A Growing FAD

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Fish Aggregating Devices (FADs) have been widely used, especially over the last few decades, by the purse seine tuna industry to increase the efficiency of fishing operations, i.e. to increase the number of fish caught for a given level of fishing effort. Essentially, FADs are man-made structures consisting of objects floating at the ocean surface. These floating structures attract fish that congregate under and around them. The precise reasons for fish behaving in this way remain largely unknown. Although a variety of fish are targeted using these devices, this document considers those used in purse seine tuna fisheries. FADs consisting of buoys or floats may be either attached to the seabed (so-called anchored FADs) or be free-floating at the ocean surface. Many free-floating FADs have an attached radio beacon that helps fishing vessels follow and locate them after they have been released. Some of these devices are very sophisticated, even having sonar equipment attached that can report levels of fish activity beneath them to the associated fishing vessel. By contrast, others are simply natural floating objects such as logs.

The use of FADs in purse seine tuna fisheries has three major consequences, all of which have considerable implications for the sustainability of tuna fisheries:

- They increase the fishing capacity of purse seiners in a way that is difficult to control and measure;
- They increase the catch of juvenile skipjack tuna;
- They result in bycatch of non-target (and vulnerable) species such as juvenile bigeye and yellowfin tuna, sharks, turtles and other fish species.

The use of FADs is widespread. For example, the proportion of skipjack tuna taken under such devices was estimated to be around half of the total global catch taken by purse seining (Bromhead *et al*. 2003). More recent reports suggest that this figure is now even higher - at around 70% of the total purse seine catch (Hallier & Gaertner, 2008). While FAD-based fishing has developed rapidly as a technique, research to determine their impact both on target species and the broader marine environment has not been carried out to the degree necessary to assure that their impacts are acceptable. Overall, while it appears that the use of FADs has intensified markedly in recent years, there is little data on their overall impact.

This lack of accurate data on the use of FADs is currently one of the biggest concerns surrounding this fishing method, and constitutes a severe compromise to the precautionary management of global tuna stocks. This is exemplified by the problems facing the West and Central Pacific Fisheries Commission where the lack of operational catch data undermines the reliability of assessments of stocks and ecological impacts (Jones & Shallard, 2008). The poor quality of operational catch data undermines the reliability of stock assessments and makes it impossible to holistically assess any ecological impacts. Recent reports from the Inter-American Tropical Tuna Commission (IATTC) also show that the accuracy of data on skipjack stocks in the region is undermined as a result of distortion of the catch per unit effort (CPUE) estimates. This distortion is caused by the use of FADs (Maunder, 2010). The available evidence suggests that this could be a problem common to assessments carried out by all regional fisheries management organisations (RFMOs) involved in the regulation of tuna fisheries using purse seine gear

The lack of information on the impacts of FADs on target species is compounded by poor quality information on their wider impacts. For example, the data presented on purse seine bycatch often understates the actual levels sustained by the fishery. Bycatch data from tuna targeted using FADs are often combined with data recorded from free-swimming (unassociated) schools targeted by purse seiners.

The end result of this practice is that it makes the overall purse seine fishery look significantly less destructive than if the figures on purse seining with FADs were presented separately. The combined FAD-associated and free purse seine catches often result in an average of 5% bycatch figures, whereas FAD-associated bycatch figures are generally around 10% of the catch (Bromhead *et al.,* 2003). [See also below]

Globally, it has been estimated that total bycatch from the use of FADs amounts to some 100,000 tonnes every year (Dempster and Taquet, 2005). Given the increasing catches of the world's purse seine skipjack fisheries (2,607,201 tonnes in 2007) and the estimated 70% use of FADs, this volume of FAD-associated bycatch could have grown to over 182,500 tonnes by 2007 and possibly even higher currently based on a simple calculation from FAO catch figures[1].

Skipjack: Deadly fish magnets risking the future profitability of these fisheries?

