRDs can assist with the on-deck release of bycatch species, such as sharks and mobula rays. These tools can improve crew safety and speed up the release of vulnerable species, enhancing their chances of post-release survival. BRDs range from simple, low-cost designs to more sophisticated, mid-cost tools, and they can be adapted to suit the characteristics of any vessel. Below, we present the most common ones used on tropical tuna purse-seine vessels.

Light Equipment Such as Stretcher, Fabric, Sarria or Cargo Net

If the shark can't be released manually right away from the brailer, use a cradle-like tool — such as a canvas, stretcher, sarria, or cargo net — to handle it safely and avoid injury. While the shark is on deck, keep it wet and in the shade, and, if possible, help it breathe by gently placing a water hose in its mouth. All vessels must carry a net carrier, stretcher, or canvas, along with the brailer, to help safely handle sharks when they're found on deck.

Stretcher being used to transport a shark before releasing it

Photos: Unknown

Shark Release Ramps with Hopper

A shark release ramp designed to connect the stern-side edge of the hopper, located on the port side, to a door on the starboard side that opens to the sea, provides a highly efficient way to quickly release sharks with minimal crew interaction. There are various ramp designs that can be adapted to vessels with or without hoppers, as well as to different vessel characteristics and sizes (see "Shark Release Ramp Guide for Purse-Seine Vessels").

Video: Shark Release Ramp

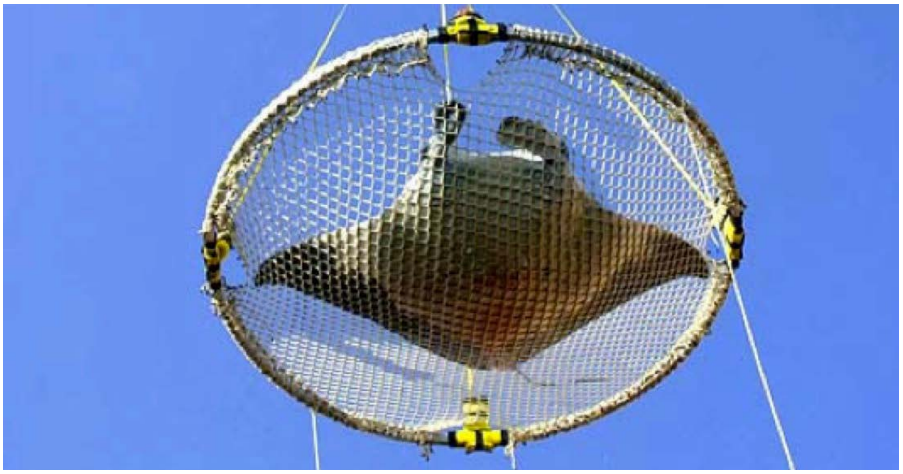
Watch a video of a shark released using a ramp with hopper: Bycatch Mitigation for Sharks in Purse-Seine Tuna Fisheries: Shark Release Ramp

Video: Cape Ferrat

Mounting a shark release ramp

Photo: Cape Ferrat

Mobulid Sorting Grids (with Vessel's Crane)



Mobulid being released using a sorting grid

Photo: Unknown

If large mobulids (and other fish, e.g., moonfish) can't be released directly from the brailer (e.g., by tipping one edge), then the animals can be returned to the sea using a piece of net, plastic tarp, or canvas that can be lifted by the crane. The material should be ready on deck before

brailing, and when a large animal is encountered, fishers can place it on the material, which is then hooked up to the crane and lifted overboard.

Mobulid being released using a sorting grid

Photo: ISSF/ATA fleet

A new BRD is the mobulid sorting grid, which features wide spaces and can be placed over the unloading hatch or hopper. This allows tuna to pass through while the ray remains on top of the grid. The grid is then lifted with a crane to release the large animal (see "Manta Ray Sorting Grid Instructions for Purse-Seine Vessels").

Video: Mobulid Sorting Grid

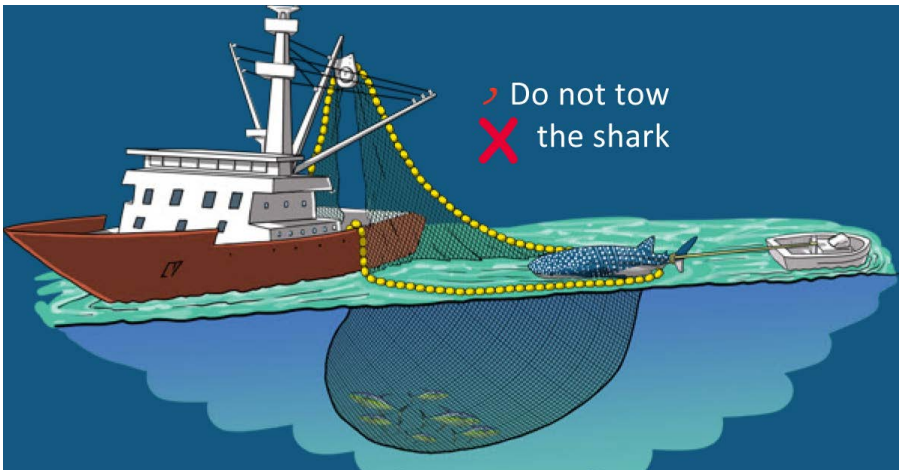
Watch a video of a mobulid released using the mobulid sorting grid: Bycatch Mitigation for Mobula Rays in Purse-Seine Tuna Fisheries: Mobulid Sorting Grid

Video: ISSF/ATA fleet

Releasing Whale Sharks

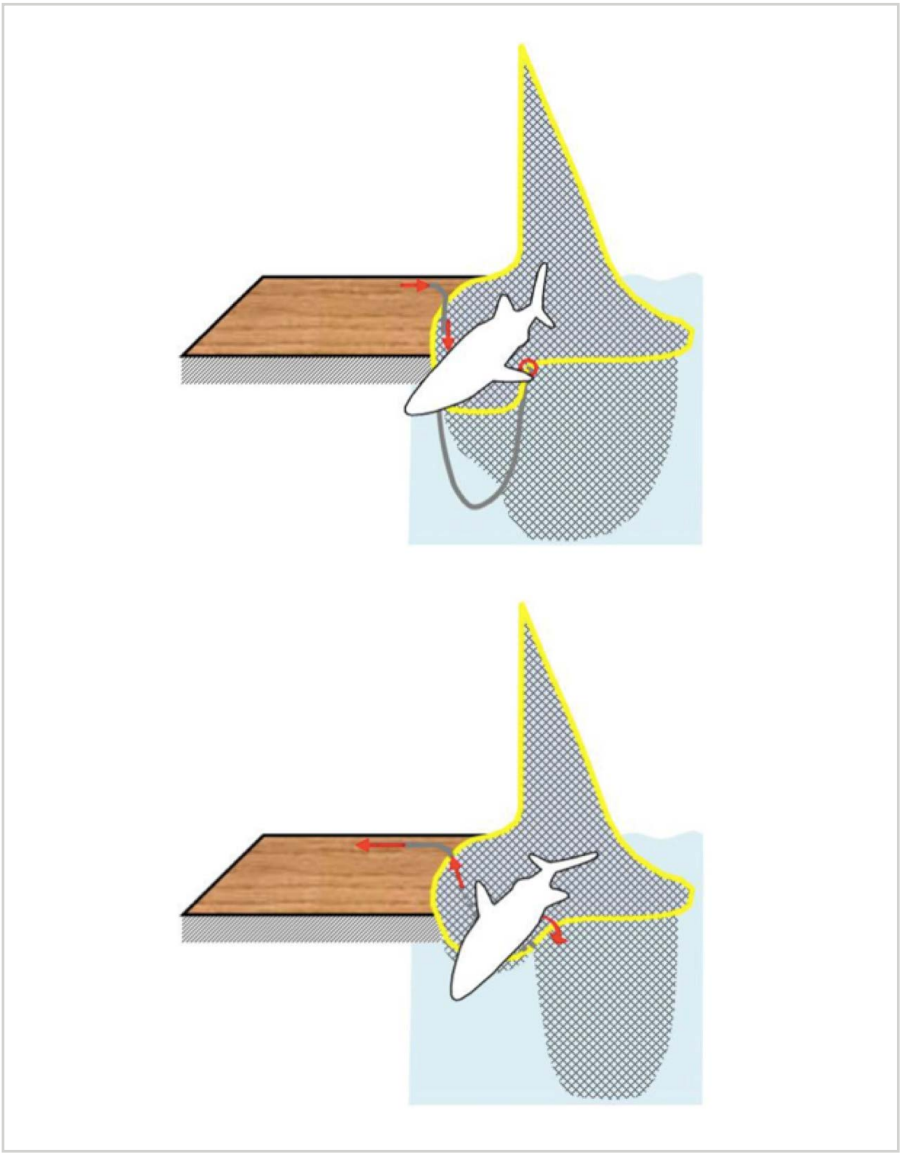
For handling — unlike other sharks and rays as discussed above — whale sharks should always be dealt with in the water.

Photo: Unknown



At no time should a whale shark be handled by its tail (e.g., lifted using the crane, or towed with a speed boat). This can cause severe injury to the animal.

