Sustainable Fisheries
PARTNERSHIP

Best Practices in Tuna Longline Fisheries

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Introduction

Tuna caught using longline fishing techniques is an important component of world tuna production but potentially imposes a heavy ecological burden on accidentally caught non-target species, also known as bycatch. However, although longline fishing poses real risks, it is possible to substantially reduce bycatch through adopting a range of measures that together constitute best practices. This short briefing reviews the issue of bycatch in longline tuna fisheries and identifies practices that can reduce the problem. It also provides examples of fisheries where best practices have been adopted and urges the seafood industry to insist on such practices when sourcing tuna.

Unlike many of the difficult political problems that beset tuna fisheries, bycatch reduction is something that the fishing industry can achieve without international diplomacy and implementation can be rapid given sufficient will. Companies that source longline tuna can make requests of their suppliers that best practices are adopted and work with other businesses to see that such approaches are replicated across whole fleets and fisheries.

Tuna from longline fisheries

Tuna are caught by a variety of fishing gears including purse seines, hook and line, harpoon, traps, and longlines. Longlines caught on average 12% of all tuna worldwide between 2009 and 2013 (ISSF 2015). Longlines are used to target a variety of tuna species including albacore, bigeye, yellowfin, and bluefin (Pacific, Atlantic, and southern) tuna and are the primary gear used to capture albacore and bigeye tuna worldwide. The percentage of bluefin tuna caught by longlines has decreased over time as purse seine fishing has become more important. Longline catches of yellowfin tuna have remained fairly stable over time, currently representing less than 20% of the total catch (ISSF 2015).

Longlines consist of a monofilament main line with branchlines attached. The branchline design can vary but typically is made up of the line, leader, and hook. The line is usually kept near the surface or at a specific depth range with regularly spaced branchlines in between pairs of floats (FAO 2003). Longlines set in the upper part of the water column typically target yellowfin tuna, while gear deployed at deeper depths target bigeye or albacore tunas. Bluefin tuna tend to be targeted in intermediate water depths.

Several different types of longline fisheries target tunas throughout the world. These include 1) industrial fisheries – typically large vessels with advanced mechanical and fish-finding navigation systems and high capital investment; 2) small-scale fisheries – small vessels with labor-intensive fishing and little capital cost, which can be for subsistence or commercial use; and 3) artisanal fisheries – traditional family or household fisheries with small capital investment and small vessels that make short trips (FAO 2005).

The primary product forms of yellowfin tuna are canned, fresh whole fish, frozen pre-cooked loins, and raw frozen loins and steaks. The primary product forms for bigeye tuna are fresh whole fish and fresh fillets for sashimi. Albacore tuna is sold most commonly as canned white tuna but is also sold as both fresh and frozen products. North Pacific and Atlantic (western and eastern/Mediterranean) bluefin tuna are primarily sold fresh (super frozen) for the sashimi

market. Southern bluefin tuna are sold as fresh (super frozen) to the sashimi market (Atuna 2014)(ISSF 2014).

Longline tuna fishing and bycatch

Bycatch, defined here as the incidental take of non-target species, has been identified as one of the most significant issues affecting both the management and conservation of marine fisheries (Hall et al. 2000, Lewison et al. 2014, Wallace et al. 2013). The type and amount of bycatch associated with individual fisheries depends on several things, including gear design (e.g., hook type), fishing method (e.g., time of day of setting), and the spatial overlap between fishing effort and individual species' distribution (Lewison et al. 2009, Wallace et al. 2008). Longlines have been identified as having one of the highest bycatch rates for many species (Lewison et al. 2014). This incidental bycatch is considered to be a global threat to long-lived animals such as sharks (Dulvy et al. 2014), sea birds (Lewison et al. 2012), sea turtles (Wallace et al. 2013), and marine mammals (Read et al. 2006).

Sharks, sea turtles, sea birds, and marine mammals are highly susceptible to incidental capture in tuna fisheries. Many of these species are distributed across large geographic areas and therefore have a large overlap with tuna fishing grounds, cross-geopolitical boundaries (making them difficult to manage), and have life history characteristics that make them especially vulnerable to fishing pressure. The life history characteristics of sharks, sea turtles, sea birds, and marine mammals include attaining sexual maturity at a late age, having a long reproductive cycle, and producing a small number of young. In addition to these bycatch species, small and/or undersized tunas and billfish are often discarded after capture and therefore constitute additional bycatch in longline fisheries.

The bycatch of these species in longline (and other) fisheries is of great concern, as many of their populations have declined greatly in recent years. For example, it is currently estimated that 1.1% of shark species assessed by the International Union for the Conservation of Nature (IUCN) are Critically Endangered, 1.4% are Endangered, 4.6% are Vulnerable, and 6.4% are Near Threatened (Dulvy et al. 2014). Six of the seven species of sea turtles are currently listed as Endangered or Critically Endangered by the IUCN. In addition, 61 species of sea birds are incidentally captured in longline fisheries, including 26 species that are threatened with extinction. The ecological impacts of the loss of these species are discussed in further detail below.

