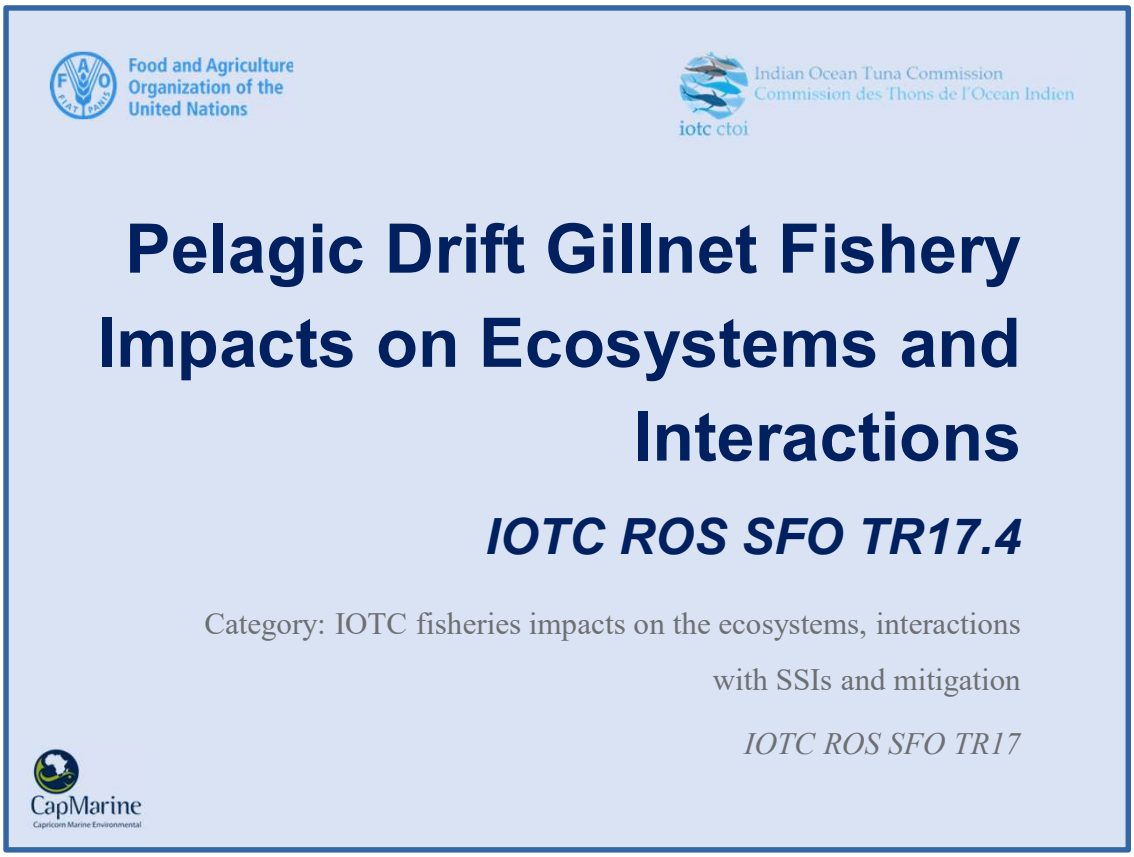
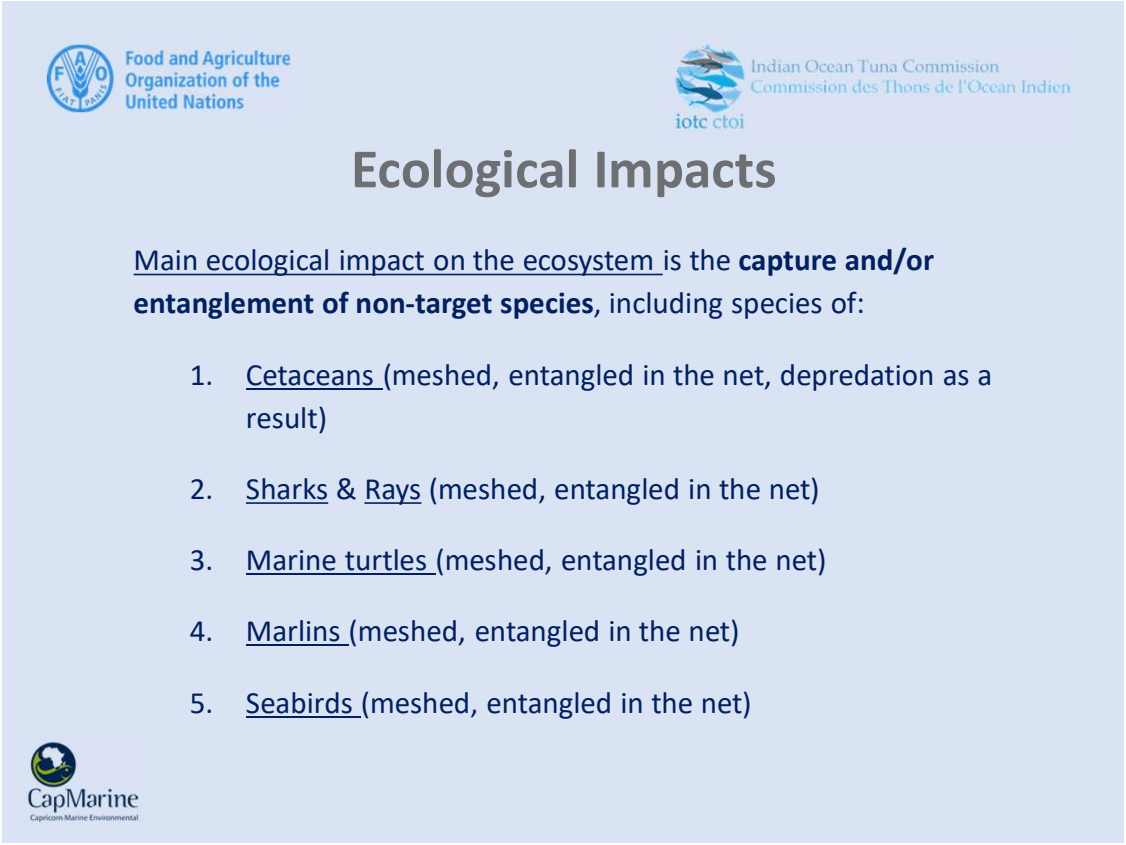