Illustration: Poisson et al, 2012



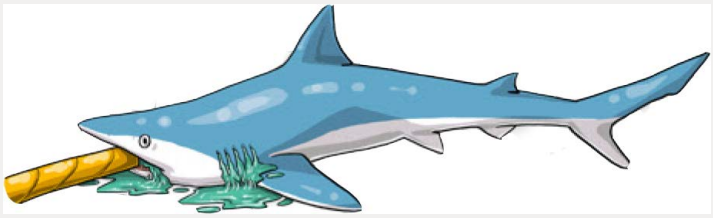
If a whale shark appears early during hauling and is at the surface while the tunas remain below, then the animal may tear the net on its own to escape, or a crew member can cut a few meters of net near the head of the animal to set it free. Alternatively, the crew in charge of the net hauling operation can use the winch and the capstan to bring the animal close to the hull, to drain the animal and then roll it outside the bunt. A rope placed under the animal and tied on the cork line could help roll it outside the net.

Illustration: Poisson et al, 2012

Shark Handling and Release Do's

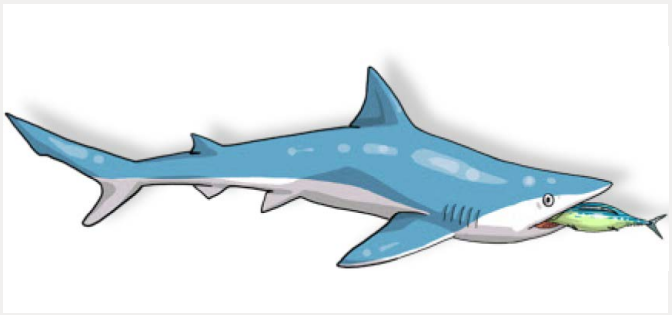
DO lightly drape a cool, wet cloth over the head of an energetic shark to calm it.

Illustration: Poisson et al, 2012



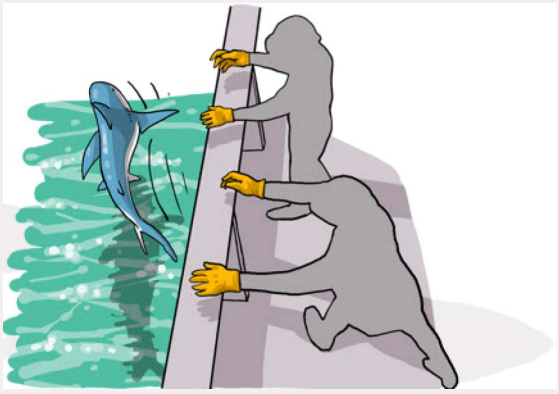
DO insert a seawater hose in a shark's mouth if, for an unavoidable reason, it cannot be released right away, to improve the animal's chance of survival.

Illustration: Poisson et al, 2012



DO avoid the animal's jaws for crew safety (some suggest placing a fish in its mouth to prevent bites), and — regardless of the animal's state (live or moribund) — be cautious at all times.

Illustration: Poisson et al, 2012



DO attempt to release the animal **as soon as possible**, which is most important.

Illustration: Poisson et al, 2012

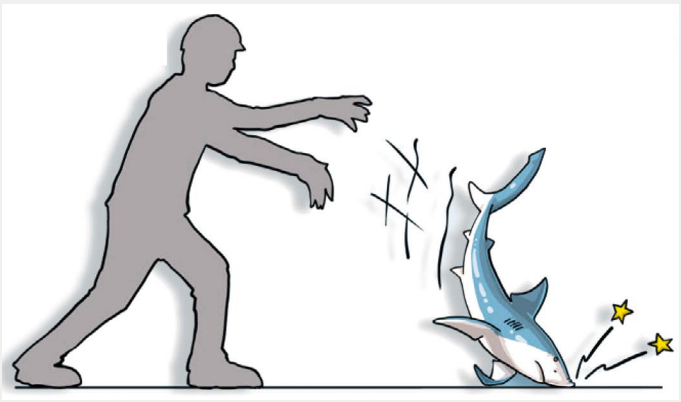
Video: Shark Handling and Release Recommendations

Watch a video of shark handling and release recommendations: Purse Seine Fisheries — Bycatch Mitigation for Sharks: Handling & Release Part III

Shark Handling and Release Don'ts

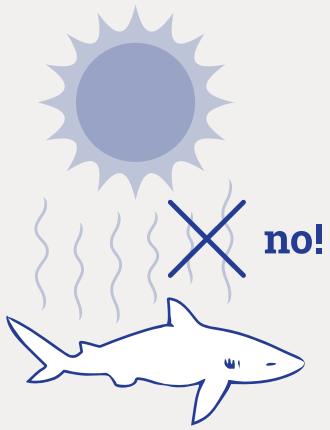
DO NOT lift the animal by its head or tail, as this can severely damage the spinal cord.

Illustration: Poisson et al, 2012



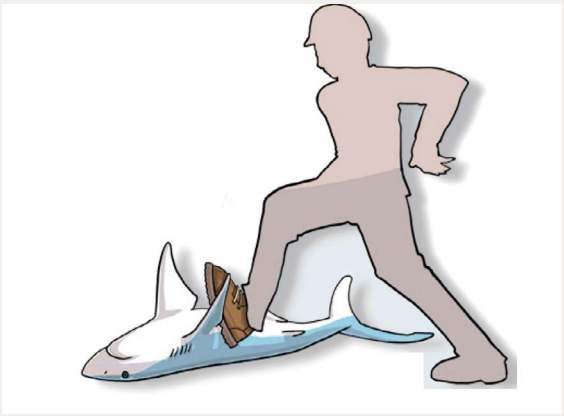
DO NOT throw, hit, or squeeze the animal. Prevent the animal from battering itself against the deck or other hard objects.

Illustration: Poisson et al, 2012



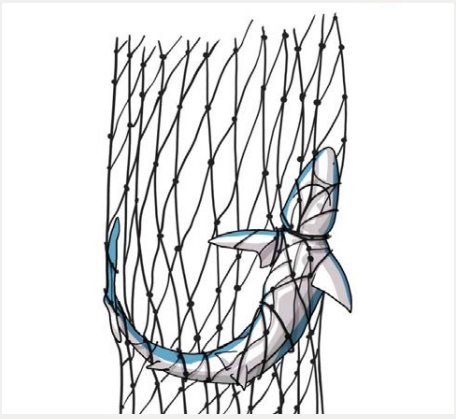
DO NOT leave the animal in the sun. If possible, handle the animal in the shade or otherwise reduce its exposure to the sun.

Illustration: Updated from Poisson et al, 2012



DO NOT yank or push the animal sharply.

Illustration: Poisson et al, 2012



DO NOT tug or yank the net around an entangled animal. Instead use clippers if necessary. For animals entangled in the net, reduce the speed of the net reel. Once the tension is reduced, carefully remove the animal.

Illustration: Poisson et al, 2012

DO NOT insert hands or objects into the gill openings.

Illustration: Updated from Poisson et al, 2012

DO NOT insert a gaff, hook, or other pointed object to drag or lift the animal.

Illustration: Updated from Poisson et al, 2012

Video: Shark Handling and Release Don'ts

Watch a video of shark handling and release approches to avoid: Purse Seine Fisheries — Bycatch Mitigation for Sharks: Handling & Release Part II

End Wasteful Shark Finning

Shark finning is the practice of retaining shark fins and discarding the rest of the carcass at sea. This practice goes against the FAO Code of Conduct for Responsible Fisheries and its International Plan of Action for the Conservation and Management of Sharks, as well as the resolutions of

several other international marine bodies, all of which call for minimizing waste and discards.

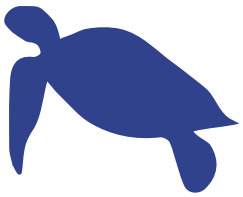
There are major uncertainties about the total number and species of sharks caught, and shark finning contributes to this problem.

ISSF has called on the seafood industry to adopt policies prohibiting shark finning and also requiring sharks be landed with fins naturally attached, if retained. All tuna fishery operators should prohibit shark finning and should retain, land, and report all sharks caught, except for species prohibited by national law or RFMO regulations, or those individuals released alive.

Related ISSF Conservation Measure

For more details, see ISSF Conservation Measure 3.1(b) Prohibition of Transactions with Shark-Finning Vessels.

