Solving the Juvenile Tuna Dilemma

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"Based on these results, we conclude that MSY levels would rise if mortality of small fish were reduced which would allow greater overall yields to be sustainably obtained". Source: Harley et al, 2010. WCPFC-SC6-2010/SA-WP-04 on the 2010 Stock Assessment Results of the big eye Tuna from the Western and Central Pacific Island.

This paper challenges us to look at the problem of taking juvenile/ immature tuna by the purse seine fisheries thus lowering the possible total output (in tonnes and $$) of the industry for the short-term benefit of local small scale fisheries and proposes novel ideas to raise revenues which could provide incentives for these small scale local fishery not to catch juvenile tuna and disincentives for those that continue to add to the problem.

Importance of Tuna Fisheries to the Coral Triangle Economies

The tuna industry in the Coral Triangle supplies a large portion of the global demand and provides livelihoods along its entire supply chain. The fishery and its ancillary industries provide huge economic benefits to the domestic economy.

The CT countries including Indonesia, Philippines, Papua New Guinea, Solomon Islands and Timor L'Este produce a quarter of the global tuna production and over half of the production of Pacific Ocean. The main four species of skipjack, yellow fin, big eye tuna, and albacore are mostly exported. Small tunas (bullet, frigate, bonitos) and tuna like fishes (dogtooth, mackerels) provide food and livelihoods to thousands of local coastal fishers.

The Western and Central Pacific Fisheries Comittee (WCPFC) reports a total production of 2.51 million tons for 2009, the highest production on record. CT countries reported a total of 849.9 thousand tons of principal species of tunas- representing 39% of the WCPFC region's total output. This production output does not even include the small tunas, lesser known tuna species, nor all tunas caught in the archipelagic waters of Indonesia.

The Paradigm of the Broken Triangle

The broken triangle (Fig 1) illustrateshow tuna fishing starts inside and near CT countries on tuna adults and juveniles by local CT fishers. Non-captured juvenile fish moves into open international waters to grow and mature and be captured by mostly well-organized distant water fleets, that can sell the high grade larger tuna into markets of the US, EU, and Japan. As the value and benefit from a single tuna increase along the supply chain, Philipine and Indonesian fishers receive the least benefit. There are few benefits that flow back from the markets to the CT fishers for managing the juvenile stocks and allow for the tuna to grow to high grade large size individuals. The local fishers can sell their under-sized juvenile at local prices or into the canneries that process it mixed with adult skipjack tuna. There is no incentive to let the juveniles swim and grow into high valued reproductive adults to be caught by other international fleet. How can we fix this broken triangle?

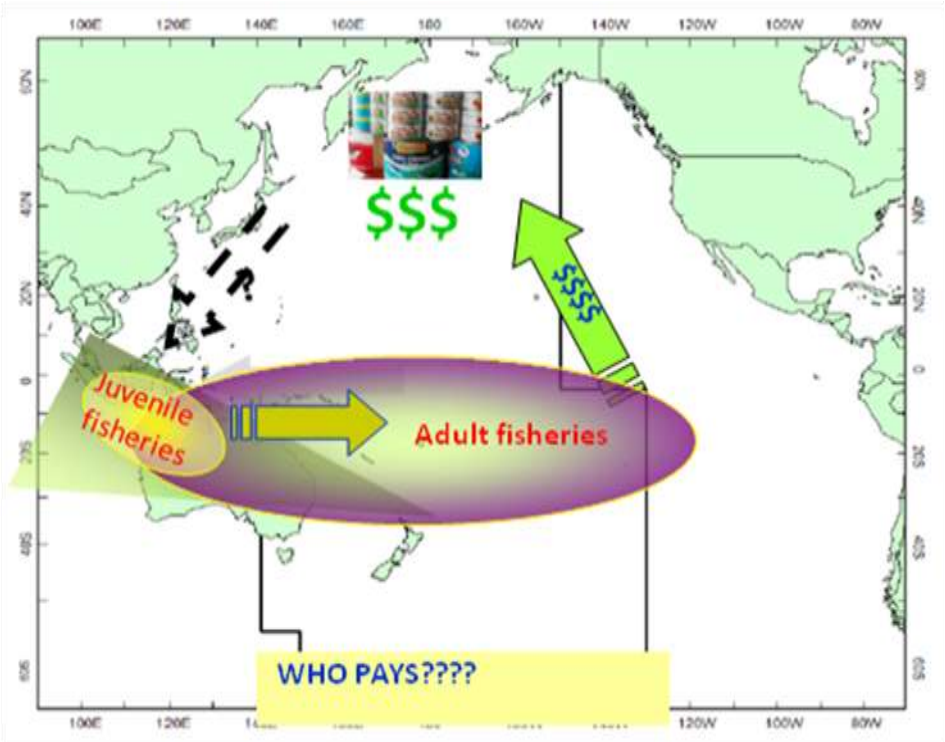

Figure 1. Flow of resources and benefits from tuna fishing and trade from the Coral Triangle region.

