

Protection of juveniles or adults? – Case of Pacific bluefin tuna

People sometimes ask me whether protection should be given to juveniles or adults (spawning stock) in the conservation and management of bluefin tuna. They also say that catching adults after spawning must be better than that before spawning in terms of stock conservation. As to the first question, it is not possible to say either should be protected. The second point is related to the first one, which will be explained later in this article. Then, what actions are actually taken in real fishery management based on what ideas? I checked the case of Pacific bluefin tuna in the Western and Central Pacific Fisheries Commission (WCPFC). The majority of Pacific bluefin tuna is caught in the WCPFC area while part of the catch is made in the area of the Inter-American Tropical Tuna Commission (IATTC), which also manages this species there. Since both Commissions manage the same species, they cooperate to manage it towards the same goal.

Regulations on juveniles are stricter than those for adults

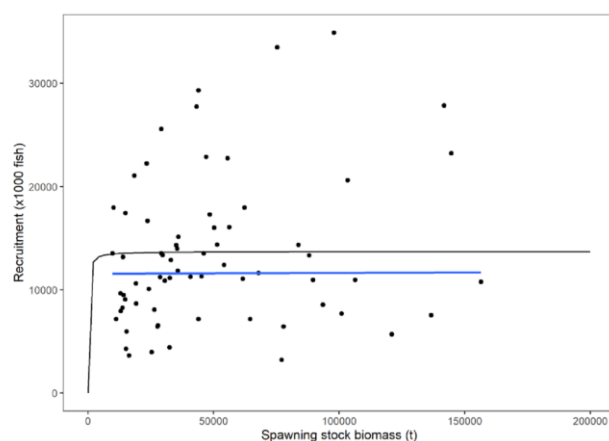
The idea that juveniles should be allowed to grow up to a certain size is not a new one. Once fish are hatched, the number of fish decreases due to prey and starving during the juvenile stage. However, as the weight gain of surviving fish outscored the weight loss caused by the dead fish, the total weight of the fish school increases. Then, as fish grows up to a certain size, the growth ratio starts declining and the weight gain becomes small. The effect of the decreasing number outscored the weight gain and the total weight of the fish school decreases. It is well known in the field of fisheries resource management that the total weight of a fish school reaches its peak at a certain size. In other words, one must find the best fish size for catch to maximize the total catch. Then, what is a certain size? This is somewhat ambiguous and does not indicate a specific size, but people in old times must have learnt empirically that refraining from catching juveniles would lead to an increase or stabilization of the catch.

The WCPFC adopted in 2014 a conservation and management measure to impose a strict control on the catch of juveniles of Pacific bluefin tuna. It required that: (i) the catch of fish smaller than 30kg (mostly juveniles) be reduced by 50% from the 2002-2004 average catch level; and (ii) the catch of fish 30kg or larger (mostly adults) not be increased from the 2002-2004 average catch level. There are several reasons why the juvenile catch had to be regulated in such a way. First, since a large amount of juvenile catch by purse seine fishing, which had started in the early 1990s, brought a great impact on the adult stock, the catch of juveniles had to be reduced. Looking at the catch history of Pacific bluefin tuna, the juvenile catch was far larger than the catch of adults in the 1990s and thereafter. Under such

circumstances, it is known that the possible negative impact of juvenile catch in a large scale on the future spawning stock greatly exceeds that of adult catch.

(https://isc.fra.go.jp/pdf/ISC22/ISC22_ANNEX13_Stock_Assessment_for_Pacific_Bluefin_Tuna.pdf).

Second, as Pacific bluefin tuna start spawning at the age of 3 or 4, the reduction in the juvenile catch is expected to increase the spawning stock in a relatively short term. Further, the relationship between the number of adults and the number of juveniles (children) produced therefrom is unclear (see below) and it cannot be said that the increase in the adult stock will increase the number of juveniles. (Please note that although the relationship in black line was actually used in the real stock assessment, both black and blue lines are linear, which means that the assumption is that the number of children will not change even when the adult stock increases.)



Relationship between spawning stock (adults) and recruitment (children) of Pacific bluefin tuna

(Excerpt from ISC/22/ANNEX/13)

Vertical axis: recruitment

Horizontal axis: spawning stock biomass

The black line is the one used for the stock assessment. The blue line is the one adjusted taking into account possible biases due to assumed recruitment variations.