2. Sea Turtles

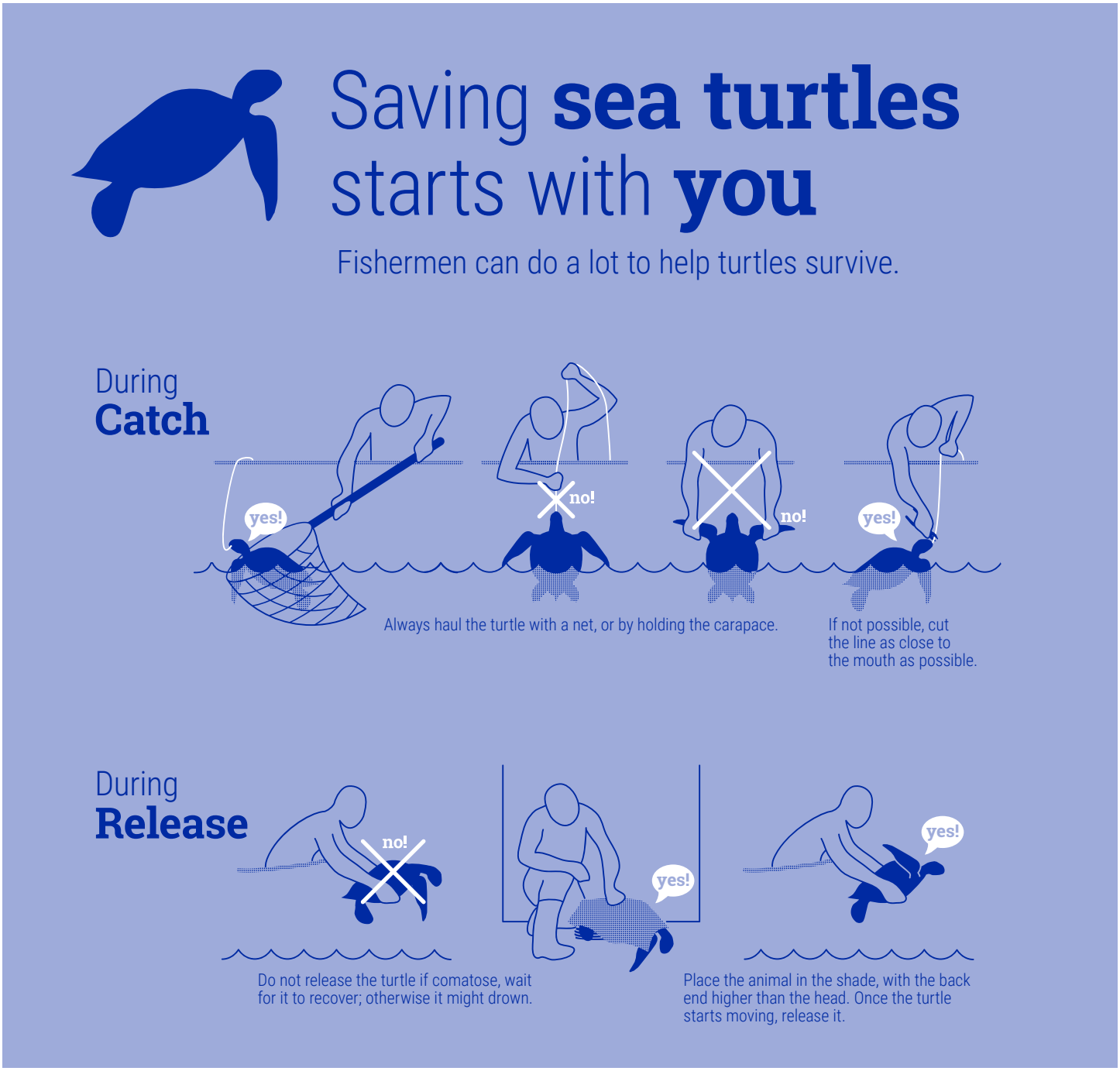


Sea turtles are sometimes found entangled in FAD nets or associated with the tuna school inside the net during the fishing set. Regarding sea turtles and FAD fishing, the most effective bycatch mitigation measures focus on the structure and/or configuration of the FAD design itself, avoiding the use of nettings, as discussed in the previous chapter.

All sea turtles are protected internationally, as these long-lived animals face numerous environmental threats, such as destruction of nesting grounds, over-harvesting of eggs, boat collisions, ingestion of marine debris, diseases linked to ocean pollution, and interactions with fisheries. There are seven species of sea turtles, five of which are commonly encountered during tuna fishing operations.

The best current practice to prevent turtle mortality once the animal is entangled in the purse-seine net is to use speedboats to release the turtle unharmed before it passes through the power block. The best time for this action is when the entangled turtle and net first come out of the water on the way to the power block — at which point hauling should be paused. If needed, use clippers to cut the

net. Disentangling the turtle at the earliest possible stage maximizes survival. Speedboats can also be used to remove any free-swimming encircled turtles.



Sea turtle bycatch mitigation techniques

Infographic: ISSF 2016

When handling turtles, never lift the turtle by the flippers or use sharp tools (e.g., gaffs) to retrieve them. Instead, hold the turtle by the sides of its shell and ease it head-first into the water as soon as possible.

If the turtle appears unconscious (likely due to prolonged entanglement underwater), place the turtle on a tilted surface with its hindquarters about 15 cm (6 in) higher than its head to allow water to drain from its lungs. Keep the turtle moist by covering its body (not the nose or mouth) with a wet towel or by spraying it periodically with water, and maintain a temperature above 15° C (60° F). Do not leave the turtle lying upside down. Check the turtle's reflexes by gently touching its tail or eyelid every three hours. An unconscious but living turtle may not respond.

If, after 24 hours, the turtle shows no sign of recovery, it is likely dead. If it does recover, release it gently back into the water.

Most Common Bycaught Sea Turtle Species

Loggerhead Turtle

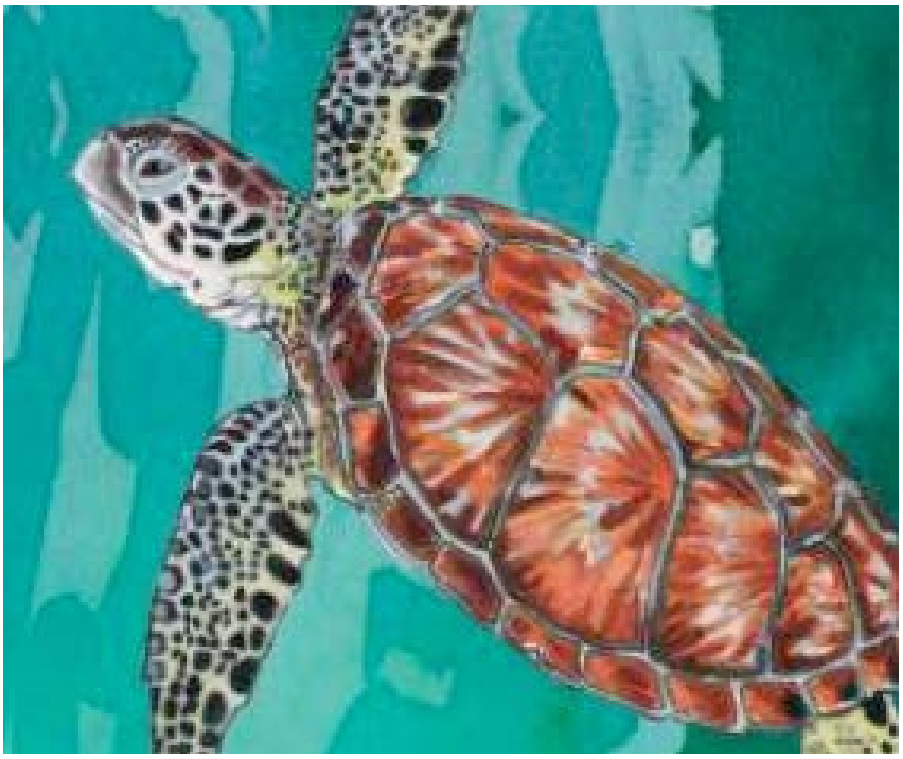
Illustration: FAO, 2009

Olive Ridley Turtle

Illustration: FAO, 2009

Hawksbill Turtle

Illustration: FAO, 2009



Green Turtle

Illustration: FAO, 2009

Leatherback Turtle

Illustration: FAO, 2009

3. Selective Tuna Fishing: Reducing Catch of Small Bigeye and Yellowfin Tunas

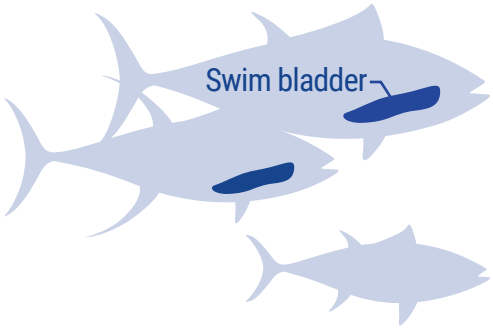
As noted earlier, the catch of small undesired sizes of tunas can account for up to 5% of a FAD set. Reducing the bycatch of small bigeye and yellowfin tunas, which are not target species of a purse seiner, is also a priority for ISSF.

Ongoing bycatch research work is testing various options on board commercial purse seiners to reduce the bycatch of small bigeye and yellowfin. As effective techniques become available, ISSF will update this section of the guidebook.

Acoustic Discrimination of Species

ISSF conducts research to help fishers receive more accurate and reliable information about the species and sizes of tuna swimming around FADs. By using FAD tracking buoys equipped with echosounders, we can move beyond simply estimating the total amount of fish beneath the FAD. Instead, this technology can give us a clearer picture of which tuna species are present at FADs, even from a distance ("remotely"). With this information, fishers can make more sustainable and selective choices, such as avoiding areas where small undesired sizes or species of tunas are concentrated, especially if those species are protected or under quota limits.