This module aims to familiarize Observers with the pelagic drift gillnet fishery impacts on ecosystems and interactions including the:

- Ecological impacts on non-target species;
- Fishery interactions with SSIs (including depredation);
- Possible mechanisms for mitigation of impacts of pelagic drift gillnet fishing on species of special interest.



Entanglements with gillnets set close to the surface is not discriminant and poses a high risk to a number of IOTC SSI including Endangered, Threatened and Protected (ETP) species, especially:

- sea turtles
- small and large cetaceans; and
- sharks.

Gillnets are designed not to be easily visible to passively catch the fish that swim into them. Therefore they are not easily visible to PET species that can get entangled when they swim into the net.

Pelagic drift gillnet fishing is a fishing method with low selectivity, both on the variety of species it catches as well as their size.

Net mesh size and hanging ratio strongly affect the selectivity of this fishing gear, that can target both adult and juvenile tropical and neritic tuna.

Gillnets are not easily visible and a large variety of non-target species are vulnerable to this fishery, including protected and vulnerable species.

The IOTC Res18/05 encourages the decrease of fishing pressure on these marlin species including Indo pacific sailfish, blue, black and striped marlins, categorized as threatened on the IUCN species list due to overfishing and listed as Species of Special Interest by the IOTC.

Pelagic drift gillnet fishing major ecological impacts on the ecosystems, also includes ghost fishing and pollution.

All species of sharks are vulnerable to the pelagic drift gillnet fisheries, with some of them being classified as threatened on the IUCN species.

Sharks contribute to a major part of the pelagic drift gillnet retained by-catch (64% of shark catches in the Indian Ocean are caught by gillnets), with some fleets being known to actively target sharks.