Although skipjack tuna stocks are considered to be more resilient to increased fishing effort than larger tuna species, studies show that FAD fishing could also be negatively influencing the long-term sustainability of this fishery. Skipjack tuna of all life stages inhabit surface waters and are therefore vulnerable to FAD based fisheries throughout their life cycle. It has been suggested that skipjack tuna are both growth-overfished and recruitment-overfished in some areas of the East Atlantic as a result of FAD use (Bromhead *et al.,* 2003). The removal of large numbers of adult skipjack tuna could cause short-term recruitment-overfishing, whereas the removal of large numbers of juveniles may lead to a smaller spawning stock in future years. It is possible that the use of FADs could also contribute to recruitment- and growth-overfishing of skipjack tuna in other ocean regions.

Given the increased efficiency of purse seine fleets in finding and capturing skipjack tuna due to the use of FADs, and hence improved CPUE, the global catch of the species have been steadily increasing in all oceans. The use of FADs, however, distorts CPUE estimates of the fisheries and hence population estimates. Accordingly, historically poor data coupled with the relative ease with which fishers can continue to find skipjack using FADs, leaves very significant uncertainties attached to the precise status of skipjack stocks in all the world's oceans.

Bigeye and yellowfin tuna: FADs driving their demise

In addition to the impacts on skipjack tuna resulting from the use of FADs, other more vulnerable tuna species (specifically bigeye and yellowfin) may also be experiencing impacts at the population level. Due to the tendency of young bigeye and yellowfin tuna to swim in surface waters and to mix with similar-sized schools of skipjack tuna they are also vulnerable to being caught in FAD purse seine fisheries. Attempts to quantify the bycatch of juvenile tuna and other species in purse seine FAD fisheries targeting skipkjack have been limited (for examples see WCPFC, 2007), but scientists consider that this bycatch is an important element in the current overfishing of both bigeye and yellowfin tuna. ICCAT (2009) explicitly recognised this problem in a recent report on tuna stocks: The younger age classes of yellowfin tuna exhibit a strong association with FADs . The Committee further noted that this association with FADs, which increases the vulnerability of these smaller fish to surface fishing gears, may also have a negative impact on the biology and on the ecology of yellowfin due to changes in feeding and migratory behaviors. Similarly the Scientific Committee for the Western and Central Pacific Fisheries Commission (WCPFC) recently noted "the continued high fishing mortality on juvenile bigeye due to associated purse-seine sets and the fisheries of Indonesia and the Philippines." (WCPFC, 2009).

According to the University of Hawaii's pelagic fishing programme, FADs used by purse seine nets are considered a major factor in pushing yellowfin and bigeye stocks towards depletion (University of Hawaii, 2008). Given the higher commercial value of yellowfin and bigeye tuna, it is not only environmentally destructive, but economically shortsighted to be killing the young tuna, particularly when this is taking place as a result of targeting the less-valuable skipjack tuna.

Ecological havoc and laying waste to endangered species

Recently it has been suggested that FADs could be acting as 'ecological traps' (Hallier & Gartner, 2008). In addition, (Dempster, 2004) association of tuna with FADs may disrupt migration patterns and lead to the modification of feeding regimes, growth and survival rates, and population size-structures.

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[1] Calculation based on the FAO estimates that total purse seine catches were 2.607.201 MT in 2007. 70% FAD with 10% bycatch

As well as the targeted tuna species, FADs attract and capture other species which are then caught as bycatch. This includes a range of other fish including overfished species of billfish and endangered sharks, as well as endangered turtles. Data presented by Korean researchers to the WCPFC Science Committee in 2009 showed that the use of FADs led to significant bycatch of juvenile bigeye and yellowfin tuna, marlin, barracuda, whale sharks, silky sharks, and Olive Ridley turtles (An *et al*, 2009).