Recent research by ISSF and AZTI has decoded the acoustic signals of tropical tunas. We have learned that different tuna species respond differently to sound due to unique features like swimbladder size and volume, allowing us to identify individual species based on their acoustic "fingerprint."



For example, bigeye tuna has a large developed swimbladder that helps it regulate buoyancy, and, as a result, its acoustic signal is stronger at lower frequencies. In contrast, skipjack tuna lacks a swimbladder, so its acoustic signal is stronger at higher frequencies. Yellowfin tuna also has a swimbladder, but it is less developed than that of bigeye. Its acoustic response tends to be relatively flat, with values ranging between those of bigeye and skipjack.

By using multiple acoustic frequencies in the echosounder buoys, fishers could be able to better distinguish between tropical tuna species. This might lead to more targeted and responsible fishing. However, for this system to work in

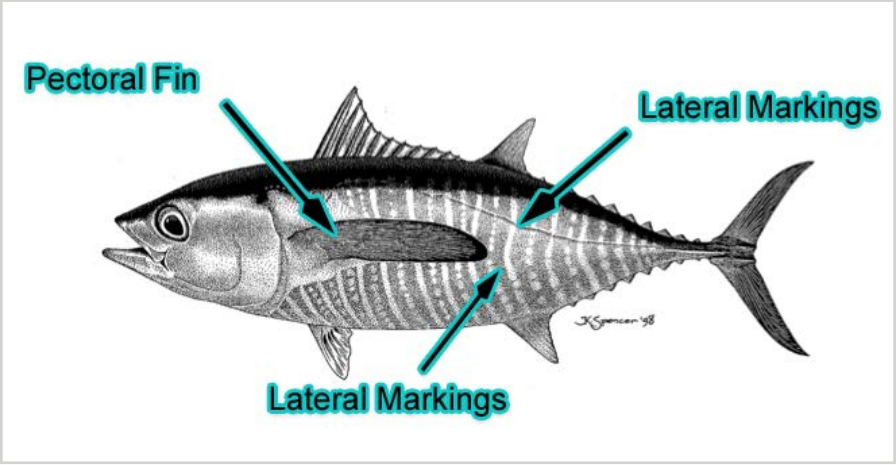
practice, two things are needed: First, the new knowledge on acoustic properties of tuna must be built into the buoys already used to track FADs; and second, fishers must receive proper training on how to use this new information.

To support this, ISSF is developing a training program that will be shared in skippers workshops and other dedicated training sessions. Once the training materials are finalized, this section of the guidebook will be updated to reflect the new acoustic discrimination tools and practices.

Species Identification

Another common challenge for skippers is distinguishing between small yellowfin and bigeye tunas. This is a useful skill, particularly as RFMOs consider management options that would require data (or catch limits) on the catch of small tunas. The following images highlight some of the characteristic features of small yellowfin and bigeye that can assist in their correct identification.

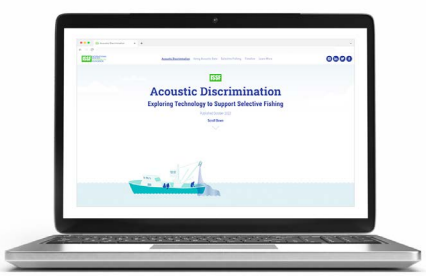
Yellowfin (30-45 cm)



Small Yellowfin Tuna

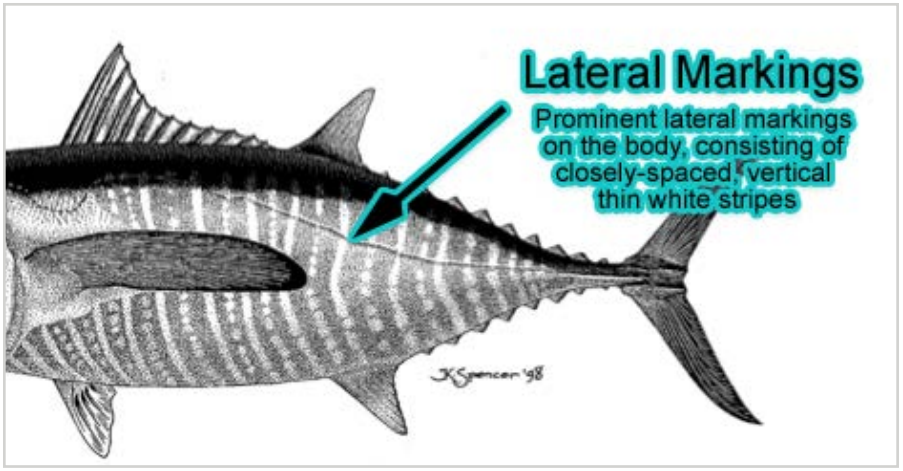
Illustration: Schafer, 1999

Acoustic Discrimination



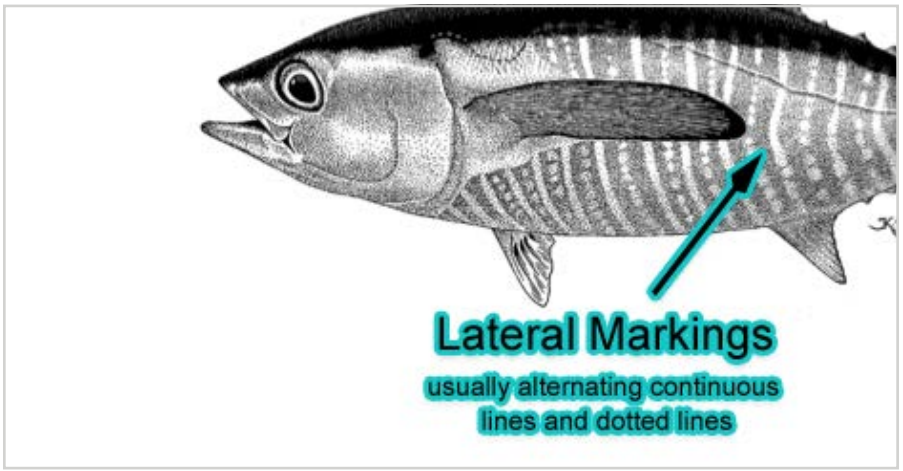
ISSF created a visual story on its website to explain the process and benefits of acoustic discrimination for more sustainable tuna fishing.

