GREENPEACE **Briefing**

Forum on Fish Aggregating Devices

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Fish aggregating devices (FADs) – The solution to increasing yields could also decimate the fish stocks.

Fish aggregating devices (FADs), called *payao* in the Philippines and *rumpon* in Indonesia, are large floating objects deployed by fishing vessels to attract fish and make easier the task of finding and catching them. FADs work because tuna and a whole range of other fish and marine animals instinctively gather around such floating objects (as they do around floating logs and even megafauna such as whales and whale sharks), for shelter and protection and to feed on smaller animals already congregating there. This includes the intended target species (often skipjack tuna) but also juveniles of other commercially valuable tuna species, as well as a wide range of non-commercial species including vulnerable sharks and sea turtles. FADs can be anchored to the seabed in coastal waters or set to drift in the open ocean (with satellite trackers to aid with relocation), and can be fished using a variety of gear types. The use of FADs with non-discriminating fishing gears, such as purse seine and ring nets, which scoop up the whole multi-species aggregation around the FAD, results in increased catch of juvenile tuna and non-target species, with drastic consequences for fisheries and ecosystems alike.

The problem for bigeye and yellowfin tuna (and fishermen) – It's not just the big fish they catch, they're hauling in a lot of the babies too.

The use of FADs in tuna purse seine and ring net fisheries targeting skipjack and adult yellowfin tuna results in increased catch levels of juvenile bigeye and yellowfin tuna. These smaller purse seined fish have a lower value and primarily supply canneries. By contrast, yellowfin and particularly bigeye tuna left to fully mature represent a valuable catch for longline, and handline vessels, and are sold as frozen loins or fresh sashimi-grade flesh. For example, in 2009–2013, purse seine caught yellowfin were priced at around US$1,500–2,500 per metric tonne, while prices for longlined yellowfin prices reached US$7,000–9,000/metric tonne in the same period.[1]

The dramatic increase in purse seine fishing with FADs is a major cause of the decline of bigeye tuna, which is officially described as overfished in all oceans except for the Indian Ocean, and is considered to be a threatened species by IUCN (category: Vulnerable). The most recent stock assessment for bigeye in the WCP shows that the adult stock has declined to 16% of its unfished level.[2] Similarly, the adult bigeye stock in the East Pacific has declined to 19% of the unfished level.[3]This represents an unacceptable risk to the stock. The proportion of skipjack, bigeye and other species in a purse seine haul varies between fleets, regions and fishing trips but catch of non-target species is almost always greater when setting on FADs.

A study of combined data from multiple fisheries found that across all oceans, sets on floating objects catch 75% skipjack, 16% yellowfin and 9% bigeye; whilst free-school fishing catches 63% skipjack, 35% yellowfin (which is frequently a target of free-school sets) and 2% bigeye.[4] However, a series of studies in the WCP showed that skipjack catches have been consistently over-reported and bigeye and yellowfin underreported in purse seine catches due to sampling and identification problems, and this may be an issue in other regions. In addition, the proportions of each tuna species caught can vary considerably by set, fleet and area fished. For example, a recent study on a Spanish purse seiner showed that on one trip in the waters of Kiribati, of the 26 FAD sets, 4 of these sets contained 85-99% bigeye tuna and 14 sets caught more bigeye than skipjack.[5]

In the Philippines, a recent study found that juveniles comprise as much as 100% of the catch in purse seines and ring nets[6]. Observer data from Philippine purse seiners and ring-netters fishing on FADs in 2010-2011 found that skipjack accounted for 41.5% and 32.1% of the catch in 2010 and 2011 respectively, with the remainder made up by other tuna, mackerel scad and other fish species. The mean size of all tuna species and mackerel scad was 23-29cm, indicating that the catch was dominated by small fish.[7]. The tendency for studies to quote only the proportions of juvenile catch by percentage weight can obscure the true scale of the problem – due to their smaller size, there are many more juvenile fish in 1 tonne than there are adults, so a high proportion of juveniles by weight translates to a considerably larger proportion by number of individuals.