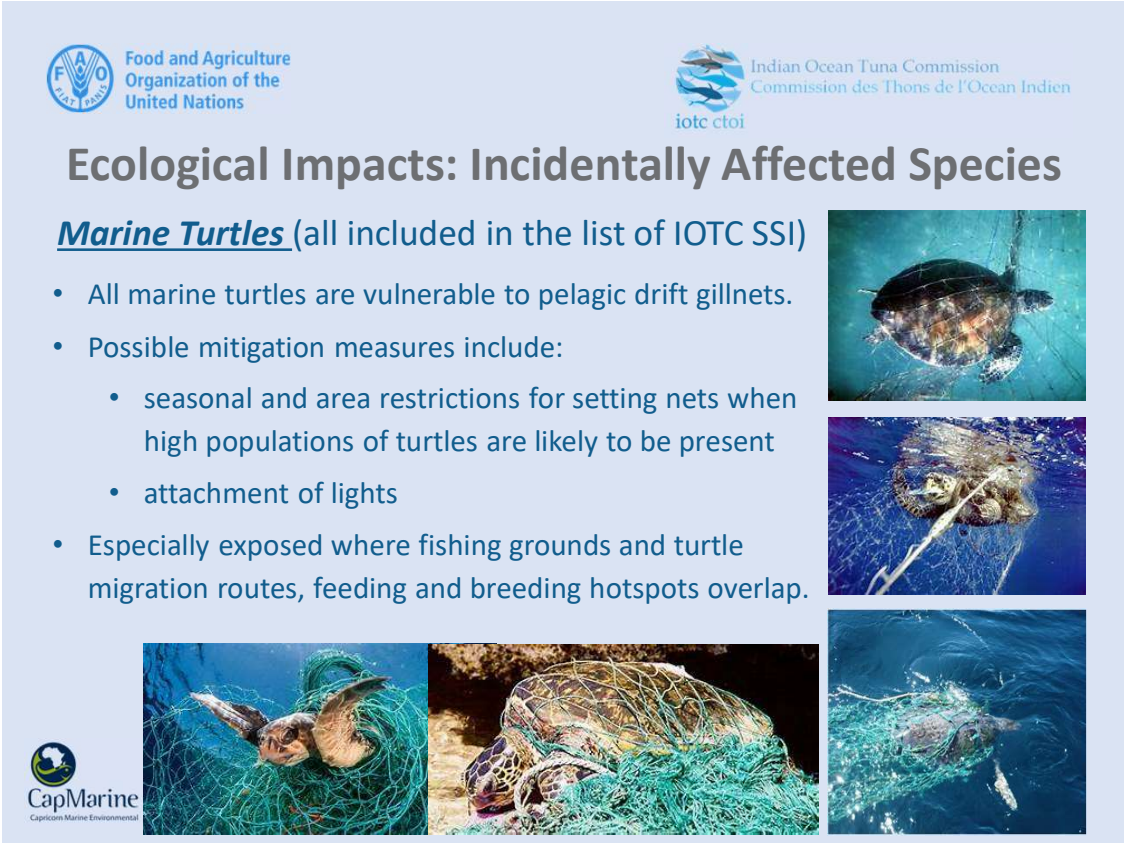
Many gillnet fisheries target sharks due to the value of their fins, and participate as such to the decline of shark species. Shark trunks are not as valuable as the fins, making finning and dumping of shark carcasses by gillnet vessels fishing on the high seas a common practice.

The IOTC has banned the use of large drift gillnets in the IOTC convention area on the high seas and CPCs EEZs (Res 17/07). Indian opposed this resolution and therefore fishing with large scale pelagic drift gillnets is allowed in the EEW of this CPC. The IOTC also approved other CMMs that protect Oceanic white tip sharks; Thresher sharks; Whale sharks and Scalloped hammerhead shark. Yet, no other IOTC CMMs is specifically designed to prevent shark by-catch with the gillnet fisheries.

Seabird mortality in gillnet fisheries occurs when diving seabirds encounter gillnets and become entangled in the net. As seabirds may encounter gillnets while they are set and hauled, seabirds may also be caught in nets set deeper than their maximum diving depth. Seabird bycatch has been documented in coastal and high-seas fisheries, as well as in drift and demersal gillnets.

Mitigation measures tested rely on making nets more visible to seabirds using

- coloured net mesh
- attachment of lights
- setting nets deeper (*diving seabirds most common in upper 20m*)



Gillnetting is a major source of mortality for all sea turtle species.

Turtles encountering a gillnet can quickly become entangled around their head or flippers as they try to escape.

Entangled turtles will drown if held under the water but have a higher chance of survival if they can reach the surface to breathe. The nylon can tighten around the turtle's soft body parts and cause deep cuts potentially leading to infections, limited movement, or complete loss of the limb. Limited use of appendages can impair a turtle's natural feeding, breathing, and swimming behaviour.

Marine turtles are especially vulnerable to gillnet fisheries where fishing grounds and turtle migration routes, feeding and breeding hotspots overlap, for example in the northeast Indian Ocean off Oman, where tuna gillnet vessels reported 600 turtles caught in 6-months (90% reported as released alive). Yet, there are strong concerns that the reporting of turtles caught on gillnets in the Indian Ocean is strongly under-estimated as well as their survival rates.

