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A global study

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by

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Preparation of this document

Worldwide, a significant amount of work is being undertaken to quantify, understand and reduce bycatch. As part of the Food and Agriculture Organization of the United Nations (FAO) work programme related to bycatch, three studies of tuna fisheries bycatch have been commissioned: investigations covering the purse seine, longline and small-scale fisheries. This document presents the results of the work on small-scale tuna fishery bycatch and the associated issues. The study was commissioned in late 2009. The collection of information occurred in February and March, with analysis and writing in April 2010.

Abstract

The aim of the study was to quantify catches of tuna and bycatch in small-scale pelagic fisheries. Additional goals were to identify on a global scale information gaps, major issues and management concerns associated with these fisheries and their bycatch.

The study made estimates of tuna and non-tuna catches in the small-scale fisheries of 181 ocean areas. The total amount of tuna produced by these fisheries was around 681 000 tonnes per year in the mid-2000s. About 753 000 tonnes of non-tuna was produced by those same fisheries.

The major priorities for improving our understanding of bycatch in small-scale pelagic fisheries are improved coverage of bycatch by the tuna regional fisheries management organizations (RFMOs) that collect such information, increased involvement of the other tuna RFMOs in small-scale pelagic fisheries, verification of the high reported catches from small-scale pelagic fisheries in Indonesia, and greater technical details on the small-scale pelagic fisheries that take sensitive species.

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Abbreviations and acronyms

CARICOM	Caribbean Community
CRFM	Caribbean Regional Fisheries Mechanism
DFO	Department of Fisheries and Oceans
EEZ	exclusive economic zone
FAD	fish aggregating device
FAO	Food and Agriculture Organization of the United Nations
GFCM	General Fisheries Commission for the Mediterranean
GRT	gross registered tonnage
GT	gross tonnes
hp	horsepower
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMARPE	Instituto del Mar del Perú
IOTC	Indian Ocean Tuna Commission
MCS	monitoring, control and surveillance
NMFS	United States National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRIFSF	National Research Institute of Far Seas Fisheries
RFMO	regional fisheries management organization
SPC	Secretariat of the Pacific Community, formerly South Pacific Commission
Univ. of WI	University of the West Indies
WCPFC	Western and Central Pacific Fisheries Commission
WPRFM	Western Pacific Regional Fishery Management Council
WWF	World Wide Fund for Nature

Executive summary

Three studies of tuna fishery bycatch have been commissioned by FAO: investigations covering the purse seine, longline and small-scale fisheries. This document presents the results of the work on the small-scale tuna fishery bycatch and the associated issues. It is intended to summarize on a national level catch information of small-scale tuna fisheries and those small-scale fisheries that catch tuna. The document also aims to identify on a global scale data gaps, major issues and management concerns associated with these fisheries and their bycatch

Bycatch

Bycatch from purse seining and longlining has been the subject of a considerable amount of research. Small-scale tuna fishing and the associated bycatch have received relatively little attention, and no work has been carried out to obtain a global overview. In addition, several recent studies link small-scale fisheries to bycatch of threatened species.

The various uses of the term "bycatch" cause considerable confusion, especially for a global study that encompasses several areas that use the term differently. Many fisheries specialists in the various regions of the world believe that their definitions of bycatch are universal (or at least should be).

The concept of bycatch may have limited relevance to small-scale fisheries in developing countries, where almost everything in the catch has economic value and can become a target.

This document attempts to avoid using the term "bycatch" when estimating national catches. It is replaced by the term "non-tuna species". When "bycatch" is used, it is synonymous with "non-target species", regardless of whether retained or discarded.

Small-scale fisheries

In this document, "small-scale fisheries" is defined as "those fisheries that use vessels that are open or partially undecked, or vessels that use outboard engines or sails, or vessels that fish with handlines, rod-and-reel gear, harpoons or similar non-industrial gear".

Catch estimates

The study made estimates of tuna and non-tuna catches in the small-scale fisheries of 181 country ocean areas. The total amount of tuna produced by these fisheries was about 681 000 tonnes per year in the mid-2000s. About 753 000 tonnes of non-tuna was produced by those same fisheries.

Important production areas

The East and Southeast Asia region produces about 72 percent of the world's tuna catches by small-scale fishing. The Indian Ocean produces about 21 percent. Comparisons between the non-tuna catches of the various regions are not very meaningful – much of the non-tuna catch is made by fisheries in which tuna is a minor component – and should not be construed to be the bycatch of the small-scale tuna fisheries of a region.