Conservation measures insufficient – More needs to be done soon and exemptions to agreed international conservation measures must be addressed

In 2013, despite the 3-month FAD-ban and promises to reduce fishing effort, the catch by purse seiners in the WCPO was the highest on record. For the first time ever, purse seiners caught more bigeye tuna (mostly juveniles) by weight than did the longliners that actually target this species (they have been catching more individuals by number than do longliners for over a decade).[8] This represents a massive loss in the potential yield, and value, of the bigeye fishery – particularly given the high price paid for sashimi-grade adult bigeye. The ex-vessel price for adult tuna caught by handline vessels from the Philippines is estimated to be $4000-6000 (US) per tonne (all species).[9] By contrast, the highest price paid for skipjack tuna destined for canning in Bangkok over the past several years was $2,350 (US) per tonne (in April 2013), with prices dropping under $1,500 during some periods.[10]

In addition to increased catch of bigeye and yellowfin tuna, FADs may have broader environmental impacts on tuna species, with consequences that are difficult to predict, as a recent review of a range of studies on FAD impact describes.[11] One study has found that tuna caught on drifting FADs are less healthy than those caught in free schools (the mean weight of fish caught by purse seiners has decreased as FAD use has increased). The increase in FAD numbers has resulted in reduced abundance of free schools, as more fish school under the FADs (which may drive further increase in FAD usage). Studies have also suggested that FADs result in changes to the movement patterns and structure of tuna schools, and may increase the vulnerability of juvenile fish to predators.

An additional problem is that catches of juvenile tunas that are discarded or sold on local fish markets are generally absent from official statistics and, therefore, not included in the stock assessments, contributing to management uncertainty.[12]

The economic losses resulting from FAD fishing may be dramatic. A recent modelling study found that the net benefits to the WCP region from reduction or elimination of fishing on floating objects could be in the magnitude of $100–350 million. These benefits would not be shared equally between fleets, with purse seine vessels seeing a reduction in earnings whilst longliners and handliners reap significant benefits. This model assumed that fisheries are managed to maximise overall rent and capture of juveniles is reduced or eliminated, and predicted that the spawning stock biomass of all species would rebuild in these scenarios.[13]

The problem for other species (and the marine environment)

In addition to juveniles of commercial tuna species, non-target catch by purse seiners and ring-netters using FADs can include a wide range of other species, including bony fish, sharks, sea turtles and occasionally marine mammals.

Sharks and rays are being killed in vast numbers by tuna fishing, and over three-quarters of pelagic shark and ray species are now classified as threatened or near threatened by the IUCN.[14] FAD sets most commonly catch oceanic whitetip sharks and silky sharks, which are in a very poor state, with fishing rates well in excess of levels that will allow the populations to maintain themselves (above F_{MSY}), and with stock declines to well below any safe level (below B_{MSY}).[15, 16, 17] The greatest impact on these shark stocks is attributed to bycatch from the longline fishery, but the associated purse seine fishery has a significant impact on silky sharks, and catches predominantly juveniles. The catch rates on silky sharks from the associated purse seine fishery alone are well above any safe level (above F_{MSY}). Even if care is taken to release silky sharks caught in FADs, they have a very poor survival rate if they are bought on board in brailers (used to scoop tuna from the net) before being released.[18] A recent report from the Indian Ocean demonstrated that the true impact of FADs on silky sharks may in fact be hidden: entanglement and death of silky sharks in the netting that hangs below FADs was 5–10 times higher than the known bycatch of this species within purse seine nets for this region.[19] Silky sharks were raised from Least Concern to Near Threatened worldwide in 2009 on the IUCN Red List of Threatened Species.[20]

Sea turtles are occasionally caught in purse seine nets. In the Pacific, over 71% of these catches occur when purse seine nets are set around floating objects, such as FADs, which sea turtles are attracted to for food and protection.[21] Like silky sharks, sea turtles can also become entangled and killed in the netting under FADs. Data from the Eastern Pacific 2003–2005 showed 1.7% of FADs sighted had a sea turtle entangled.[22] In the WCPFC, encounter rates are highest in animal-associated sets, drifting log sets and anchored FAD sets, and lowest for drifting FADs. This reflects the time it takes for multi-species assemblages to form under drifting objects, with sea turtle encounter rates being highest for those set types where the object or school is floating for longest.[23] Sea turtles caught by purse seines include olive ridley, green, leatherback, hawksbill, and loggerhead sea turtles, all of which are listed as threatened by IUCN.[24]

The scale of the problem – How much is too much?