A variety of cetacean species are vulnerable to pelagic drift gillnet fishing. Since gillnets are not easily visible, marine mammals and small cetaceans can get easily entangled in gillnets when they swim into them and/or when attempting to prey on the fish caught in the net. It is estimated that gillnets caught an estimated total of 4.1 million small cetaceans between 1950 and 2018.

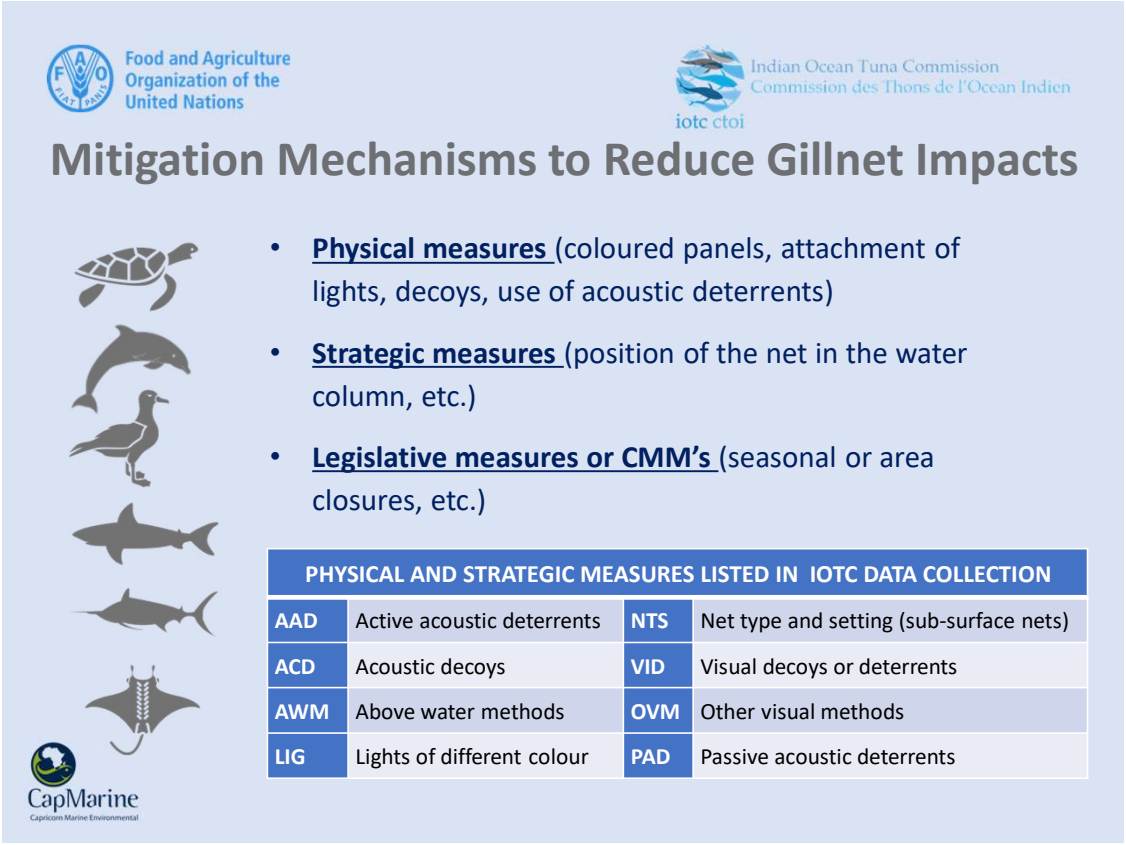
Reports indicate mortalities of:

- 100% sirenians (dugongs)
- 75% odontocete species (toothed whales)
- 66% pinnipeds (seals)
- 64% mysticetes (baleen whales)

Cetaceans interacting with gillnet fisheries in Indian Ocean region include:

- bottlenose dolphin
- common bottlenose dolphin
- Risso's dolphin
- spinner dolphin
- whales such as Bryde's whale, and Eden's whale

The high risk of cetacean mortality was one of the main reasons for international communities adopting the moratorium (ban) on large scale driftnets.