Indonesia's small-scale pelagic fisheries appear to produce about 390 000 tonnes of tuna and 519 000 tonnes of non-tuna. These estimates rely heavily on a recent World Wide Fund for Nature (WWF) report. Because this indicates that Indonesia is responsible for over half of the tuna caught by small-scale pelagic fishing in the world, efforts should be made to confirm the validity of that study.

Although some fisheries specialists contend that there are no small-scale fisheries that target tuna (i.e. there are only small-scale fisheries that take tuna as part of a catch), the study identified 15 small-scale fisheries that target tuna. These fisheries catch more than half of all tuna taken by small-scale fisheries.

Discarding

Discarding in small-scale pelagic fisheries appears to be so low that it should not be considered a major problem or a priority for receiving management attention.

Bycatch reduction

Most small-scale fisheries that catch tuna are true multispecies fisheries in which there are no discards and perhaps no sensitive species in the composition of the catch. In these situations, the general thrust of reducing/eliminating bycatch may not be appropriate. What is required in many small-scale pelagic fisheries is attention to any components of the catch that are over-exploited, threatened, or protected.

Sensitive species

One of the most important issues in the bycatch of small-scale pelagic fishing is the capture of sensitive species, especially sea turtles and marine mammals. The targeted tuna fisheries are generally not problematic; most difficulties appear to occur with small-scale gillnets, a type of gear that rarely targets tuna, but that takes relatively large amounts of turtles and mammals.

There are a number of technical measures to decrease turtle bycatch in small-scale longline and gillnet fisheries. An important principle is that the development, design and implementation of turtle bycatch reduction measures should take into account the socio-economic aspects of fishers and fishing communities.

Information on techniques for reducing the incidental catch of marine mammals in small-scale pelagic fisheries is not as common as that for turtles. Much of

the current work consists of developing appropriate strategies, such as better documenting the extent of the threat, capacity building for national fishery officers and generating national political will to take action.

Priorities for improving information

The major priorities for improving understanding of bycatch in small-scale pelagic fisheries are improved coverage of bycatch by the regional fisheries management organizations (RFMOs) that collect such information, increased involvement of the other tuna RFMOs in small-scale fisheries, additional information on the catch from small-scale pelagic fisheries in Indonesia, and greater technical details on the small-scale pelagic fisheries that are likely to be taking substantial quantities of sensitive species.

Contents

1. Introduction

1.1 BACKGROUND

Global awareness of bycatch in fisheries is increasing. *The State of World Fisheries and Aquaculture 2008* (FAO, 2009a) indicates that over the past few decades, a public consensus has developed on the view that bycatch can have significant consequences for populations, food webs and ecosystems. Worldwide, a significant amount of work is being undertaken to quantify, understand and reduce bycatch.

As part of FAO's work programme related to bycatch, three studies of tuna fisheries bycatch have been commissioned: investigations covering the purse seine, longline and small-scale fisheries. This document presents the results of the work on small-scale tuna fishery bycatch and the associated issues.

1.2 WHY STUDY THE BYCATCH OF SMALL-SCALE TUNA FISHERIES?

Several recent studies have highlighted the need to learn more about bycatch in small-scale fisheries in general. Two reports are especially helpful in explaining the rationale for this research:

- Small-scale fisheries occur primarily in developing nations, and their documentation and management are limited or non-existent. Although bycatch of industrial-scale fisheries can cause declines in migratory megafauna, including seabirds, marine mammals and sea turtles, the impacts of small-scale fisheries have been largely overlooked. Small-scale fisheries occur in coastal waters worldwide, employing over 99 percent of the world's 51 million fishers. Future research is urgently needed to quantify small-scale fisheries bycatch worldwide (Peckham *et al.*, 2007).
- Large-scale industrial fisheries have received the lion's share of bycatch attention, with research focusing on trawls, longlines and high-seas gillnets. These fisheries are more amenable to research due to the limited number of vessels involved (relative to artisanal and small-scale fisheries). Moreover, a few cases have been highly publicized (e.g. dolphins in the tuna purse seine fisheries, sea turtles in shrimp trawls, albatrosses in longlines). Nevertheless, several recent studies link artisanal fisheries to bycatch of threatened species. The reports of those studies suggest a bycatch of such a magnitude that mitigation efforts cannot overlook the effects of small-scale fisheries (Soykan *et al.*, 2008).

