Does fishing on drifting fish aggregation devices endanger the survival of tropical tuna?

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Fishermen hold empirical knowledge that tuna aggregate under floating objects, such as lengths of old rope, pieces of wood, or even large marine mammals. There is still no full explanation for this aggregation behaviour, but the past 20 years have seen purse-seine fishery operators take advantage of the associated concentrations of fish. Fishermen cast off floating rafts equipped with buoys which act as FADs.

An enormous purse-seine net, deployed in a wide arc on either side of the vessel, encircles the school of tuna that come to shelter under the FAD. The lower part of the net is tightened, enclosing the fish in a hemisphere large enough to entrap a mass of tuna.

A sudden growth in the size of tropical tuna catches taken from under these artificial drifting objects was observed for the early 1990s. This was true especially for juveniles. Between 1996 and 2005 the average annual catch taken on FADs reached 1 115 000 tonnes, nearly a third of the global figure for tuna, all species considered together. In Japan, the fish processing industry furthermore had long reported that the flesh from floating-object associated tuna was less plump than that of specimens caught from free schools. This prompted an IRD research team to investigate whether or not the practice of drifting FAD fishing could set up an ecological trap for the tropical tuna species.

This trap concept is a notion from population biology used to describe

situations in which the population falls following a sudden change in its environment, most often linked to human activity. An example is give by marine turtles which, after hatching on beaches, use the sparkle of moonlight on the sea surface to guide themselves back to the ocean. However, high light pollution levels on urbanized coastlines in certain regions disturbs their sense of direction. Young turtles therefore set off on a path that leads them to land, where they die from dehydration.

Over the past ten years, over 30% of world catches of skipjack (Katsuwonus pelamis), bigeye (Thunnus obesus) and yellowfin (Thunnus albacares) tuna, the three tropical tuna species which can be caught at drifting FADs, have been achieved using this fishing method. For the skipjack amounts taken under drifting FADs reached even as high as 72% of all catches. To check if the large-scale deployment of drifting FADs could present an ecological trap for these species, a range of biological (fish plumpness, growth rate, stomach fullness) and ecological (migration pattern and distance) indices were determined on yellowfin and skipjack captured under FADs in the Atlantic and Indian Oceans.

Comparison was then made with data gathered from free-school caught individuals of these same species. A salient finding was that 74% of drifting FAD-associated skipjack had empty stomachs at the moment of capture compared with only 13% for those fished from free schools. Figures of the same order of magnitude were obtained for yellowfin, with proportions respectively reaching 49% caught on drifting FADs and 7% from free schools. The survey indicated that the tuna caught under the FADs fed less well than those fished from free schools. Moreover, the fact that for the same weight the FAD-associated specimens caught showed lower plumpness than the free-school ones could reflect a deficiency in energy-reserve accumulation in those that concentrated around the floating devices.

The research team also sought to find out if the large-scale deployment

of drifting FADs could affect the migration patterns of these far-travelling fish species. Tagging surveys allowed comparison of the nature of migrations accomplished by fish moving with the drift of FADs with that of non-FAD-associated individuals. The migration directions and displacement rates in terms of daily distances travelled were indeed affected by the presence of artificial floating objects. Drifting FADs therefore appeared to act as super-stimuli, like strong magnets exerting a binding attraction that leads the tuna towards ecologically inappropriate waters with scarcer food supplies.

This survey brought support for a body of reasonable assumptions regarding the tuna behaviour. However, it did not provide certain confirmation of drifting FADs' negative impact on the entire life cycle of these tuna species and therefore of their possible role as a true ecological trap. Nevertheless, the biological effects observed indicated that it would be more reasonable to preclude deployment of drifting FADs near coasts where tuna juveniles aggregate. These young fish represent the future of the whole stock and such a restriction would be a way of avoiding their being led astray, away from the zones which are ecologically most favourable to them.

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