Mitigation measures to prevent interaction's with gillnets can be divided into to 3 categories : physical measures, strategic measures and legislative measures or Conservation mitigation Measures (CMMs)

- Physical measures include making the nets visible (coloured panels, attachment of lights, decoys) and using visual and acoustic deterrents (active and passive devices).
- Strategic measures imply the application of strategic mitigation measures aimed at fishing strategies such as changing the positioning of the net in the water column to prevent catching sea turtles, setting nets at night to prevent seabirds diving into the net.
- Legislative measures or CMM's can include the promulgation of seasonal or area closures to protect turtle migrating corridors, and areas with high populations of turtles; restrictions of soak time to allow for some of the PET species to be released before they drown.

Currently no mitigation measures are specifically covered in the IOTC Resolutions, except for the ban of large scale drift gillnets (pelagic drift gillnets with a length of more than 2.5 km) (Res 17/07).

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Acoustic Decoys or Deterrents

Can be used with:
- Gillnet
- Longline
- Purse Seine

Useful in reducing bycatch of:
- Marine Mammals
- Seabirds

Include:
1. Passive acoustic devices
2. Pingers
3. Acoustic Harassment Devices (AHDs)
4. Predator sounds

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1 – Objects such as rubber tubes are attached to fishing nets to alert cetacean to their presence.

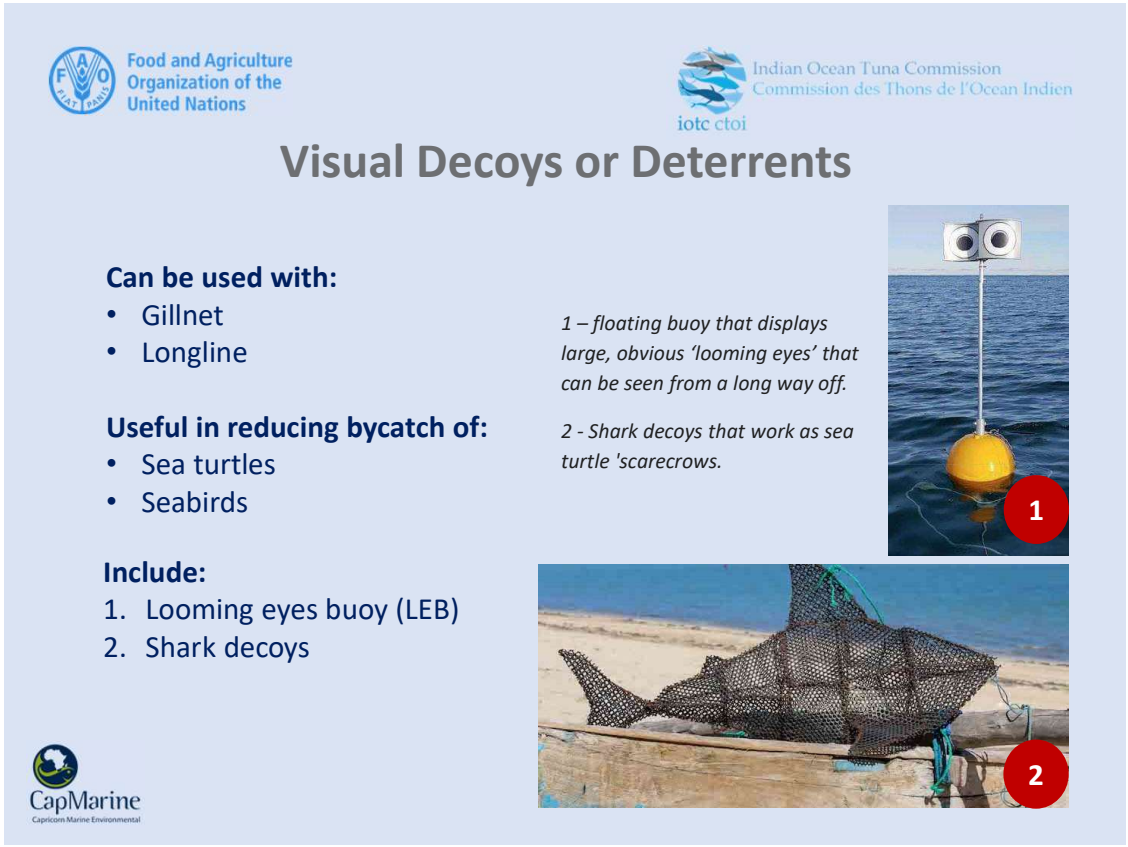
2 - Acoustic pingers are used to repel cetaceans away from fishing nets.

Acoustic decoys and deterrents use sound to discourage or distract bycatch species such as sea mammal and seabirds from interacting with the fishing gear.