In the tuna fisheries, bycatch from purse seining and longlining has been the subject of a considerable amount of research. Small-scale tuna fishing and the associated bycatch have received relatively little attention and no work has been carried out to obtain a global overview.

Another reason for studying the bycatch of small-scale tuna fisheries emerged during the study. Several fishery specialists interviewed felt that the bycatch from very small-scale tuna fisheries had special significance. They contend that, unlike longline and purse seine fisheries, management interventions to alter or reduce the bycatch from these tiny fisheries are difficult or not possible, so it is important to know the amount of tuna and bycatch in these "semi-unmanageable" fisheries. This concept will be revisited in Section 9.1.

This document is intended to summarize on a national level catch information of small-scale tuna fisheries and those small-scale fisheries that catch tuna. It also aims to identify on a global scale data gaps, major issues, and management concerns associated with these fisheries and their bycatch.

1.3 THE STUDY

This study was commissioned in late 2009. The collection of information occurred in February and March, with analysis and writing in April 2010.

It is important to note the limited nature of this study: the budget allowed for 18 days of travel and 18 days for analysis and writing the document. As such, it was only possible to consult with regional agencies and with fishery specialists with regional perspectives. There was only limited contact with national-level specialists, mainly in those countries where small-scale tuna fishing is especially important and where information is scarce. The information used for the national catch estimates was largely limited to RFMO data and the readily available literature (i.e. that provided by regional agencies and specialists or that was available on the Internet).

1.4 SOME DEFINITIONS AND CONVENTIONS USED IN THIS DOCUMENT

1.4.1 Bycatch

The various uses of the term "bycatch" cause considerable confusion, especially for a global study that encompasses several areas that use the term differently. Many reports on bycatch appropriately begin with a precise definition of bycatch.

In addition to the term "bycatch" having several meanings, there is the additional difficulty of applying the concept of bycatch to small-scale fisheries. "Bycatch" and "target" can be relatively clear in large-scale fisheries of developed countries – where there is an objective of capturing certain high-value fish – but these concepts become increasingly irrelevant in the progression to small-scale fisheries in developing countries, where almost everything in the catch has economic value and can become a target.

Many of the small-scale fisheries that capture tuna are truly multispecies – with the "target" being almost any type of fish. Alternatively, for some of the other fisheries covered in this document, there are specific targets, but they are not tuna (i.e. tuna could be considered a bycatch).

For these reasons, the present study attempts to avoid using the term "bycatch" when estimating national catches. It is replaced by the term "non-tuna species". When "bycatch" is used, it is synonymous with "non-target species", regardless of whether retained or discarded. It is recognized that "non-tuna species" and "non-target species" may sometimes be inexact, as in some countries undersized fish and shark-damaged fish of the target species are considered bycatch.

1.4.2 Small-scale

"Small-scale" is another term that causes considerable difficulty for a global study. There are a large number of schemes used to delineate the lower end of the fishing spectrum ("small-scale", "artisanal", or other terms). According to Gillett (2005), these include:

- Tonnage of vessel used in fishing – "municipal fisheries" in the Philippines are defined as those operations that use fishing vessels of three gross tonnes or less.
- Distance offshore – Taiwan Province of China small-scale/artisanal fisheries refer to the production obtained without any fishing boat or using non-powered fishing boats within three nautical miles of the coast.
- Size of vessel – in the former Netherlands Antilles, artisanal fishing is that which is carried out on vessels of less than 7 metres. In Chile, artisanal swordfish fishing is that which is carried out on vessels of less than 28 metres.
- Carrying capacity – in Iran (Islamic Republic of), artisanal fishing is that which is carried out on fishing craft that carry between 1 and 100 tonnes of fish.
- Water depth – in Suriname, fishing operations in depths less than ten metres are considered artisanal.
- Horsepower – artisanal fishing in Guinea-Bissau is that which is carried out on fishing craft up to 60 hp.
- Gear – small-scale fisheries in Thailand are those that use gillnet fisheries (except Spanish mackerel and mackerel encircling nets), plus cast net and scoop fisheries and collecting shellfish.
- Combination of features – in China, Hong Kong Special Administrative Region (Hong Kong SAR), artisanal production is that from vessels less than 40 feet (equivalent to 12.2 metres) fishing along coastal waters 15–25 fathoms deep (equivalent to 27.4–45.7 m).
- Other schemes for partitioning the small-scale/artisanal sector involve how the catch is disposed of, length of voyages, labour intensity, and the degree of mechanization of fishing gear or catch storage.