Defining the Juvenile Tuna Problem

In the Coral triangle, tunas spawn all year round. The eggs and larvae are found in both the coastal and offshore areas and grow to 20-50 cm within a few months when they enter the fishery. These early recruited fishes are caught by coastal fisheries, notably purse seines, ring net, hand line and gillnets (Aprieto 1995, Zaragosa et al 2004).

Purse seines and ring nets operating in the CT target mainly skipjack tunas that are processed into cans, while hand line and long line targets mature tuna sizes for the sashimi market. Gillnets are non-selective and catch what is available depending on the season. A conflict exists between the purse seine fleet catching juvenile yellow fin and big eye tunas as non-target catch. This occurs where, for unclear biological reasons, yellow fin and big eye juvenile tunas swim alongside schools of skipjack of similar sizes.

In attempts to reduce costs of fishing, fish aggregating devices (FADs) were introduced in the region in the 90's, and this has exacerbated the issue as these devices tend to herd more juvenile tunas than free swimming schools do. Mature skipjack is less than half the size of an adult yellow fin or big eye, and thus the catch of targetted adult skipjack is mixed with juveniles of the other species. The increase in catch of juveniles in the last 50 years may have contributed to the slight decline in trophic level of the catch. (Siebert et al 2006).

How big is the juvenile tuna problem?

Aiming to quantify and illustrate the urgency of the problem for the Coral Triangle region, we have used the most recent and updated catches from Philippine domestic fleet (Barut and

Gervailes, 2010). To estimate the proportion of juveniles, data from the National Stock Assessment Program was used (NSAP, 2006, 2007, 2008). Length at maturity for each species from FISHBASE: skipjack = 45 (± 5cm); yellow fin = 100 (± 10 cm); big eye tuna = 120 (± 15cm).

Table 1. Total tuna catches and proportion of juveniles by gear type based on 2009 catches from Philippine archipelagic waters. Data sources: WCPFC (2010), NSAP (various years)

Gear Type	skj	Prop juv	yft	Prop juv	bet	Prop juv	Total Catches (tons)	
Purse Seine	123736	0.3	21381	1	2663	1	147780	
Ring Net	29862	0.5	7347	1	291	1	37500	
Tuna Hand line	102	0.05	7768	0	330	0	8200	
Hook and Line	23899	0.6	43172	0.95	2929	0.95	70000	
Others	1355	0.5	1327	0.95	15	0.95	2697	
TOTAL	178954		80995		6228		266177	

Table 2. Quantity (tons) of juvenile tunas caught by the Philippine domestic fleet[J1].

Gear Type	skj	yft	bet	Total Juvenile Catches
Purse Seine	37121	21381	2663	61165
Ring Net	14931	7347	291	22569
Tuna Hand line	5	0	0	5
Hook and Line	14339	41013	2783	58135
Others	678	1261	14	1952
TOTAL	67074	71002	5751	143827

Based on these numbers, 54% of the 266.2 thousand tons of tuna caught, are juveniles. Per species proportion of juveniles skipjack tuna is 37.5%, for yellow fin tuna it is 87.7% and for big eye tuna as much as 92.3%. This Philippine example also reflects similar conditions in Malaysia and Indonesia and to a lesser extent to PNG and Solomon Island tuna fisheries where juveniles, have grown to >10kg are far more common in catches of purse seine as one moves eastward to the Pacific islands.

Continuation of catching large proportions of juvenile tunas does not support an effective and sustainable tuna industry. Markets need to be sensitized about the juvenile issue as current pricing and purchasing practices do not discriminate juveniles from adults.

Economic cost of catching Juvenile tunas

The total value of the juvenile tuna catch, using average skipjack whole round prices for 2009 (Thailand, $1050/metric ton) amounts to $151.0 million of which $74.5 million comes from

yellow fin juveniles. These juvenile tunas end up in the can or in the local wet markets, where prices are much lower.

If these juvenile individuals could grow to maturity and be catch after another year – accounting for natural mortality losses- the initial 71 thousand tons of YFT would be reduced to 23 thousand tons. Its total value however, due to price difference ($4000/metric ton for sashimi grade) is much higher at $92.1 million. And the now adult YFT may have had a chance to spawn and thus support a next generation of fish entering the waters and eventually the fishery.

Fishing the juveniles of yellow fin tuna alone, as in the case for the Philippines, creates potential loss for the 2009 tuna fishery at $17.6 million.

Some thoughts to fixing the broken triangle – too stimulate thinking and debate

1. Could we develop a scheme that raises funds by putting a price on catch of juveniles as a "sustainability levy". Similar to the 'cap and trade of carbon credits", each fleet will be given a cap on a yearly harvest of juvenile YFT and BET that they need to offset by buying credits from countries where juveniles are taken. These funds could then be used by countries to invest in conservation and management .
2. Could these funds raised be used to retrain and retool fishers to leave the sector. The $17 million price differential as the example given above for the Philippines is a fairly large sum that when raised initially (say from GEF) and perhaps paid for by the hand line and long line fishery (as beneficiary of the scheme) could provide the support to wean local fishers from catching juvenile tunas.
3. Can we estimate the function values, the amount in monetary terms that nature provides to raise and grow these tunas to marketable sizes. This amount will be added to the existing tuna prices and these needs to be returned to the source countries where tunas where caught to manage junevile tuna populations better.

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