Acoustic deterrents consist of a range of devices that either emit sounds, using electrical or mechanical means, or acoustically reflect those emitted by echolocating cetaceans. These devices may be deployed on or near fishing gear and include categories referred to as pingers, acoustic harassment devices (including seal-scarer devices), and acoustic alerting devices. Their intended use is to enhance detection of fishing gear by those cetaceans that echolocate for prey detection and other reasons: to do so, they may create an alert or unappealing sound that causes animals to avoid the sound source, or associate it with an obstacle to avoid.

- ***Pingers*** tend to be relatively small, cylindrical units roughly the size of a soda can. They produce sound at different frequencies, and are most commonly used to avoid the bycatch of small cetaceans in gillnets.
- ***Acoustic Harassment Devices*** (AHDs) using higher sound outputs that typically inflict pain or discomfort.
- ***Passive acoustic devices***, objects such as rubber tubes, thick polyester rope, and chains attached to fishing nets to alert a marine cetacean to their presence using echolocation.
- ***Predator sounds*** mainly include the playback of killer whale calls, with the aim of prompting marine mammal prey species to flee or avoid the area the sound is being emitted from.

There is evidence to support the contention that pingers are one of the best technical measures available to mitigate bycatch of some cetacean species, predominantly in gillnet fisheries.



Visual decoys or deterrents include shark decoys for turtles and floating buoy that displays large eyes for seabirds.

Shark decoys have been shown to work as sea turtle 'scarecrows', though these decoys also frightened-off target finfish species (tunas, billfish, mahi-mahi). However, there remains potential to develop decoys which maintain target species catch rates while deterring sea turtles from approaching gillnets.

Researchers have also developed a floating buoy that displays large, obvious 'looming eyes' that can be seen from a long way off. As the buoy bobs in the water, the tall pole sways conspicuously, and the eyes rotate in the wind. The idea for this 'looming eyes buoy' (LEB) came from two visual stimuli that stimulate an avoidance response or trigger a collision risk signal in birds' brains. Trials are underway to test whether the LEB triggers a significant 'escape' response from marine seabirds attending gillnet fisheries.

LED illumination of gillnets (a low cost tool) has been used successfully to reduce sea turtle bycatch without reducing target catch. Reduction in the incidental capture of seabirds has also been demonstrated.

Green LED lights affixed to gillnets reduces the number of seabirds unintentionally snared when diving into the water for fish by 85 percent. The method was originally developed to save sea turtles. Green became the colour of choice because turtles are able to see the wavelength, but fish aren't, meaning the light can be used to shoo / scare turtles away without jeopardizing catch. The number of sea turtles accidentally caught in fishing nets dropped by 64 percent when green LEDs were in place.

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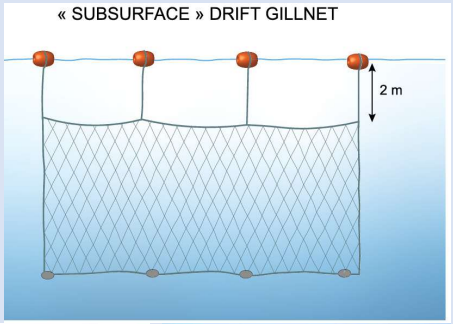
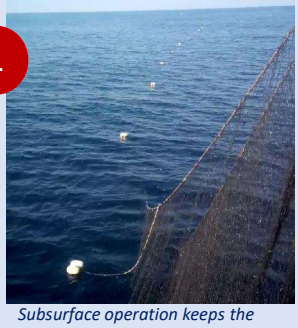
Sub-surface Gillnets

Can be used with:
- Gillnet

Useful in reducing bycatch of:
- Sea turtles
- Seabirds
- Marine Mammals
- Sharks and Rays
- Billfish



Floats attached to headline of the subsurface gillnet



Subsurface operation keeps the gillnet 1.5 to 2 m below the surface

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With sub-surface gillnets the headline of the net is set below a specified depth, usually 2 m in research to date. This method of gear deployment is still in an experimental stage.

Tests conducted in Pakistan by WWF-Pakistan showed a major reduction in entanglement and mortality of cetaceans and turtles in subsurface gillnet. Entanglement and resultant mortality of cetaceans were observed to decrease by 98.45 %. The catches of billfish (including sailfish, marlins and swordfish) is also substantially reduced in subsurface gillnet operations as compared to surface placement of nets (IOTC-2019-WPEB15-48).

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ANY QUESTIONS?

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