The use of FADs in industrial tuna purse seine fisheries began in the late 1980s and has increased dramatically in subsequent years. There is currently no requirement for fishing fleets to report the number of FADs that they deploy so data to estimate the scale of their use and impact is sorely lacking[25]. Nevertheless, efforts have been made to estimate the number of FADs deployed by tuna fishing vessels worldwide. One study estimated that between 47,000 and 105,000 drifting FADs are deployed globally each year,[26] another reached an estimate of ~91,000 per year[27] (note that this does not imply this number added to the oceans every year as many will be retrieved and redeployed although others are lost or abandoned so accumulation is likely). Of these it is suggested that almost 60% may be deployed in the Western and Central Pacific Ocean (WCP) (followed by the Eastern Pacific Ocean at ~24% and the Indian and Atlantic Oceans with approximately 10% each), and the vast majority are accounted for by a handful of industrial fishing powers.[28] It is estimated that the Philippines deploys ~7300 drifting FADs annually – only Japan and Ecuador are thought to deploy more. The same study found that the Indonesian fleet deployed approximately 2000 drifting FADs. The global abundance of anchored FADs is estimated to exceed 73,000, of which over 10,000 are thought to be used in the Philippines, Indonesia, Thailand and Papua New Guinea (almost 15% of the global total). However, this could be an underestimation, as the data for the Philippines has not been updated since 1996.[29]

In the WCP in 2013, despite the fact that a 4-month FAD-ban was in place, the proportion of total ‘associated’ sets was 32%, among the highest for the previous decade. The proportion of sets on drifting FADs was the 3rd highest at 22%, with 5% of sets on logs, and the final 5% on ‘other’ associated sets. Associated set types, particularly drifting FAD sets, generally account for a much higher average catch per set than associated sets, so the percentage of sets for drifting FADs was just 22%, while the percentage of catch for drifting FADs was 36%.[30]

FAD usage varies by fleet with some vessels preferring to target ‘free schools’ (not associated to any floating object – artificial or natural), which tend to consist of larger, and therefore more valuable, tuna. For example, Korean purse seiners have a lower than average rate of FAD usage, although the proportion of sets they made on FADs and natural floating objects increased from 5% in 2001 to 27% in 2006 due to increased difficulty spotting free-swimming schools of tuna in the WCP.[31]

The use of FADs significantly increases a vessel’s fishing capacity, and the massive global increase in FAD use therefore contributes significantly to overcapacity in the global tuna fleet (in a way that is difficult to quantify or monitor). Technological advances in FAD design continue to result in further capacity increases. The most recent generation of FADs are equipped with echosounders that transmit daily or hourly estimates of biomass beneath the buoy, allowing skippers to confirm the presence of a school beneath a FAD before visiting it, as well as sensors to detect environmental parameters.[32] As modern FADs can be located quickly and at any time of the day they can be can fished on at dawn (unlike free-schools, which must be located in daylight hours).

The way forward on FADs

Greenpeace's position remains that a full ban on the use of FADs is the simplest, fastest, and most effective way to remove the wide range of problems associated with FADs. However, at a minimum, the following interim FAD management measures, with clear time bound goals for implementation, should be put in place both in the Western and Central Pacific Ocean and in the archipelagic waters of the Philippines and Indonesia:

- Clear labelling for owner identification and tracking of drifting FADs
- Mandatory reporting on the deployment and use of drifting FADs
- Limits on drifting FAD deployment
- Limits of the number of FAD sets by vessels
- Removal of lost, derelict and/or unlabelled FADs
- A moratorium on the construction and deployment of FADs for commercial scale use should be in effect immediately, with resources allocated for this purpose diverted to other areas such as enforcement of laws to curb Illegal, Unreported and Unregulated fishing or the creation of management measures for protecting spawning areas for tuna and other commercially important marine resources.

In addition, Greenpeace recommends that

- Science-based, precautionary reference points and harvest control rules for all target and bycatch species should be put in place for the effective management of the fisheries.
- Pacific high seas pockets are closed to all types of fishing.[33]

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