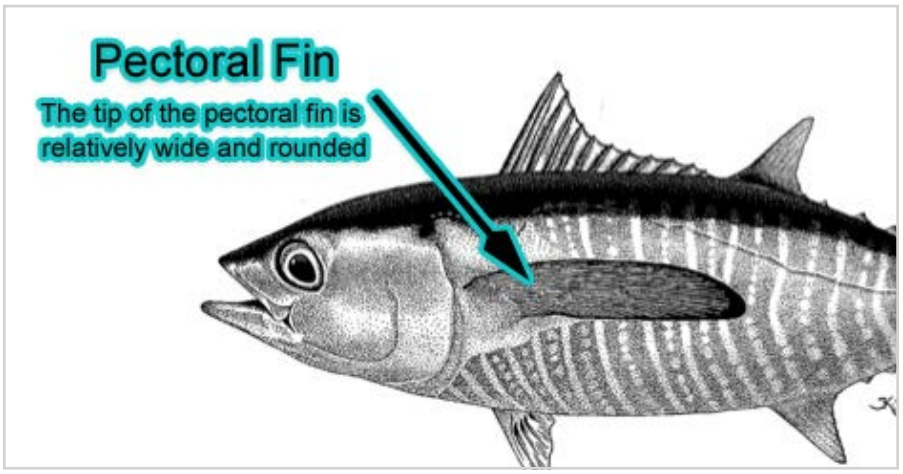
View the web feature



Lateral Markings

Illustration: Schafer, 1999

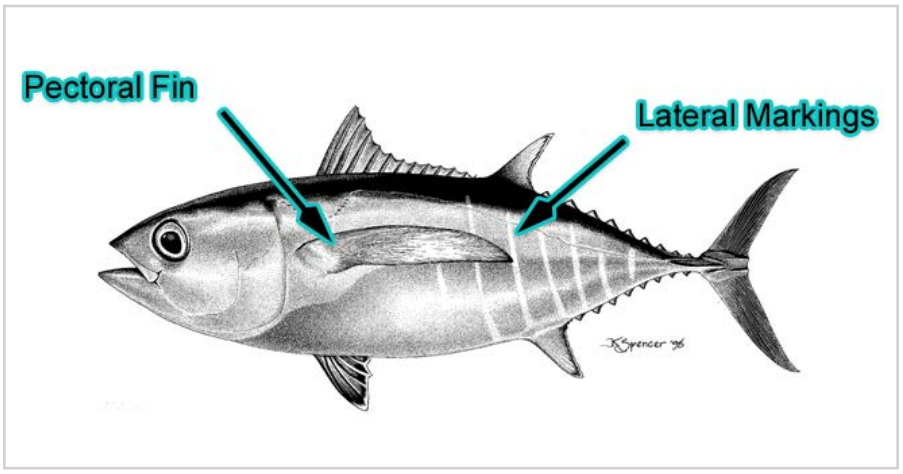




Pectoral Fin

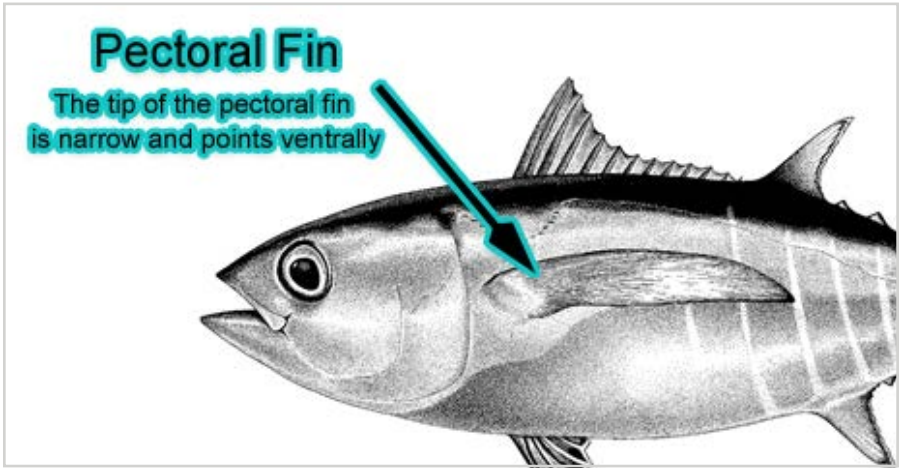
Illustration: Schafer, 1999

Bigeye (30-45cm)



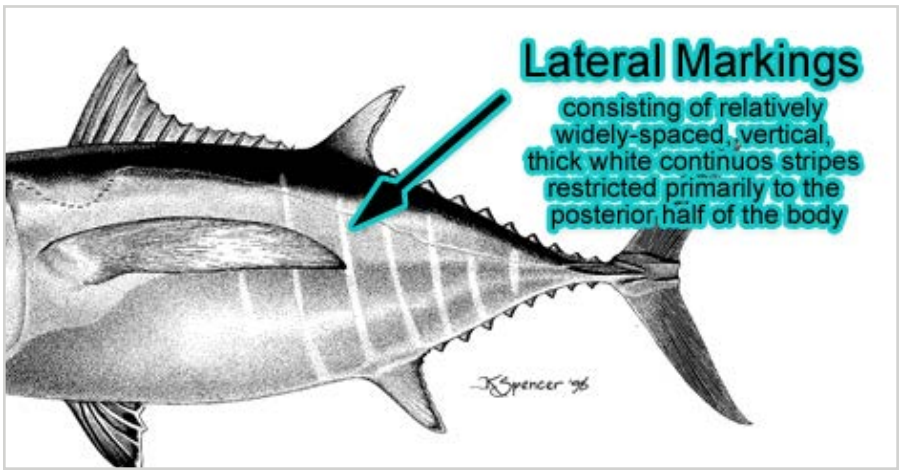
Small Bigeye Tuna

Illustration: Schafer, 1999



Pectoral Fin

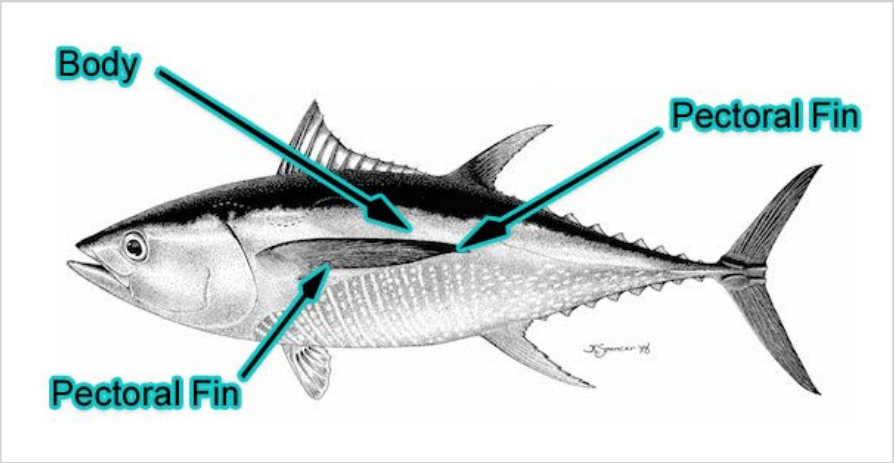
Illustration: Schafer, 1999



Lateral Markings

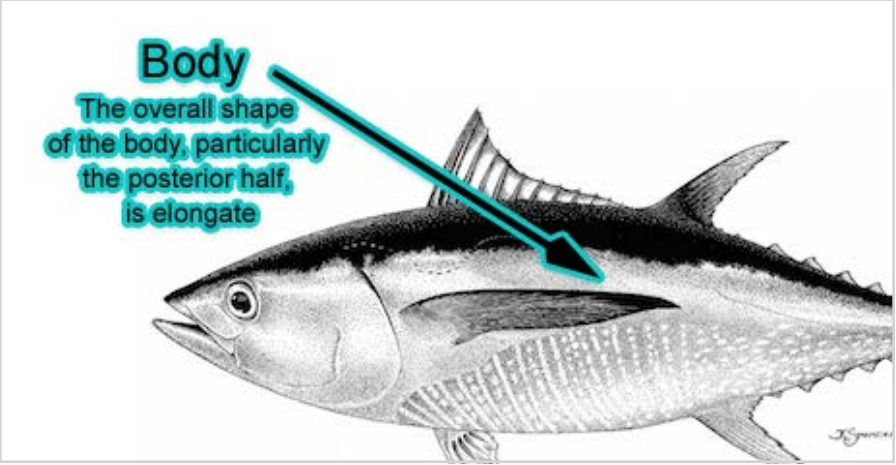
Illustration: Schafer, 1999

Yellowfin (46-110cm)



