# Bycatch in the World's Tuna Fisheries: An Overview of the State of Measured Data, Programs and a Proposal for a Path Forward

**An International Seafood Sustainability Foundation White Paper**

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***"When you can measure what you are speaking about and express it in numbers, you know something about it."***

*William Thomson, Lord Kelvin*
*Lecture to the Institution of Civil Engineers, 3 May 1883*

Lord Kelvin's maxim, that scientific understanding begins with the gathering of data from measurements, has an inescapable corollary: if you can't measure something, you can't manage it.

The Science Committee of the International Seafood Sustainability Foundation, on whose reporting and analysis this white paper is based, stands on the same empirical ground. As Science Committee Chairman James Joseph states the case, "Collecting and analyzing comprehensive information on the numbers and kinds of tunas discarded and non-tuna species taken as bycatch and their distribution in time and space are essential to understanding the possible impacts of bycatch and discard on the diversity and health of the ecosystem."[1]

Bycatch -- the unintended taking of juvenile tuna, non-targeted fish, and other animals -- and discards of unsuitable catch occur in nearly all of the world's many commercial fisheries. In some they are large enough to affect the fishery, while in others they are insignificant biologically and economically. Either way, bycatch and discards represent waste of natural resources, even for species whose commercial value may be nil and whose role in the ecosystem may be as yet undefined.

The far-roaming nature of tuna and the global reach of the tuna fishing industry warrant worldwide coordination – a global understanding -- of the many efforts being made to gather more comprehensive, relevant, and authoritative data and the research and development activities being undertaken to reduce bycatch and discards.

To these ends, the ISSF provides this report and makes the enclosed proposal for global coordination of bycatch and discard mitigation research.

[1] JIM JOSEPH, CHAIRMAN, ISSF SCIENCE COMMITTEE

## I. Current State of Measured Data

### Eastern Pacific Ocean

Estimates of bycatch and discards from purse-seine vessels, which capture nearly 90 percent of the tunas and tuna-like fishes in the EPO, rank among the best and most complete series of data available for any fishery in the world. The Inter-American Tropical Tuna Commission (IATTC) maintains a comprehensive database on bycatch made by purse-seiners. Observers accompany every trip of large purse-seine vessels fishing in the EPO. The basic data show a wide array of species taken as bycatch, whose effect on the respective marine life populations is unknown, particularly the interaction among species. Similarly, the recorded tuna catch data includes detail reflecting tuna species and size captured, and provides information on juvenile tuna catches. Very little data exists about bycatch related to the second most important gear type, long-line.

### Western and Central Pacific Ocean

Since the mid-1980s the Oceanic Fisheries Program of the Secretariat of Pacific Communities and several nations with vessels fishing in the WCPO began placing observers aboard purse-seine and longline vessels to collect data, including estimates of discard and bycatch. Coverage was very low, 0.8 percent of all longline sets and 3.5 percent of purse-seine vessels, yielding insufficient data for reliable annual measurements of overall discards and bycatch.

### Atlantic Ocean

The International Commission for the Conservation of Atlantic Tunas (ICCAT) created a subcommittee for ecosystems within its Scientific Committee on Research and Statistics to collect data for estimating the species and quantities of bycatch and discards. The program has suffered from very low observer coverage for most of the fisheries, but some useful data has been collected.

Under a Spanish program observers collected data on 1,500 purse-seine sets during 2001-2004 and found bycatch and discards in similar proportion to the same species taken in the Pacific. As in other oceans, longline data comes from nations with the smallest longline fleets and is therefore much more sparse than for purse-seine fleets. Most of the bycatch data reviewed by ICCAT is for seabirds and turtles. Lacking comprehensive data regarding seabirds, the sub-committee has used risk-assessment analyses to prioritize efforts to collect data and evaluate seabird interaction with longline gear.

The limited data available for longline suggests significant interactions with turtles. ICCAT scientists have been studying the behavior of animals around floating objects so as to modify gear and fishing techniques to either avoid catching unwanted species or release them alive.

### Indian Ocean

Overall, the availability of data on bycatch and discards for the Indian Ocean tuna fisheries is not good, especially when compared to that of the EPO. The Indian Ocean Tuna Commission (IOTC) recognizes the shortcomings in data and is directing effort toward improving the situation.

## II. Programs Conducted to Date and RFMO Measures Designed to Reduce Bycatch & Discards

### Eastern Pacific Ocean

IATTC programs to reduce bycatch and discards fall into three categories: limits on the take of bycatch and discard species, fishing gear and technology, and spatio-temporal distribution of fishing effort. Its original requirements of gear and practices to reduce dolphin mortality in the purse-seine fishery remain in use.