Sharks and rays are being killed in massive numbers by tuna fishing, including three quarters of the oceanic pelagic shark and ray species which are now classified as threatened or near-threatened by the IUCN and which are caught regularly in purse seine nets targeting tuna (Camhi *et al,* 2009. For example, silky sharks are the most commonly-caught species of shark in the Eastern and Western Pacific purse-seine fisheries, particularly by purse seines using drifting FADs (IATTC, 2009 and SCP, 2008). The continuing decline of this species of sharks has recently led to their IUCN red listing being raised from Least Concern to Near Threatened world-wide. In the Northwest and Western Central Atlantic they are listed in the higher category of Vulnerable (Camhi *et al,* 2009).

Oceanic whitetip sharks are the second most commonly-caught species of shark in the Eastern Pacific purse seine fishery (IATTC, 2009). They are red-listed as Vulnerable worldwide, and as Critically Endangered in the Northwest and Western Central Atlantic (Camhi *et al*, 2009). The Oceanic whitetip shark was also proposed for listing on Appendix II at the last Convention of Parties of the Convention on International Trade of Endangered Species. Whale sharks are also commonly caught by purse seiners in the Western and Central Pacific (SPC, 2008) and are red-listed as Vulnerable worldwide (Camhi *et al,* 2009).

Cutting fins off sharks, often while they are still alive, and then throwing the sharks back into the ocean is common practice on tuna fishing boats. The fins can be sold at top prices in countries where shark fin soup is a delicacy. In the central Western Central Pacific Ocean alone, the annual catch of sharks has been as high as 80,000 sharks a year, and ‘disproportionably high capture rates of sharks’ were also reported from purse seine sets on schools of tunas associated with floating objects (Moloney, 2005). With the increasing use of FADs since this report, this figure is now likely to be higher.

Six of the seven sea turtle populations worldwide feature in the IUCN Red List of Threatened Species and all five Pacific sea turtles are listed as Critically Endangered, Endangered or Vulnerable. One of the most dramatic declines has occurred in the Pacific Ocean, where nesting populations of leatherback turtles have plunged by over 95% in the last three decades and loggerheads by 80–86% over a similar period (Lewison *et al*, 2004). Fishing with FADs may cause severe problems for local populations of turtles (Bromhead *et al*, 2003) while research indicates that thousands of marine turtles die each year in long lines in the Pacific Ocean alone (Lewison *et al*, 2004).A recent report on global bycatch of turtles by global fisheries suggests that estimates are severely underestimated (Wallace *et al*, 2010). There is also little data available on the numbers of turtles captured and killed in the underwater nets and other associated structures of floating FADs.

Although longline fisheries have the largest impact on the decline of sharks and turtles, it is of huge importance - given the endangered status of many of these species - that the mortality of these species in purse seine fisheries is urgently brought to, or close to, zero. It is, however, unclear how the bycatch of sharks and other marine life could be effectively mitigated in these fisheries. While turtles can be freed from the smaller purse seine nets by observers it is questionable whether this can be done in an efficient manner for the larger nets in the midst of large schools of tuna. The most effective way of immediately reducing bycatch, given the fact that few effective mitigation techniques currently exist, is by banning the use of FADs in purse seine fisheries altogether.

Conclusions and Recommendations

Greenpeace’s position is succinctly summarised by Bromhead *et al,* (2003), who state “the current and expanding use of FADs with purse seine fisheries around the world appears likely to have a number of detrimental effects, both to the long-term sustainability of tuna fisheries, to the ecology of tuna species, and to a lesser extent, the ecology of other pelagic species.” FADs were widely introduced as an alternative method to catching tuna in order to solve the dolphin bycatch issue. However, the bycatch problem has merely been transferred to other species of marine life and clearly shows that the single species approach to bycatch problems in tuna fisheries does not work. It also shows that the industry alone cannot be tasked with innovation for solving the problems of FAD-based purse seine fisheries. Given the above concerns and the importance of this high volume fishery to the economies of coastal states and its contribution to the world’s food security, Greenpeace believes that the use of all objects that are deployed artificially as FADs by purse seine fisheries should be banned globally by all the tuna RFMOs. Furthermore, as a matter of urgency the tuna fisheries must be based on ecosystem-based management and the precautionary approach.

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