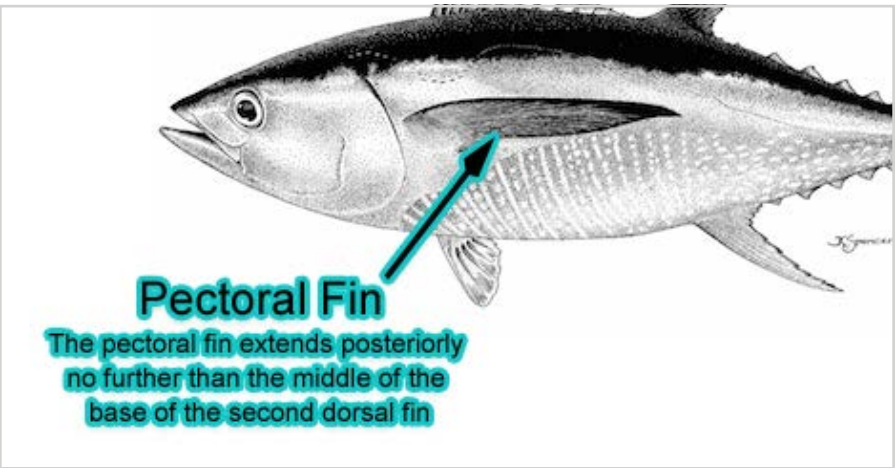
Medium Yellowfin Tuna

Illustration: Schafer, 1999



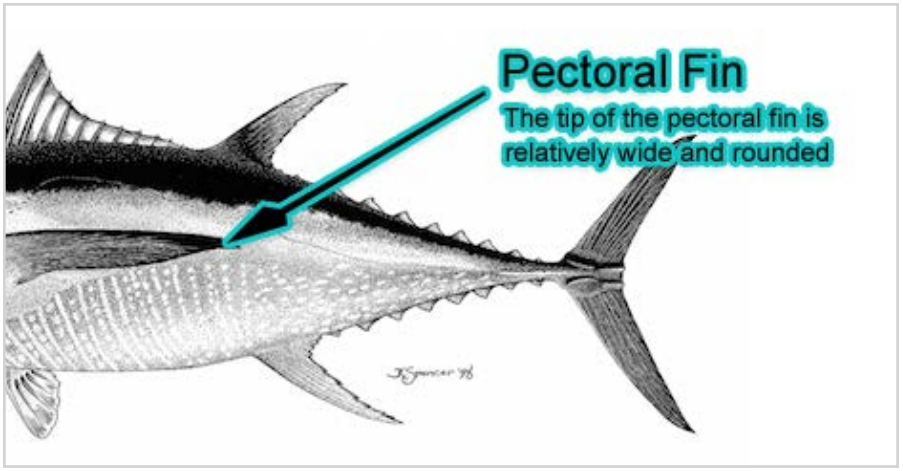
Body

Illustration: Schafer, 1999



Pectoral Fin Location

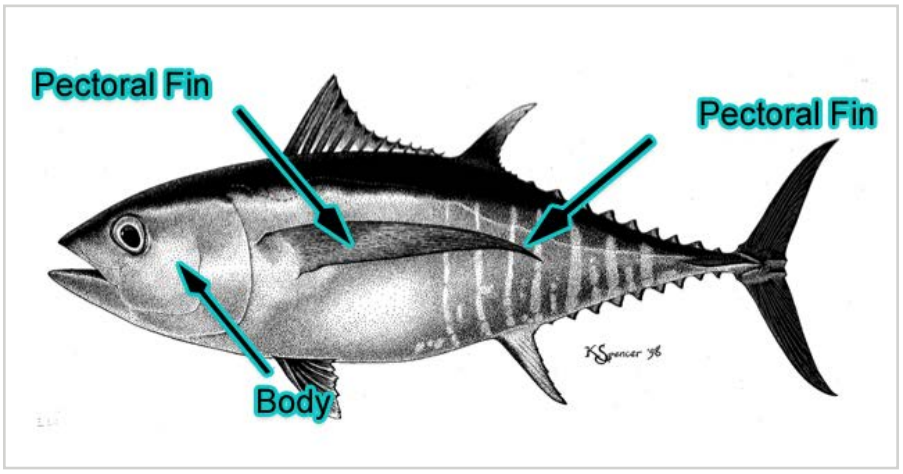
Illustration: Schafer, 1999



Pectoral Fin Tip

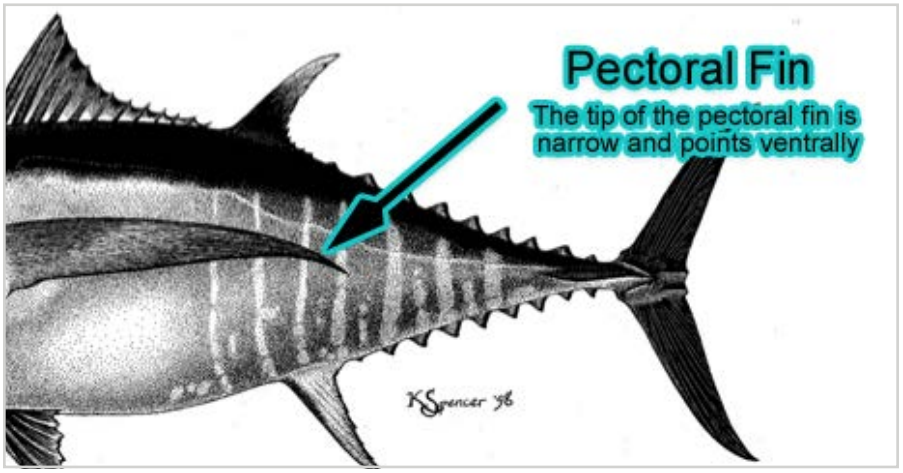
Illustration: Schafer, 1999

Bigeye (46-110cm)



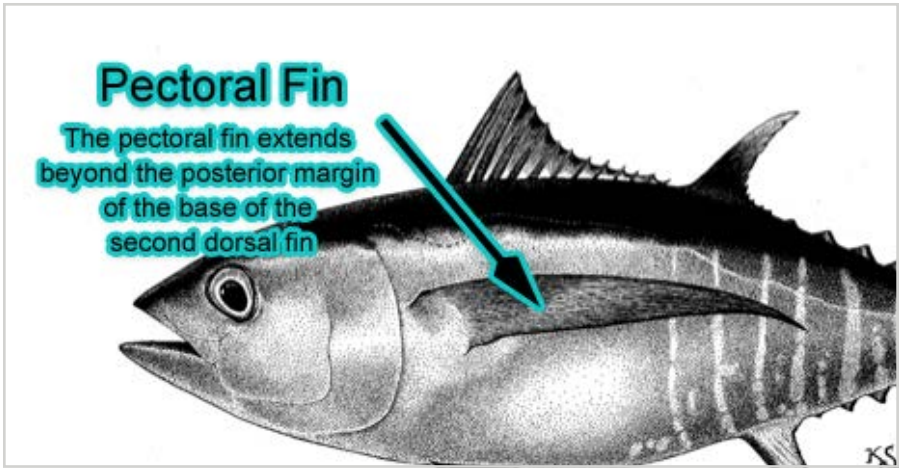
Medium Bigeye Tuna

Illustration: Schafer, 1999



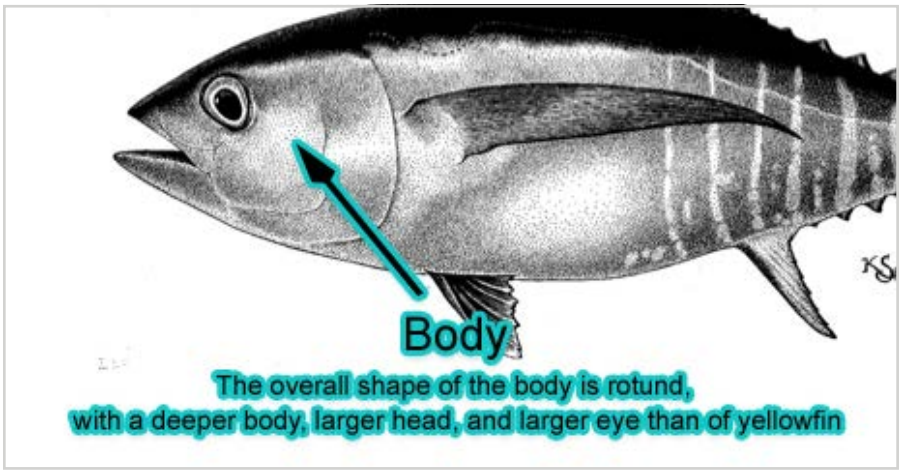
Pectoral Fin Tip

Illustration: Schafer, 1999



Pectoral Fin Location

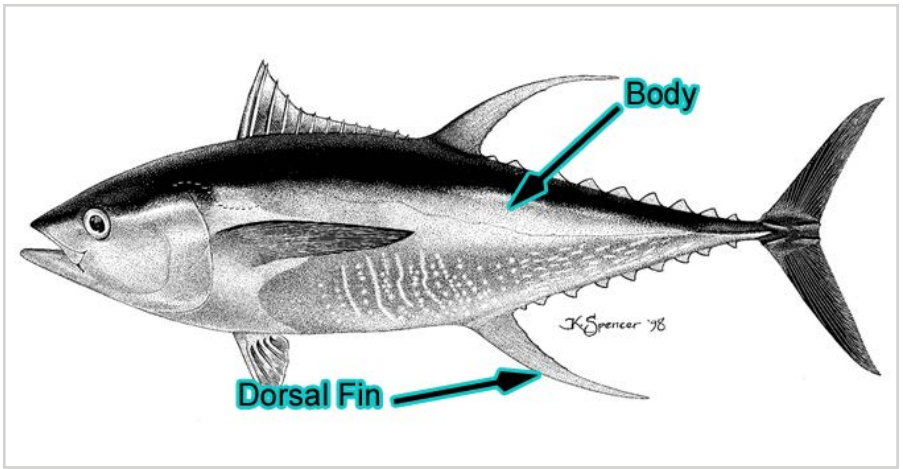
Illustration: Schafer, 1999



Body

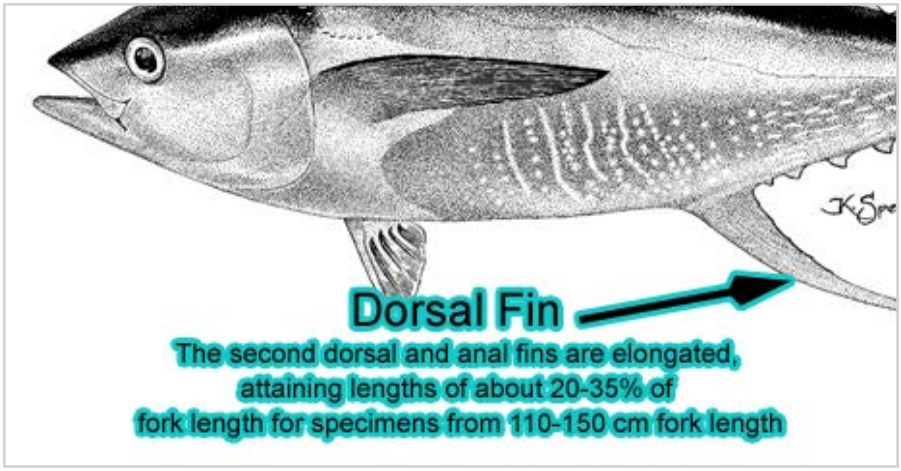
Illustration: Schafer, 1999

Yellowfin (>110 cm)