Purse-seiners must land all bigeye, skipjack, and yellowfin tuna caught, except those unfit for consumption for reasons other than size. Purse-seiners must promptly release unharmed all sea turtles, sharks, billfishes, rays, mahi-mahi and other non-target species. Separately, fishermen must take specific steps to reduce turtle capture and mortality, such as stationing a speed boat to disentangle and resuscitate turtles as the net is retrieved. Longliners must use de-hookers, line cutters and scoop nets to save sea turtles.

A three-year program called for data collection on turtle-gear interactions and on the resulting bycatch; collaboration on better techniques for reducing bycatch, and joint research on the use of circle hooks, which show promise in reducing turtle bycatch. Further work is needed to confirm these results and to include more vessels, particularly the large-scale, high-seas longliners.

Additional programs call for full utilization of retained sharks, a maximum weight ratio of 5 percent shark fins to sharks onboard, regulation of retention, transshipping, landing, and trading in shark fins, and the release of non-targeted sharks.

The IATTC recommended implementing the FAO plan for reducing seabird mortality by longliners and learned from investigation that albatross and petrels are the species most affected by longliners, consistent with studies in other regions. The science staff has recommended expanded data collection and research on seabird bycatch reduction in pelagic longline fisheries. The staff also recommended requiring longliners to reduce seabird bycatch by using side setting, night setting, bird-scaring lines, weighted branch lines, blue-dyed bait, underwater setting devices, and management of offal discharge.

Among several EPO gear and technology programs is one to examine vessel size, net depth, mesh size, fishing location, oceanographic features, FAD configuration and distribution and other variables related to bigeye tuna catches by purse-seiners.

Commission scientists and fishermen in Ecuador and Venezuela are developing sorting grids – large panels with varous sized openings placed in the net through which small fish can pass unharmed -- for use inside purse-seine nets, adapting a concept developed by scientists in Norway for use in trawl nets. Conclusive data await further testing.

Scientists of the IATTC, Stanford University and Monterey Bay Aquarium are studying tuna and other species to determine whether their bahavior around floating objects might lead to bycatch mitigation techniques. Tuna species, particularly bigeye, seem to stratify vertically. Skipjack may separate from FADs and other species before dawn.

## Western and Central Pacific Ocean

Several working groups deal directly with bycatch, concentrating on studying means of improving the data base and mitigating bycatch. Though observer coverage has been very low, the Western and Central Pacific Fisheries Commission (WCPFC) is formulating guidelines to increase coverage substantially. Several studies are directed towards quantifying bycatch and discards for purse-seiners and longliners.

Longline vessels are required to manage offal discharge and use bird-scaring devices and deep-setting line launchers or underwater chutes. Sea turtles must be disentangled, resuscitated and released alive. Longline vessels must carry line-cutters and de-hookers for releasing turtles. Beginning in 2010 longline vessels fishing swordfish in shallow sets must use large circle hooks and only finfish for bait. All sharks captured and not released are to be fully utilized.

Mitigation measures such as tori and scarecrow lines, colored bait, and circle hooks are being undertaken in the albacore longline fleets, and conservation and management measures on seabirds, turtles, and sharks apply to many of the vessels fishing for albacore.

For purse-seiners, Spain's government and tuna industry developed mechanisms to improve targeting and reduce bycatch through FAD design. The Spaniards also undertook acoustic technology improvements to identify fish species and size for more selective capture. Both of these studies are being conducted in areas outside the WCPO, but are being monitored and under review by the WCPFC's Fisheries Technology Specialist Working Group. Japan, Korea, the United States and the European Union created programs to study fish behavior around FADs so as to avoiding unwanted species and sizes.

For longliners, the WCPFC Scientific Committee and the three working groups began studies of operational characteristics of longline gear with an eye toward more selective fishing; mechanisms such as tori lines, side setting, and night setting with minimum artificial background lighting to reduce bycatch of seabirds; use of circle hooks and dyed bait to mitigate turtle mortality

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The Ecosystem and Bycatch Working Group set out to prioritize bycatch and discard research regarding various species. The Scientific Committee identified various approaches to eliminating bird mortality by longliners such as line-weighting to sink hooks more rapidly, below-the-water setting chutes, bird-scaring (tori) lines, setting lines at night, managing discharge of offal, release of live birds, water canon to deter birds, area and season closures, and dyed bait to not attract birds.

Recent WCPFC resolutions call for implementation of and reporting on FAO IPOA-Seabirds standards. Longliners must use bird-scaring devices and deep-setting line launchers or underwater chutes and manage offal discharge. Another measure requires disentangling, resuscitating and releasing sea turtles. A measure calls for implementation of the FAO IPOA-sharks and full utilization of all sharks not released alive. A measure requires purse-seiners to land or transship at port all bigeye, skipjack and yellowfin tuna. This full-retention concept applies to all small tunas except when a vessel has no more room to store all the fish caught in its last set, the fish are unfit for human consumption, or key equipment malfunctions.

