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FAD USE AND FISHING MORTALITY IN TROPICAL TUNA FISHERIES

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Abstract

The authors participated in the Global FAD Science Symposium, March 20-23, 2017, in Santa Monica, California and are presented without affiliation. This paper is one of several from the Symposium and does not represent an exhaustive discussion of the issue but includes points agreed by participants. The participants recognized that impacts of FADs and FAD management cannot be considered entirely independently of harvest strategies, issues related to fishing capacity, ecosystem structure, or management of all other fishing gears in tropical tuna fisheries. None of these points alone will address the management challenges associated with FAD use. The effectiveness of any of these points will depend on the levels of implementation and compliance and need to be connected to processes in the RFMOs. Participants underlined the need for data harmonization, standardization, and availability and stressed the need to develop standardized language and definitions to support consistent interpretation of what conservation and management measures intend to achieve across ocean basins. Participants noted that "best practices" are not necessarily "most practical" and will need to be assessed to determine which are most appropriate to apply in any particular management setting or geographic area. Finally, participants stressed the need for ongoing and close collaboration among scientists, managers, and industry in driving innovative solutions within and across RFMOs. The points presented here are not in an order of priority; priorities and solutions may change on a regional basis.

Introduction

Increasing use of FADs and development of associated technology has increased the impacts on juvenile and small bigeye and yellowfin tunas, which are caught in FAD-associated purse seine sets and mostly retained but occasionally discarded. Mitigating that catch has challenged tuna RFMOs. This paper presents conclusions agreed by participants at the Global FAD Science Symposium,[1] summarizing key contextual information related to catches and management of bigeye and yellowfin in the FAD fishery, proven and promising 'best practices' to mitigate those catches, and gaps in current scientific knowledge.

Key information

Since the 1990s, increasing use of FADs and improving technology related to the devices has fueled improvements in the efficiency and profitability of the purse seine fishery, leading to greater catches of the primary target species skipjack tuna, but adding to the impacts on bigeye and yellowfin tunas, caught as juvenile or small fish. Scientific data collected by tagging and fishery observations indicate that bigeye, in particular, appears differentially vulnerable to being caught by sets on FADs. Management of FADs in RFMOs has sought to maximize the catch of skipjack at sustainable levels while mitigating catches of bigeye and yellowfin. Meanwhile, the development of FAD fisheries has occurred amidst increasing numbers of purse seine and support vessels entering the global fishery. More effective management of FADs needs to be placed within a greater context that considers the overall purse seine fleet capacity and effective fishing effort, as well as impacts from other gears, to achieve management objectives that should be clearly specified by the RFMOs.

Proven and promising approaches to mitigation

Currently available

Existing approaches to mitigate bigeye and yellowfin mortality, used singly or in combination, were reviewed for what works and what does not to identify a currently available 'best practice.' One approach establishes a closure that prohibits setting on FADs within a defined area and/or period of time. Although experience with closures in certain ocean areas shows they constrain the catch of bigeye, it is notable that the control is applied only during the terms of the closure. A second approach places total annual limits on the number of FAD sets or tonnage of bigeye and/or yellowfin. While effective at mitigating catches of bigeye and/or yellowfin, total annual limits may need to be allocated among fishing parties, or in some cases by zones, which could invite a negotiating process. A third approach establishes per-vessel FAD buoy limits. In practice, however, buoy limits set to date in certain ocean areas have not been restrictive at the fleet level and a lack of relevant scientific information does not allow for setting science-based limits that would be consistent with management objectives. Because establishing year-round control over FAD use is desirable and given experience with what works, this review shows that annual limits on FAD sets or bigeye/yellowfin catches constitutes a current 'best practice' approach. In this light, RFMOs should consider developing appropriate limits on FAD sets or bigeye/yellowfin catches for full-time application. These limits should be developed within a greater context of comprehensive tropical tuna management. If employing FAD set limits, an interim limit on the number of total FAD buoys deployed should be established to prevent unrestricted 'cherry picking' from amongst an unmanaged number of FADs and avoid undesirable changes in tuna aggregation dynamics. A buoy limit may also incentivize a vessel owner to operate efficiently to maximize profit from each buoy and minimize buoy loss. In addition, common standards for effective RFMO/national FAD management plans should be established to improve and harmonize data collection, which is discussed separately below. RFMOs should also adopt a common definition of a FAD set to enhance verifiability and compliance.

Promising and/or potential approaches

A range of additional approaches applying new technologies or incentives are being examined. One promising approach would identify the species composition before an operator commits to a set using data from the echosounder buoys on FADs and acoustic equipment on board the vessel to avoid setting on large quantities of juvenile and small bigeye and/or yellowfin. The technology requires further development to discriminate among the tropical tunas with reliability and a regulatory or market incentive to promote 'good choices' among vessel operators. Cooperation among fisheries scientists, vessel operators and buoy manufacturers could promote development of this technology to achieve pre-set species identification. Dynamic closures in use in other fisheries could be promising in tuna fisheries but require accurate real-time monitoring of species composition, catch rates and levels, and a management system capable of operating in short time-scales. Also promising are economic incentives that encourage greater effort on free school fish, such as through market certification or other pricing schemes that reward free school fish with greater prices. Enhancing the selectivity of the purse seine fishery through changes to net depth or operational characteristics appears not conducive to mitigating catches of juvenile and small bigeye or yellowfin, but could be promising in areas, such as portions of the Western and Central Pacific Ocean (WCPO), due to certain oceanographic conditions. Finally, other mitigation approaches being explored, such as changes to FAD design or the introduction of purse seine net sorting grids, have not been able to reliably mitigate undesirable tuna catch. Meanwhile, identification of bigeye hotspots in some ocean areas, such as the WCPO, requires greater investigation.

Gaps in current scientific knowledge

More information is needed to understand the interactions between FADs, vessel operations and fishery dynamics to improve scientific assessments and design improved management interventions. Critical data gaps exist. Some RFMOs, for instance, lack data on the total numbers, locations and designs of FADs deployed and set upon. RFMOs should close these data gaps as a matter of priority by implementing existing tools such as observer programs and/or e-monitoring of purse seine vessels and Vessel

Monitoring Systems. Collecting new types of data on the operational and economic characteristics of purse seine vessels and acquiring data transmitted from FAD echosounder buoys – potentially with an appropriate time lag or other confidentiality measures – opens up new opportunities. Integrating those data with observer and catch data could lead to the identification of impacts of FAD densities on the fishery, locations of potential bigeye hotspots, and determine why the catch of bigeye varies among purse seine vessels fishing in the same ocean basin (i.e. why do some vessels catch more bigeye than others?). More information also is required to understand the associative behaviours of the tropical tunas in all ocean areas, including their spatial variability and vulnerability. A wide-scale collection of individual FAD deployment, tracking, and set-history data could also help scientists develop a purse seine catch per unit effort (CPUE) index, which could prove valuable for stock assessment and understanding stock dynamics. Most stock assessments for tropical tunas use only longline and pole and line CPUE indices, though most of the catch comes from purse seine operations. In addition, there remains a need to develop harmonized FAD fishery indicators (e.g., number of sets, ratio of FAD-associated sets to unassociated sets, etc.) to estimate the contribution of FADs to the overall effective fishing effort in tropical tuna fisheries across ocean regions.