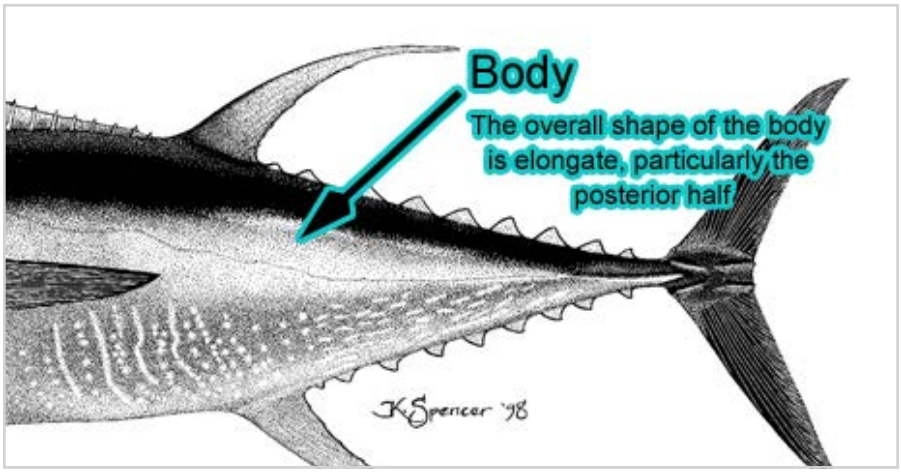
Large Yellowfin Tuna

Illustration: Schafer, 1999



Dorsal Fin

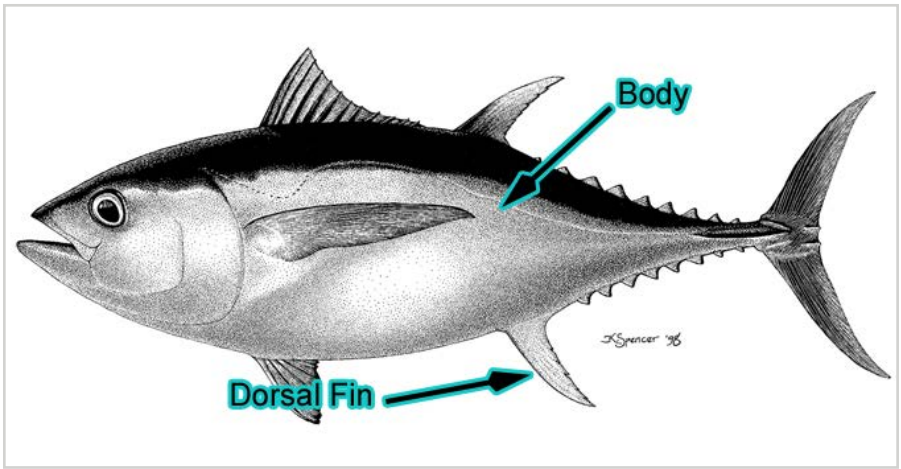
Illustration: Schafer, 1999



Body

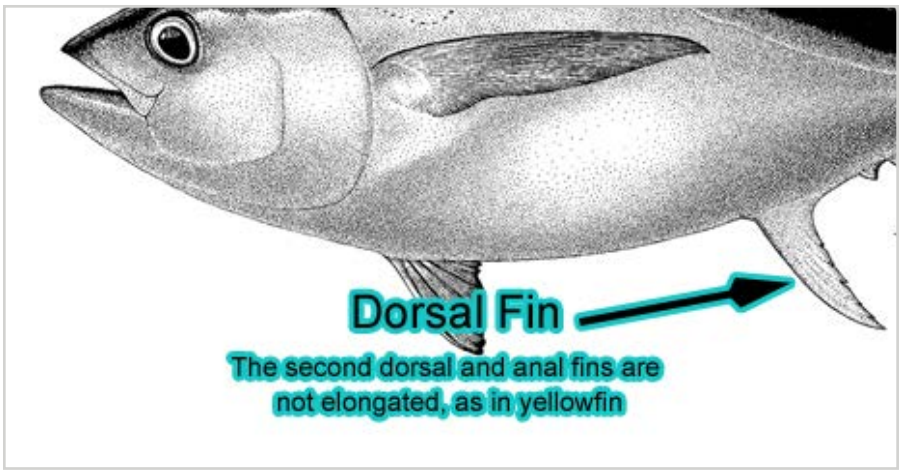
Illustration: Schafer, 1999

Bigeye (>110 cm)



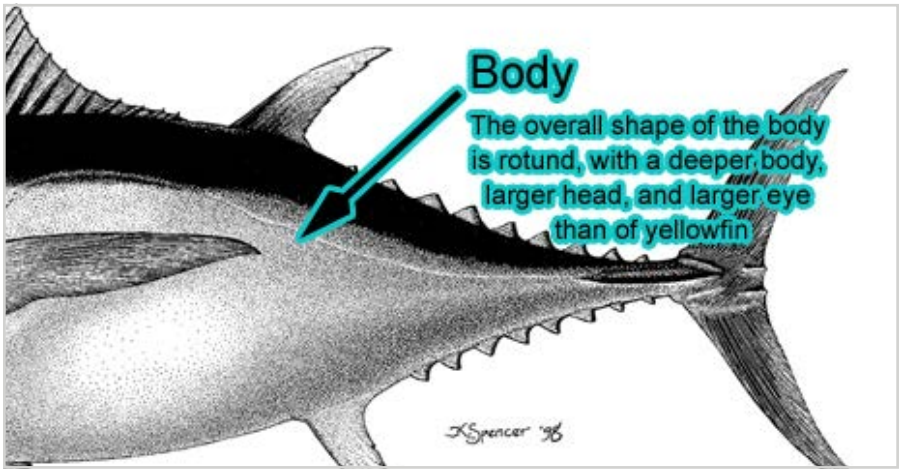
Large Bigeye Tuna

Illustration: Schafer, 1999



Dorsal Fin

Illustration: Schafer, 1999



Body

Illustration: Schafer, 1999

FISHER COOPERATION AND INPUT

If your vessel encounters a tagged fish, shark, ray, marine mammal, or sea turtle, please make an effort to recover the tag.

In most cases, instructions on where to report those recaptures appear on the tag. Generally, the date, location, animal's length (and sex when it is noticeable), and fishing conditions should be reported. This is valuable data for fisheries management decisions, stock assessments, and other biological research.

The bycatch mitigation and handling guidelines in this guidebook were developed with the input of scientists, skippers, crew, and fisheries managers. However, best practices are always evolving, and if new information becomes available, ISSF will update this guidance.

Share Your Ideas

If you have used successful alternative methods for bycatch mitigation and handling on your vessel, we are eager to learn about them and perhaps to test such techniques during our research cruises.

Share this information with us by sending an e-mail to info@iss-foundation.org.

Chapter 4: **Fisheries Management**

INTRODUCTION

The ability of Regional Fisheries Management Organizations (RFMOs) to manage tuna stocks is only as good as the quality of compliance by their many members. When vessels do their part to meet the RFMO obligations, they make a vital, fundamental contribution to the success and sustainability of the fishery.

INTERNATIONAL ORGANIZATIONS AND INSTRUMENTS

Tuna is an international resource, since tuna species strand and migrate across oceans and the waters of many countries. Moreover, tuna can be caught in one country by a vessel flagged to another, processed in a third country, and consumed in a fourth.

As a result, there are a great variety of organizations that shape the fishing process and management, from global (the United Nations) to regional (RFMOs), subregional (the parties to the Nauru Agreement in the western Pacific), and national (coastal and flag state) levels.

The United Nations Convention on the Law of the Sea (UNCLOS) established rules for the use of, and operation on, the world's oceans. It governs all aspects of ocean space, such as demarcation, environmental control, marine research, commercial activities, and the settlement of disputes relating to ocean matters.

CHAPTER OBJECTIVES

1. **Summarize the major organizations and instruments responsible for tuna fisheries management at the global, regional, and national levels**
2. **Outline the vessel-level actions necessary for compliance with RFMO obligations, such as fishing measures, data reporting obligations, observer requirements, and contribution to tagging programs and tag recovery**

Relevant Information for Fishers

Here are the aspects of UNCLOS most relevant to tuna fishers:

- Coastal states have sovereign rights to their territorial sea (12 nautical miles), and to the resources in their exclusive economic zone or EEZ (200 nm).
- All states are allowed the traditional freedom of navigation, research, and fishing on the high seas, as well as "innocent passage" of their vessels through other Coastal states' waters.
- All states undertaking activities that affect living marine resources on the high seas are obligated to adopt or cooperate with other states in adopting measures to manage and conserve those resources.

To implement this last point, the United Nations Fish Stocks Agreement (UNFSA) was conceived. Specifically, UNFSA does the following:

- Establishes principles for the conservation and management of highly migratory fish stocks that must be based on the precautionary approach and the best available scientific information
- Requires the management of those other species in the same ecosystem that are affected by fishing activities (i.e., bycatch)
- Requires both coastal and distant water fishing States to ensure compatible conservation measures between EEZs and the high seas
- Specifies the duties of flag States to exert control over their fishing vessels
- Contains rules on the establishment of RFMOs, including the obligation of fishing states to become members and comply with all measures

RFMOs' conservation and management measures vary somewhat, but they include these primary mechanisms:

- Catch and/or effort limits
- Catch and/or effort reporting
- Spatial and/or temporal closures, and gear restrictions
- Controls on at-sea transshipments
- Observer and Vessel Monitoring System (VMS) requirements
- Scientific data provisioning, reporting, and handling

Each RFMO has different ways of tackling these subjects. But in all cases, high levels of monitoring and compliance are key to successful management. Without compliance, excess catch depletes fish stocks, poor reporting and data provisioning prevents accurate assessment, and violating closures or observing requirements weakens necessary protections.

Decisions about stock assessments, catch limits, and management strategies are only as good as the quality of data received by the RFMOs' scientists, and vessels play a critical role in this process.