## Atlantic Ocean

The French and Spanish industries' voluntary closing of floating-object (FAD) fishing during November-January 1997-1999 in the Gulf of Guinea was among the most significant bycatch-reduction efforts in the Atlantic as it led to a similar conservation measure by ICCAT.

Studies are under way regarding fish behavior around floating objects and more selective gear and technology. The work has generated useful information although no breakthroughs.

Spain's work in purse-seining suggests the kind of material hung under FADs may affect turtle mortality. Further research on this is planned.

The ICCAT Sub-Committee on Ecosystems is encouraging participating nations to protect seabirds and turtles by setting conservation and management standards within national action plans. Brazil's action is proving effective in gathering bycatch data on seabirds and implementing measures to reduce longline bycatch. The sub-committee has set out to assess the abundance of seabirds that interact with the tuna fisheries and to prioritize future bycatch-reduction efforts. It will undertake an ecological risk assessment.

ICCAT required all longliners south of 20ºS to use tori lines during daylight. Brazilian longliners reduced their seabird bycatch by 64 percent and increased target species catch by 15 percent.

Based on results of studies by Atlantic fishing nations the sub-committee has recommended circle hooks for longline and handline fishing while research continues.

A 2008 resolution would required vessels to release alive all bigeye thresher sharks taken as bycatch. Another calls for an assessment of the porbeagle shark population in the Atlantic.

## Indian Ocean

The IOTC Working Party on Bycatch (WPBy) met for the first time in 2005, recognized the severe shortcomings in bycatch and discards data and recommended better cooperation among the nations to collect data through on-board observers. Subsequent effort was made to compile information from archives of other organizations.

With the WPBy's new name in 2007, Working Party on Ecosystems and Bycatch (WPEB), and expanded terms of reference – including monitoring bycatch for better data from all fleets -- the WPEB will direct greater effort toward collecting bycatch information and evaluating bycatch effects on sharks, seabirds and turtles.

The WPEB will attempt to reduce bycatch and discard by encouraging, coordinating, and reviewing research to modify fishing gear, recommending conservation measures accordingly and transferring the technology and knowledge to the industry. Much of the effort is directed toward FAD design guided by research on species behavior. Work by Spain in 2005 found that turtle entanglement and juvenile yellowfin and bigeye bycatch appeared to be less with some experimental FAD designs. Further tests are being considered. Some positive results were reported from Japanese researchers on bird- and turtle-deterrent devices. The IOTC has approved measures to require their use.

The IOTC has encouraged fishing nations to support the FAO International Plan of Action on Sharks (IPOA-Sharks), and a number of them are developing action plans notwithstanding the many directed fisheries for sharks in the coastal countries bordering the Indian Ocean.

A 2005 commission resolution calls for annual reports of shark catches, a plan to assess shark stocks , research on more selective gear, and full utilization of captured sharks. It also sets shark finning guidelines.

Fishing nations are asked to require their vessels to make every effort to avoid harm to turtles by means employed by other RFMOs. Likewise, the IOTC has begun addressing seabird bycatch, approving resolutions regarding national action plans, data gathering, a zero-bycatch goal, and use of mitigating technology and fishing practices.

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## III. Proposal for a Global Path Forward

Regarding the purse seine tuna fishery, fishing methods and bycatch issues are similar from ocean to ocean. Data associated with these matters, however, vary vastly in detail and scope. Scientists working for and through the RFMOs, national governments, the industry, and environmental organizations have done excellent work and developed innovative approaches to better fishing practices and technology to reduce bycatch. This work has not been well coordinated and could benefit through greater cooperation and coordination among the programs.

Work in the arena of bycatch and discard mitigation would be much more meaningful if the diverse research efforts and funds applied were augmented, coordinated, prioritized and conducted in a complementary manner.

With this understanding, ISSF offers to do the following:

- Host a global workshop to include the RFMO, national and interested scientists working on the studies to date

  The workshop participants would
  (1) review the current research programs;
  (2) identify the most promising areas;
  (3) set priorities for further research

  All areas of research related to fishing methodology, gear modification and design, and fishing strategies will be addressed,

- The research should incorporate a dedicated research fishing vessel from which to conduct gear and technology experiments

- Develop and implement a global fundraising strategy, to include nations, industry participants and other environmental NGOs to support the work

- Involve a fleet of willing fishing vessels to conduct diverse ocean trials, according to a standard research protocol, of the most promising technologies identified.

Collaborating in a globally coordinated manner such as this would leverage the much needed and excellent work underway within various governments, management and regulatory bodies, and environmental organizations while reducing and hopefully eliminating duplication of effort.