An appropriate definition of "small-scale" for the present study should result in identifying and separating out fisheries in such a way so that there is substantial management significance. Following this logic, there is great difficulty in managing

many of the very small-scale fisheries that catch tuna, and it is important to know the amounts of tuna and non-tuna those fisheries take. Accordingly, this study uses the following definition to describe these small fisheries:

> "Small-scale" refers to those fisheries that use vessels that are open or partially undecked, or vessels that use outboard engines or sails, or vessels that fish with handlines, rod-and-reel gear, harpoons or similar non-industrial gear.

In many of the documents used in estimating the national catches of tuna, it was not possible to determine if the gear used was small-scale. For those cases:

- unless there is reason to believe the contrary, pelagic gillnets are not considered small-scale; and
- unless there is reason to believe the contrary, "hand", handline and troll are considered small-scale.

Fixed tuna traps – because of their large physical size – are not considered to be small-scale. This is consistent with Di Natale *et al.* (2006) who state that the use of this type of gear was the first industrial fishery in the Mediterranean.

1.4.3 Other terms

Unless otherwise stated, "tuna" is defined as being the principal market species of tuna: skipjack, yellowfin, bigeye, albacore, Atlantic bluefin, Pacific bluefin and southern bluefin.

Coryphaena hippurus is the common dolphinfish, but it is also known in English as mahi-mahi and dorado. In this document, it is mainly referred to as simply dolphinfish, but in the national/regional sections the name customarily used in that area is used here (e.g. "dorado" off Central America).

There are small-scale tuna fisheries (i.e. tuna is the sole or primary target) and there are small-scale fisheries in which tuna are caught (i.e. as a minor component of the catch). Having made this distinction, for simplicity, the latter is often referred to as "small-scale pelagic fisheries" in this document; however, it is acknowledged that sometimes tuna are caught inshore of the true pelagic environment.

"Sport fishing" here is intended to cover several types of activities, including personal recreation, commercial sport fishing (mainly for tourists), and sport/competition fishing. All of these are taken to be "small-scale". Not included in the document's usage of "sport fishing" (and not considered "small-scale") are the long-range charter boats, such as the vessels that take fishers from south California, United States of America, into tropical Mexico.

2. Regional findings

Appendixes 1 to 9 give the estimates of tuna and non-tuna catches by small-scale pelagic fisheries in 181 "country ocean areas". Costa Rica, for example, would be covered by two ocean areas, the Pacific coast and the Caribbean coast. These areas are grouped into nine regions:

1. Eastern Pacific
2. Caribbean
3. Non-Caribbean areas of the Western Atlantic
4. West Africa
5. Northeast Atlantic
6. Mediterranean
7. Indian Ocean
8. East and Southeast Asia
9. Oceania

The following sections discuss the major features of each region with respect to several topics: total tuna and non-tuna landings by small-scale fisheries; any small-scale fisheries actually targeting tuna; the quality of data available; any regional fishing patterns to emerge; the major components of the non-tuna catch; any "hot bycatch issues" associated with small-scale pelagic fisheries; and concerns related to the bycatch of species of special interest, such as turtles and marine mammals.

2.1 EASTERN PACIFIC

Appendix 1 gives the readily available information on small-scale tuna fishing in the Eastern Pacific.

The appendix shows that in the entire Eastern Pacific region small-scale fishing in recent years has produced somewhere around 9 000 tonnes of tuna. About 30 000 tonnes of non-tuna species are caught annually by the small-scale fisheries that catch tuna.

In the small-scale fishing activity in which tuna are caught, one of the major features of this region is that there are actually only a few small-scale fisheries that could be considered directed tuna fisheries – that of Ecuador and, to a lesser extent, that of Peru. Most of the other small-scale fishing that catches tuna is either directed at dorado or is a multispecies fishery – in both of these cases tuna is a minor component of the catch.

In terms of gear, only directed small-scale tuna fisheries use longlines. Gillnets and handlining are generally multispecies fisheries in which small amounts of tuna are caught. Trolling appears most important in sport fishing.