Conservation and management measures are adopted by the tuna RFMOs and implemented in the various flag and coastal states' laws and regulations. Fishers must be familiar with RFMO management measures and both the vessel's flag state's laws and the laws of the coastal state in which they are fishing. Fishers are encouraged to contact their flag state for more information on the applicable requirements for the RFMO in which they are fishing, and consult the RFMOs' databases for the full text of the measures.

This section contains descriptions of the main tuna RFMOs.

RFMO Information

For more info on the tuna RFMOs and their member countries, visit ISSF's Regional Fisheries Management Organizations page.

INTER-AMERICAN TROPICAL TUNA COMMISSION (IATTC)

The Inter-American Tropical Tuna Commission (IATTC) area of jurisdiction is the eastern Pacific Ocean. IATTC was founded in 1949, making it the oldest tuna commission in the world. The RFMO is relatively small. Its different working groups usually meet on an annual or biannual basis, although smaller groups meet on an ad-hoc basis as required. The IATTC manages transboundary stocks of temperate tuna in coordination with the International Scientific Committee of Tuna and Tuna-like species in the Northern Pacific Ocean (ISC), while tropical tuna are coordinated with the WCPFC.

Detailed information and full text resolutions and measures can be found at iattc.org.

The Commission applies the precautionary principle to fisheries management. The Commission interprets Maximum Sustainable Yield (MSY) as a target reference point and thus if catches for target species reach the MSY limit, management measures are sought.

Mandatory fisheries data submitted to the Commission include catch-and-effort data and length frequency data. In addition, the Commission holds information on gear, flag, and fish-carrying capacity for several fisheries. IATTC has an extremely comprehensive observer program covering 100% of large purse-seine vessels, although coverage on longline and small purse-seine vessels is not carried out by the secretariat.

WESTERN AND CENTRAL PACIFIC FISHERIES COMMISSION (WCPFC)

The management of fish resources in the WCPFC area is a complex task due to the diverse interests of coastal states and distant water fishing nations that share highly migratory resources.

Effective management rests on the provision of science by two scientific bodies external to the Commission that

in turn require timely and accurate provision of data by Commission members. The Ocean Fisheries Programme of the Secretariat of the Pacific Community (SPC-OFP) provides contracted scientific support to the Commission, through the Commission's Scientific Committee (SC), on tropical and southern stocks. On the other hand, the International Scientific Committee (ISC) provides non-contracted research to the Commission's Northern Committee (NC) on stocks occurring north of 20° N. SC and NC provide the scientific outcomes for consideration in the Commission's annual meeting.

Cooperation with other organizations includes many RFMOs such as IATTC, CCSBT and IOTC.

Detailed information and full text resolutions and measures can be found at wcpfc.int.

INTERNATIONAL COMMISSION FOR THE CONSERVATION OF ATLANTIC TUNAS (ICCAT)

Established in 1969, ICCAT has a relatively large membership, the majority of which are coastal states in the Atlantic region. The ICCAT secretariat plans budgets and facilitates the work carried out by the Commission, while national scientists from the contracting and cooperating parties conduct the data collection, scientific research and stock assessment of the key stocks managed by the Commission. Meetings of the various working groups occur annually, ensuring constant management discussion and revision where necessary. The Commission adheres to the precautionary approach to fisheries management and actively collaborates with other RFMOs to reduce IUU fishing.

The Commission specifically addresses issues such as discards and bycatch, protected and endangered species, IUU, and capacity. Recommendations adopted by ICCAT apply throughout the ICCAT area of competence, although they are implemented domestically by CPCs for operations both inside and outside their EEZs.

Detailed information and full text resolutions and measures can be found at iccat.int/en.

INDIAN OCEAN TUNA COMMISSION (IOTC)

IOTC was formally established in 1993. The objective of the Commission is to promote cooperation among its members with a view to ensuring, through appropriate management, the conservation and optimum utilization of stocks covered by this Agreement and encouraging sustainable development of fisheries based on such stocks. IOTC manages the transboundary stock of southern bluefin tuna in coordination with the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

Detailed information and full text resolutions and measures can be found at iotc.org.

The Scientific Committee advises the Commission and sub-commissions on research and data collection, the status of stocks, and management issues. As with other tuna RFMOs, separate subgroups composed of CPC-country scientists conduct research on specific areas of interest to the Commission. Both Commission and Scientific Committee meetings take place on an annual basis. Binding Conservation and management measures for CPCs are usually adopted by consensus of all members in a Commission meeting.

Members of the Commission must provide available and accessible statistical information on catch, effort, and sizes as well as information on bycatch and other affected non-target species.

COMMISSION FOR THE CONSERVATION OF SOUTHERN BLUEFIN TUNA (CCSBT)

The Commission for the Conservation of Southern Bluefin Tuna was founded in 1994. The Commission has no specific area of jurisdiction. Instead, the Commission applies to southern bluefin tuna (*Thunnus maccoyii* - SBT) throughout its global distribution. CCSBT is recognized as having the

principal SBT management role and therefore conducts the assessments and sets the conservation measures for SBT.

Science planning, execution, and analysis is primarily conducted by the Scientific Committee and Member States. CCSBT shares interest with several other RFMOs, namely WCPFC, IOTC and ICCAT.

CCSBT collects a variety of data types from its members and cooperating non-members, including total catch, catch and effort data, and catch at size data. Catch and trade information is also collected. CCSBT does not have a management area and has no mandate for managing species other than SBT, although the Commission has established a Working Group on Ecologically Related Species (ERSWG) and has taken measures to reduce the impact of SBT fishing on ecologically related species and bycatch.

Detailed information and full text resolutions and measures can be found at: ccsbt.org.

FURTHER NOTES ON DATA REPORTING AND COMPLIANCE

Purse-Seine Observer Coverage Requirements

For purse-seine vessels, although the details of the programs vary, in the WCPFC, IATTC, and ICCAT there are 100% coverage requirements (at least for certain geographical areas and/or times of the year and certain vessel sizes). In the IOTC, there is a 5% observer coverage requirement for vessels 24 m and greater in length overall operating on the high seas and for vessel less than 24 m if they fish in EEZs and on the high seas. Fishers operating purse-seine vessels in these RFMO Convention Areas must become aware of the specific applicable observer requirements.

Observers collect and report data on tuna catch, bycatch, and discards, among other things, through observer program worksheets and/or logbooks. In addition, some regions have port samplers who collect catch data as well. These data

are an essential part of the scientific evaluation of the tuna fisheries and the ecosystem they inhabit. Skippers should ensure that observers and port samplers are given the access necessary to carry out these important duties.

Through Conservation Measure 4.3(a) on Observer Coverage, ISSF asks its participating seafood companies to conduct transactions with large-scale purse-seine vessels only if they have 100% observer coverage (human or electronic if proven to be effective).

Tag Recovery and Reporting

Tuna (and other fish) tagging programs have a number of uses, but almost all scientific tagging programs share a common goal: gathering data about fish.

Most tagging programs seek information on fish movements, growth, behavior, and mortality. This data is critical to scientists' understanding of fish biology and for the creation of accurate models for stock assessments. Fishers might also encounter tagged seabirds, which will have small bands on their legs.

Simple tags have printed information and instructions on how to return the tag. These tags remain attached to the fish until it is caught or landed. Some high-tech tags monitor and record position and environmental data continuously. Some fish tags even pop off the fish at an appointed time, float to the surface, and transmit information via satellite.

If vessel crew catch or land a tagged animal, please take the time to remove the tag, note the time and location of the catch/landing, and ensure that the tag is returned to its owner. Often there are rewards for the return of tags — another reason to help contribute to the good management of your fishery.

Fishers must not remove the tags from live birds.

CONCLUSION

By reading this guidebook, you are ensuring that the vessels you skipper are compliant with the skipper training measure. The ISSF Skipper Training Conservation Measure requires that ISSF Participating Companies transact business only with vessels whose skippers have:

- Reviewed this purse-seine skippers guidebook, which is available as a downloadable PDF (multiple languages) or online (English only) at issfguidebooks.org. The guidebooks contain information on bycatch handling and mitigation, non-entangling and biodegradable FADs, mitigating ecosystem impacts, RFMO requirements, and other useful information about fishing sustainably **OR**
- Attended an in-person and/or online ISSF skippers workshop on sustainable fishing practices **OR**
- Attended an in-person skippers workshop conducted by a trainer that has been accredited by ISSF to conduct these workshops **OR**
- Viewed an ISSF skippers workshop video online

Share Your Suggestions

This guidebook to best practices in sustainable purse-seine tuna fishing is a living document that will continue to be updated.

ISSF welcomes suggestions at info@iss-foundation.org to improve the guidebook or ideas for further fisheries research.

COMPLETION FORM

You have now completed the review of the Skippers' Guidebook to Sustainable Purse Seine Fishing Practices.

For ISSF to record this activity and ensure that the vessel(s) you skipper receive(s) credit for meeting the related ISSF Conservation Measure, **you MUST follow the link on the right to complete a short online completion form.**

You will need to be connected to the Internet to submit the form. If you do not currently have Internet (wi-fi) access, please return to this page to complete this step when wi-fi is available.

Fill out the completion form here

Credits and Citations

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