Ecological impacts of longline fishing

Sharks, tuna, and billfish are considered to be top predators in many ecosystems, playing a critical role in their structure and function (Stevens et al. 2000) (Libralato et al. 2005){Morgan and Sulikowski 2015}. The loss of sharks has been shown to negatively impact several ecosystems. For example, the loss of sharks can lead to changes in the abundance of their prey species, which can lead to a cascade of other trophic level impacts in the ecosystem (Myers et al. 2007, Duffy 2003, Ferretti et al. 2010, Schindler et al. 2002, Ruppert et al. 2013). The reduction in biomass of tunas and billfish can result in similar changes to the ecosystem (Ward and Myers 2005). In addition, behavioral changes, such as changes to the activity level of prey

species, their diet, and/or habitat utilization can be caused by the loss of sharks (Heithaus et al. 2007).

Sea turtle bycatch is problematic primarily in the tropics and subtropics. Sea turtles with hard shells tend to bite baited longline hooks resulting in their capture. Leatherback turtles, however, rather than ingesting baited hooks, tend to get caught by becoming foul-hooked on the body and entangled.

Sea birds are typically caught during the setting process, primarily in fisheries that occur in higher latitudes. Sea birds become hooked or entangled while trying to remove the bait, are dragged under water, and subsequently drown as the gear sinks.

Marine mammals, toothed whales, and, less frequently, baleen whales are occasionally entangled and hooked, which can result in injury and mortality. Interactions with pinnipeds may also occur in coastal longline fisheries. For example, the Hawaii longline fishery had occasional captures of Hawaiian monk seals (*Monachus schauinslandi*) prior to the adoption of a closed area around the Hawaiian Islands.

Data reporting issues in the Western and Central Pacific Ocean

Western and Central Pacific Fisheries Commission (WCPFC) member countries are required to collect and report certain catch and effort data to the Commission (WCPFC 2014a). However, notable examples of non-compliance and data gaps persist. For example, the Scientific Committee has noted that the lack of operational data (i.e., set-by-set data) from some vessels fishing on the high seas (China, Japan, Korea, and Chinese Taipei) hinders the assessment process or target and bycatch species. In addition, China, the Philippines, Belize, and Indonesia have been identified as non-compliant or potentially non-compliant with scientific reporting of annual catches. China and the Philippines have also been identified as non-compliant with reporting on the number of active vessels. Belize, China, Indonesia, and Korea have been non-compliant with providing catch and effort data aggregated by time period and area. With

regard to reporting size composition data, China, El Salvador, Korea, Belize, Ecuador, EU, and the Philippines have been non-compliant (WCPFC 2014b).

Best practices in avoiding bycatch in longline tuna fisheries

Best practices have been identified for a number of species and include:

Sharks/rays: 1) use fish instead of squid for bait (Watson et al. 2005, Yokota et al. 2006, Gilman et al. 2007a), 2) prohibit the use of wire leaders or shark lines (Branstetter and Musick 1993, Stone and Dixon 2001, Ward et al. 2008a), 3) avoid hotspots (i.e., areas where sharks are commonly caught in large numbers), 4) set longline gear in deeper waters, 5) move fishing locations when shark interaction rates are high (Gilman et al. 2008a), and 6) reduce soak times (Ward et al. 2004).

Sea turtles: 1) use of wide circle hooks (compared to narrower J and tuna hooks) along with large whole bait fish instead of squid species for bait (Bolten and Bjorndal 2002, Bolten and Bjorndal 2003, Bolten and Bjorndal 2005) and 2) set in water deeper than 100 m (Largacha et al. 2005, Watson et al. 2005, Gilman et al. 2006b, Ryder et al. 2006, Gilman et al. 2007a, Sales et al. 2010).

Sea birds: 1) avoid fishing during peak periods of foraging; 2) use blue-dyed bait, shield deck lights, require offal and other discards to be retained and require the use of artificial bait; 3) use underwater setting devices; and 4) use bird-scaring “tori” lines, object cannons, towed objects, and acoustic deterrents (Brothers et al. 1999, FAO 1999, Gilman et al. 2003, Gilman et al. 2005, Gilman et al. 2007b, Gilman et al. 2008b, Robertson et al. 2010).

Marine mammals: 1) avoid fishing in known hotspots; 2) conduct fleet communications to determine where marine mammal sightings may have occurred and move fishing locations when interactions occur; 3) use circle hooks (Gilman et al. 2006a, Nowacek et al. 2007, Hamer

2009); and 4) use “weak” hooks, designed to straighten when weight is applied to them (Bayse and Kerstetter 2010).

Juvenile billfish: 1) avoid fishing in areas with large amounts of juvenile and small swordfish and other billfish; 2) use circle hooks; 3) set gear in water deeper than 100 m; and 4) restrict the use of light sticks (Itano and Holland 2000)(Sibert et al. 2000)(Adam et al. 2003, Beverly and Robinson 2004, Morato et al. 2008, (Ward et al. 2008b, Beverly et al. 2009, Morato et al. 2010, Passfield and Gilman 2010).

