Problems in farming of Atlantic bluefin tuna

The problems occurring in the farming of Atlantic bluefin tuna (ABT) were previously reported in my article dated March 2019. As a follow-up, this article highlights three points: (i) statistics for ABT farming production and trade; (ii) accurate estimation of catch amount at the time of putting live caught fish into farming cages (caging); and (iii) growth estimates of farmed ABT. It discusses what these problems are and how they relate to each other.

Statistics for ABT farming production and trade

The International Commission for the Conservation of Atlantic Tunas (ICCAT) has no statistics for farming production and trade of ABT. The lack of compilation and publication of such data is a serious defect given that the scale of the farming has become so big now. ICCAT introduced an electronic bluefin catch document (eBCD) which mandates ICCAT Members to report the movement of ABT from catch to export/import. This could enable ICCAT to produce such statistics, but no progress has been made so far. Since more farmed ABT is being exported to countries other than Japan in recent years, it would be possible to see the whole picture of ABT trade if the export data to those countries were to become available. It seems that the Fisheries Agency of Japan (FAJ) will make more efforts in ICCAT to realize such compilation and publication. This problem should be resolved as soon as possible.

Accurate estimation of catch amount at the time of caging

It is difficult, in farming, to count the number of fish as well as to measure the length and weight of each fish (biological measurement) and this has caused problems in conducting the ABT stock assessment and management of allocations to each Member, which made it difficult for ICCAT to manage the total allowable catch (TAC). To overcome this, ICCAT introduced, in 2014, stereoscopic video cameras (SVC). SVC consists of two cameras which record ABT at the time of caging. The length determined through the video image of each ABT is converted to the weight using the length-weight relationship formula and thereby the total amount of the catch can be estimated. While measurement through SVC should cover a random selection of 20% of the fish to be caged, there are concerns that smaller fish are being intentionally selected for measurement. Also, the measurement is done by clicking the tip of the head and the central end of the caudal fin on the screen, so the length could be calculated as being shorter if the wrong places are clicked intentionally. If these things are occurring, there is a possibility that: the catch amount is underestimated; the stock assessment is biased; and TAC is not observed, causing compliance issues.

Another problem is that, when recording the movement of fish going into cages, sometimes the bulk of the fish all quickly move at the same time. In such cases, several individuals are superimposed on the screen or the video images of some fish in the group are obscured. This causes the possibility of underestimating their number and difficulty in measuring their length. In addition, the validity of 20% has not been scientifically tested. To resolve these problems, Japan has been leading a discussion on the realization of a system which automatically measures the length of all the fish using artificial intelligence (AI). It is not clear, however, whether this will be introduced soon.

Growth estimates of farmed ABT

Since it is difficult to measure directly the weight of the fish subject to farming and the estimates through SVC cannot exclude human biases, FAJ has been checking the consistency between (i) weight growth of fish during farming calculated by comparing the weight of caged fish and the weight of harvested fish, both of which can be extracted from eBCD accompanying fish imported to Japan and (ii) a table produced by the Standing Committee on Research and Statistics of ICCAT (SCRS) indicating weight growth by size at caging and by duration of farming. This revealed that there are many cases in which the growth of fish is two or more times higher than the figures in the SCRS table. In some cases, the import of the fish to Japan was suspended while discussion was going on between the exporting Member and Japan. Let's examine the problem of the growth in farmed fish in detail, looking at recent events.

The size of ABT caged for farming varies greatly, ranging from 30 kg to 300 kg. In some cases, only fat fish just before spawning are selected for farming whereas in other cases only skinny fish just after spawning are selected. Nevertheless, ICCAT has only one formula for conversion of length to weight, which does not appear to be able to cover all the cases. Next, let's look at the table produced by the SCRS regarding possible growth rates by size at caging and by duration of farming. In 2009, when this table was produced, the ABT stock was depleted, and the catch statistics were inaccurate. The table was produced in a hasty manner to estimate the catch weight of ABT subject to farming, which was expanding rapidly. It should be noted that the basis for calculating the figures in the table is not clear and no threshold beyond which the growth is considered abnormal was established. This is one of the causes behind the suspension of the ABT import to Japan as mentioned above.

There are problems in FAJ's estimation of growth by comparing the average weight of the fish at caging and the weight of the fish harvested (imported) on the eBCD. Export of fish is usually conducted by harvesting fish several times from the same farming cage.

When only big fish are exported, the estimated growth becomes much bigger than the actual one. On the other hand, when small fish are exported, the estimated growth becomes small, or even negative in extreme cases. To resolve this problem, FAJ compares the average weight of the fish caged and the average weight of the fish harvested after most of the fish are harvested. Unfortunately, this method cannot be applied to cages where part of the fish is carried over to the following year.

To respond to a criticism that the SCRS table does not properly reflect regional differences in growth of ABT, the SCRS has started a new research project to estimate the maximum growth rates during farming by looking at data on an individual basis, but it is not easy to trace the growth of individuals. In addition, the growth rate of the same size of caged fish may vary, depending on conditions such as the temperature, the feed and the density of fish in a cage. The SCRS is planning to calculate the maximum growth rates by about four different areas to address such variations.

The quickest solution for estimating the weight of ABT for farming would be that ICCAT will develop a system consisting of SVC and AI which automatically measures the length, as well as a software which automatically converts the measured length to the weight. The discussion on this new technique is expected to advance as soon as possible. If this new system is established, the current research project on growth rates in farming by the SCRS would be no longer necessary. Since management of ABT farming in ICCAT could affect management of farming in southern bluefin tuna and Pacific bluefin tuna, attention should be given to how this discussion will proceed in the next few years.