With these reason, the WCPFC considered that the best way for recovery of the Pacific bluefin tuna stock would be to reduce the juvenile catch while maintaining the adult catch. The latest stock assessment indicates that the stock is steadily recovering and has already exceeded the interim target level, approaching the long-term target level. This means that the measure focusing on regulation of juvenile catch has been effective.

While the minimum catch size of Atlantic bluefin tuna is set at 30kg, there is no such regulation in the management of Pacific bluefin tuna. This is because most of the fisheries catching Pacific bluefin tuna would be prohibited if such regulation were introduced. It is not realistic to implement such measure. On the other hand, it was scientifically predicted that the stock would surely recover, even if low recruitment continues, by reducing the juvenile catch by 50% and keeping the adult catch. In the case of Atlantic bluefin tuna, the eastern stock, which occupies the super majority of the catch of Atlantic bluefin tuna, was not well managed and even the catch estimate was not reliable. Accordingly, a CITES Appendix I listing proposal (prohibition of commercial trade if listed) was submitted. To avoid the listing, much more stringent regulations had to be established quickly, including the minimum size requirement. It should be noted, however, that this minimum size requirement is not necessarily applied to all the fisheries. For example, smaller minimum size requirements are applied to fisheries such as Croatian purse seine fishing, which are conducted in the area where only juveniles are found, and baitboat fishing in the Bay of Biscay where fishermen have been traditional catching juveniles. These are examples that certain flexibility from the socioeconomic standpoints is necessary for fishery regulations.

Catching adults after spawning rather than before is more effective for conservation of adult stock?

As explained above, if the majority of the catch is juveniles as in the case of Pacific bluefin tuna, the control on the adult catch can be effective for protection of adults, but not so for the stock recovery itself. On the other hand, the control on the juvenile catch is expected to protect future spawning fish and thereby recover the stock. This is why it is important to reduce the juvenile catch while maintaining the adult catch. During the course of this discussion, the WCPFC did not discuss whether adults should be caught before or after spawning.

In the case of Atlantic bluefin tuna, environmental NGOs once claimed that spawning grounds should be a sanctuary (a protected area), which is somewhat related to this argument. Upon this claim, ICCAT (the Commission) requested the scientific committee (the SCRS) to consider the validity of this logic. As long as I read the record on communication between the Commission and the SCRS, the SCRS did not express its views on this. The protection of the spawning grounds is closely related to the fishing period of purse seine fishing, which operates in the Mediterranean and produces the majority of the catch in the eastern stock. The spawning period in the Mediterranean is June to July while the main fishing period of purse seine fishing is June. This means that there is an extensive overlap between the two, but purse seine fishing before the spawning period is not prohibited. For the western stock,

fishing for Atlantic bluefin tuna is prohibited in the Gulf of Mexico, which is the spawning ground for the stock. However, fishing before the spawning period is not prohibited. It seems to me that in the case of Atlantic bluefin tuna, little attention is also given to the question of whether the adult should be caught before or after the spawning season.

In summary, in the case of bluefin tuna, no reference is made as to the effectiveness of the adult catch after spawning on protection of adults. It should be noted, however, that the effects of catching adults before or after spawning on the resource management may vary, depending on species, and protection of adults before or after spawning is important for some species. What is written here is applicable only to bluefin tuna.

Co-existence of various fisheries is expected

Apart from the analysis of the validity of protecting juveniles or adults, resource management should also consider another important element, that is, coordination among existing fisheries. Bluefin tuna migrate in vast areas, from coastal to distant-water areas, and are caught by different fisheries. This makes coordination among different fisheries difficult. It is important for resource management to recognize this and try to let various fisheries co-exist for several reasons.

First, various fisheries operating in different areas and catching different sizes of bluefin tuna can provide information on the overall stock fluctuation and thus merits for the stock assessment although the amount of data to be collected increases and the assessment model becomes more complicated. Second, the majority of catch comes from coastal fisheries and the characteristics of coastal fisheries should be considered. Coastal fisheries such as traps and trolling can catch bluefin tuna in a limited time and area. In many cases, they can catch only juveniles. Purse seine fisheries that have been catching juveniles are becoming an important source for providing fries to aquaculture. Coastal fisheries catch most compared to offshore and distant-water fisheries and play a socioeconomic and cultural role, which is important for local societies. Taking account of these points, it is my hope that all the people concerned about bluefin tuna will show wisdom so that the catch levels of juveniles and adults by different fisheries are adjusted appropriately for survival of each fishery while keeping the stock at a healthy level.