While the information on bycatch mitigation has been presented by taxonomic group, it is critical to holistically assess the relative effects of a change in gear or methods across taxa, recognizing that a method that mitigates problematic catch of one taxonomic group or species may exacerbate the catch of other vulnerable species of the same or different taxa.

Examples of best practices for reducing bycatch in longline fisheries

Hawaii Longline Swordfish Fishery

Hawaii has one of the highest observer coverage rates in longline fisheries operating in the western and central Pacific Ocean. For longline fisheries operating in the region and belonging to the Western and Central Pacific Fisheries Commission the required observer coverage rate is 5% (WCPFC 2007). The Hawaii deep-set fishery (targeting tuna) has a 20% observer coverage rate and the shallow-set fishery (targeting swordfish) has 100% observer coverage (WPRFMC 2009). The required use of suites of bycatch mitigation methods has reduced both seabird and sea turtle catch rates by 90% in the shallow-set fishery and the seabird catch rate in the deep-set fishery has seen a 65% reduction. Recent concerns over false killer whale captures in the deep-set fishery have resulted in the required use of weak hooks and possible area closures.

US NED Atlantic Fishery Experiment

The US National Marine Fisheries Service conducted the Northeast Distant Fishery Experiment (NED) between 2001 and 2003. The NED tested a variety of techniques to determine their effectiveness in reducing bycatch of sea turtles in the US pelagic longline fishery. The researchers developed a technique that included the use of 18/0 circle hooks and mackerel bait, which reduced bycatch rates of leatherback and loggerhead sea turtles by 65–90% (http://www.nmfs.noaa.gov/mediacenter/turtles/). Based on this research, the US adopted new regulations requiring the use of 18/0 circle hooks or larger, the use of only mackerel bait in the NED, and 100% observer coverage (NMFS 2014). In addition, outside of the NED region, longline vessels targeting tunas are only allowed to use 18/0 or larger circle hooks and whole finfish and/or squid bait (http://www.nmfs.noaa.gov/sfa/hms/compliance/guides/index.html) and observer coverage rates outside the NED region have ranged from 7–17% since 2004—much higher than WCPFC required observer coverage rates (NMFS 2014).

Australian Eastern Tuna and Billfish Fishery

The Australian Eastern Tuna and Billfish Fishery (ETBF) has a Bycatch and Discarding Workplan. The workplan is a collaborative effort between the government, industry, and scientists and aims to focus on "high risk" bycatch species. Current plan objectives (covering 2014–2016) are to be addressed by the Australian Fisheries Management Authority (AFMA) and include: 1) develop bycatch mitigation devices for seabirds, 2) reduce interactions with protected seabirds, 3) improve post-release survival of captured sharks, and 4) improve the understanding of shark catch composition. The end goal is a more tactical approach to managing bycatch in this fishery. In addition to this workplan, the Australian ETBF already requires the use of circle hooks to reduce sea turtle capture and de-hooking devices and line cutters to release incidentally captured sea turtles. The plan also requires tori lines, line weighting requirements, and prohibiting the discharge of offal during setting and hauling to reduce incidental sea bird captures (AFMA 2014a). The Australian ETBF aims to observe 8.5% of the fishery, higher than the 5% WCPFC-mandated coverage rate (AFMA 2014b).

Fiji Longline

The Fiji longline fishery, which targets albacore tuna in the South Pacific Ocean, is certified as sustainably fished by the Marine Stewardship Council (MSC). This longline fishery reported an observer coverage rate of 7.6% between 2008 and 2011. The Fiji longline fishery does not target sharks; prohibits the use of shark gear and wire traces; and requires the use of circle hooks, recording and reporting of captured sharks by species, and fishing in waters deeper than those inhabited by pelagic shark species. In addition, Fiji has a Government Decree in place to prohibit targeted shark fishing. There are also large marine reserves where fishing is banned. Interactions with endangered, threatened, and protected species are very low in this fishery. Sea turtles are protected in Fijian waters. Vessels are provided with and trained to use de-hooking devices (and other tools), which aid in the release of incidentally captured sea turtles. (Akroyd et al. 2012).

Recommendations to industry

Buyers of tuna are best placed to encourage the voluntary improvements described in this document. Such measures may go beyond regulatory requirements but can make a big difference to environmental performance. Bycatch is under the control of the fishing companies and implementing these best practices can be achieved directly onboard vessels. It is recommended that buyers require best practices in reducing bycatch as a minimum requirement of purchasing longline tuna.

Buyers can also encourage adoption of bycatch best practice at a regulatory level. This can be achieved through companies making public declarations in support of the adoption of best practices in bycatch reduction; encouraging fishing companies to commit to publicly disclose data regarding the nature and volume of bycatch (set-by-set) for each vessel; and contacting fishery managers directly to request regulatory improvements.

Fishery assessments and recommendations are made public for discussion among stakeholders on the FishSource website (www.fishsource.com). The site also maintains fishery-specific information including links to fishery improvement projects (FIPs). The tuna sector page of sustainablefish.org contains specific advisory notes on best practices.

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