

# APPENDIX 1. Bycatch

## Impacts by gear type

All fishing gears have some level of environmental impact, and bycatch is one of the most noticeable ones. This summary presents the overall ratings given by default to various gear types. Deviations from these color ratings may occur for individual stocks, due to advice from the ISSF Scientific Advisory Committee; these are noted for each particular stock in which deviations may occur.

This summary is presented only for non-target (non-tuna) species. Note that in some ocean regions, fishing modes such as FAD-based purse seining and pole-and-line fishing can result in high catches of small individuals of bigeye and yellowfin, which are undesirable. In this stock status report, these impacts are measured directly under the status section for these stocks.

Sources of information used for these ratings include the following: Amandè et al. (2010), Clarke and Harley (2010), FAO (2009), Gillett (2011), Gilman (2011), Harley, et al. (2011), IATTC (2012), IOTC (2005), IOTC (2015), Matsumoto and Bayliff (2008), Morizura et al. (1999), Olson (2010), Pianet et al. (2010a), Pianet et al. (2010b), SPC/OFP (2008), SPC/OFP (2010) and Justel-Rubio and Restrepo (2015).

ORANGE

### GILLNET FISHING

Gillnet fisheries take substantial amounts of tunas in various ocean regions, especially in the Indian Ocean. For the most part, these are poorly monitored but it is known that they tend to catch many different species at the same time. Bycatch rates of many non-target species tends to be high. Large-scale driftnets are generally prohibited on the high seas but appear to continue to be used.

**Sharks.** Silky, oceanic whitetip and scalloped hammerhead sharks are common in gillnet fisheries. All of these species are of concern because of their low productivity and vulnerability to overfishing.

**Sea Turtles.** Sea turtle bycatch is thought to be highest in gillnet fisheries compared to other gears.

Sea birds. The incidental catch of sea birds in gillnet fisheries is largely unknown.

**Other finfish.** Gillnet operations catch a number of other finfishes. Some of these include very productive species such as dolphinfish ("mahi-mahi") that are not of immediate concern.

GREEN

### HANDLINES

This mode of fishing typically results in small bycatch rates.

ORANGE

### LOONGLINING

**Sharks.** Longline fisheries tend to have very high catch rates of sharks (in some areas, 30% of the longline catches are sharks). In some cases the sharks can be a target of the fishing operations, at least for parts of a trip. Sharks caught include a wide range of species, some of which are thought to be resilient to fishing (blue shark), and others which are likely to be more vulnerable

because of their low reproductive rates (e.g., porbeagle and thresher sharks).

**Sea Turtles.** Some turtles are also caught in longline operations as bycatch, many of which are discarded (including live releases). All RFMOs have some type of mitigation measure in place. Roughly one half, or more, of the turtles caught are alive, so the main mitigation measures aim to dehook them and release them alive.

**Sea birds.** Some sea birds are also caught in longline operations as bycatch, especially in higher latitudes. Most (~90%) sea birds caught are dead when brought onboard, so the best practice for mitigation is to avoid their being hooked, which is the main type of mitigation measure used by the RFMOs. Of particular concern are albatrosses and petrels.

**Other finfish.** After tunas and sharks, longline operations catch a number of other finfishes. Some of these include very productive species such as dolphinfish ("mahi-mahi") that are not of immediate concern. Longlining also catches marlins, some of which are estimated to be overfished.

ORANGE

### MID-WATER TRAWLING

This mode of fishing has a small bycatch rate of cetaceans.

YELLOW

### POLE-AND-LINE FISHING

There are no major concerns with the catch of vulnerable non-target species by this gear. However, the method requires the use of live baitfish (small pelagics) that are used to keep the schools of tunas attracted to the fishing vessels while they are fished. The effects of fishing on these populations is largely unknown; however, they should be managed in order to support pole and line fisheries. Gillett (2011) notes that the amount of baitfish

available in the WCPO is a limiting factor to the amount of pole and line fishing that can occur. In addition, the bait species captured are generally more fragile than temperate baitfish species.

GREEN

#### PURSE SEINING ON FREE SCHOOLS

This mode of fishing typically results in small bycatch rates of non-target species.

YELLOW

#### PURSE SEINING ON FADS

Purse seining on FADs (anchored FADs, drifting FADs and natural logs) generally has bycatch rates of non-target species that are higher than those of free school sets.

**Sea Turtles.** The number of turtles that die in purse seine fishing operations is very small. Nevertheless, it is relatively easy to release turtles when caught alive and this is the main mitigation measures used by RFMOs.

**Sharks.** FAD purse seine fishing operations catch several species of sharks, some of which, based on catch trends, may have been declining in abundance in recent years, such as oceanic white tip and silky sharks. Entanglement can be a significant problem, especially if FAD designs use underwater netting materials with large mesh sizes. ISSF is advocating for RFMOs to require non-entangling designs.

**Sea birds.** Mortality of other sensitive species like seabirds in FAD operations is almost nonexistent.

**Other finfish.** FAD fishing does result in large catches of other finfish such as dolphinfish ("mahimahi"). Currently, it appears that these catches do not adversely impact the abundance of these species which are very productive and resilient to fishing. Rather, the main problem with these bycatches is one of utilization (waste), since the majority of these are discarded at sea so that the fish holding tanks can be reserved for the more valuable tunas.

YELLOW

#### PURSE SEINING ON TUNA-DOLPHIN ASSOCIATIONS

**Marine mammals.** In the EPO, purse-seine fishermen have learned to take advantage of the association between yellowfin schools and herds of dolphins that is prevalent in the region. Fishermen maximize their catches of yellowfin by setting their nets around these associations. Mortality of dolphins was very high early on, but the IATTC estimates that it has since the late 1980s declined by 98% after fishermen and scientists developed techniques for releasing the dolphins alive after a set, and retaining the tunas. Some scientists believe that there is an un-quantified level of mortality after the sets, caused by stress, and this remains a controversial issue. Based on fishery-independent surveys, the abundance of most dolphin populations in the region was estimated to be either stable or increasing, while a few may have been declining. The last such survey was in 2006 and as a result there is uncertainty in the current status of those populations. Thus, the rating for this fishing method has changed from Green to Yellow (November, 2015). The Agreement on the International Dolphin Conservation Program (AIDCP) establishes allowable dolphin mortality limits; current (2011) levels are one-fourth of that level. There is a 100%-coverage observer program in place for these operations. Catches of non-target species in these operations are very small.

GREEN

#### TROLLING

This mode of fishing typically results in very small bycatch rates of non-target species.

GREEN

#### TUNA TRAPS

Migrating schools of bluefin tuna have been caught by traps that are fixed near the shoreline, especially in the eastern Atlantic and Mediterranean. Most of the catch in these traps consists of scombrids, including bluefin, and up to 99% of it is utilized. There are no major bycatch issues known with this passive gear, although it occasionally catches sharks.