Problems in bluefin aquaculture-Need to increase effective utilization of stereoscopic cameras

Introduction

Southern bluefin tuna farming as currently practiced, started successfully from the mid-1990s by Australian companies and thereafter spread rapidly to various Mediterranean countries and to Mexico (along Californian Peninsula coast) by

the mid -2000s and continues to the present. Japan, the originator of bluefin tuna farming has the oldest history of small scale bluefin tuna farming which started in the 1970s. Japan continues to be a bearer of the tuna farming industry and has now begun bluefin tuna farming using artificial seeds obtained from parents produced by lifecycle aquaculture along with use of seed juveniles caught in wild.

Bluefin tuna farming production substantially surpasses wild tuna production which used to be the main provider of bluefin tunas. The farming innovation and development is continuing. However, recently some negative issues related to the bluefin farming seem to be appearing such as illegal transactions involving several thousand tons of farmed bluefin tuna disclosed by the Spanish government and the EU and doubts related to false reports from a part of the Mediterranean farmed bluefin tuna that showed abnormally high weight gain during farming. In addition, I am concerned about the stock assessment of the east Atlantic

bluefin stock although the stock assessment has improved significantly due to mandatory use of the stereoscopic cameras that monitor the number and length/ weight of the wild tuna transferred into the farming cages. Here, I would like to express briefly my opinions, specific to use of stereoscopic camera, with the concerns related to the Atlantic tuna farming and how to resolve them.

Problems of using the stereoscopic camera

As previously mentioned, after bluefin farming started in the Mediterranean Sea and the Strait of Gibraltar areas, most of the bluefin tuna caught in the east Atlantic and the Mediterranean Sea has become produced by the farming. Before the farming era, catch in number and length/weight of bluefin were measured mostly by scientists and enumerators

at unloading ports but this direct measurement became impractical after the farming started because tunas destined to the farming operations are transferred alive into the farming cage. To obtain the number and size of the live tuna used for the farming, the use of stereoscopic camera has become a mandatory requirement.

Tuna farming starts from catching wild bluefin mostly by purse seiners, then the live tuna caught are trans-ferred from the purse seine net to another net specifically designed to tow fish very slowly for a few weeks keeping them alive from the fishing ground to the farming sites. At the farming site, a short net tunnel that connects the towing net and the farming cage is used to transfer the tuna. Measurement of length of bluefin tuna takes place by simultaneous shots of the target tuna entering through the short net tunnel by two cameras fixed about 1m apart installed at the entrance part of the farming cage. Measurement of length of target live tuna is made indirectly with use of triangulation theory.

At times, when tunas overlap without showing the whole body or when the water is not clear enough, the measurement does not work. However, length measurement and number of tuna is accurately made in most cases. According to the rules stipulated in the regulatory measures, the total number and length of 20% of the total number of tuna randomly selected into the farming cage should be reported for each caging time. The measured data thus obtained form fundamental statistics for stock assessment of the east Atlantic stock which includes the Mediterranean Sea. In addition, these data form an important basis to check whether or not allocated catch limit is observed by estimating total weight of caged tuna . This is done by multiplying the total number and average weight obtained through conversion of length to corresponding weight using length-weight equation. Although it seems that some technical improvements are required with the stereoscopic camera, particularly with respect to size reduction and easier/versatile manipulation, such improvements are expected in the near future. Thus, the use of the stereoscopic cameras is an effective and indispensable tool.

Lack of witness inspection of length by observers

However, the operational procedures for the use of the stereoscopic camera, rather than the tool itself, is problematic.
Current regulatory measures require attendance of observers qualified by the ICCAT (regional observer : ROBS) to check whether recording of the number and length of tuna is carried out satisfactorily during transfer and caging. Although the ROB witnesses the

counting of the number of fish, they never witness length measurements. This leads to the doubt that the estimate of the total weight of caged fish is biased. For example, it could be suspected that a catch of more than that allocated (over-quota) can be made if intentionally small fish are selected to be measured, as the ROB does not make witness the length measurement process. This intentional measurement of the small fish at the start of the caging results in abnormally higher weight gain than that estimated by the Scientific Committee of ICCAT(SCR) and that will be discovered in the final stage of the transaction as it is impossible to cheat weight at harvest stage. Whether or not my suspicion is true can be seen if the record of actual size measurement is carefully examined. To increase transparency of the tuna farming, Japan has been proposing the ROB check both size measurement and estimated weight as a mandatory requirement. However, the EU and other parties in the ICCAT are opposing this by postulating this measure causes practical difficulty to be implemented. This opposition is regrettable and can not be justified in view of responsibility of Contracting Parties to ensure compliance with regulatory measures. Opposing measures like this raises suspicions that illegal acts are being silently approved. This situation should be urgently rectified.

Has stock assessment really been improved by use of the stereoscopic camera?

Total catch in number/weight and length composition of the east stock of Atlantic bluefin was quite uncertain after the tuna farming rapidly spread and became the major producer of bluefin until use of the stereoscopic camera was made mandatory. To cope with this situation and make reliable stock assessment possible, the stereoscopic camera was introduced and it is true to say that the basic statistics such as catch and size composition has been significantly improved during the past 10 years or so. However, it seems that stock assessment that requires a long time series data over decades can not be improved in relations to or as a result of the use of the stereoscopic camera. Here, some sign of doubt can be seen if current length measurement, one of the crucially important factors of reliable stock assessment, is accurately done. The doubt is about the strong year class that originated in 2003, supposed to be the strongest year class ever observed in the history of the Atlantic bluefin fisheries. This year class was first recognized in the Japanese longline catch operating in the north Atlantic and a clear transition of modes in length composition has been observed yearly for over 10 years, indicating this is really a strong year class. This year class was dentified in other fisheries like in the trap net fishery but the overall estimate of the 2003 year class strength in the stock assessment including length measurement by the stereoscopic camera, ranks only at the same level of the strength

among adjacent years. This is somewhat surprising because the 2003 year class towers above the other year classes in the Japanese data which has reputation as one of the highest reliability. Why does the stock assessment show a different view?

Poor statistics for purse seine fishery

Again here, this difference in estimates of the year class strength could come from the bias incurred from lack of witness inspection by the ROB of size measurement made by the stereoscopic cameras already previously mentioned. As previously suspected, if length measurement of caging tuna was intentionally made for smaller individuals, it means that many smaller fish have been caught from the stock every year and this is translated into continuous good recruitment in the stock assessment. Despite of appearance of a very strong 2003 year class in the Japanese longline fishery, the Japanese catch is only a small fraction of the total bluefin catch, far smaller than that by the major purse seine fisheries. Therefore, the 2003 year class strength was buried under the total statistics. In addition, it should be born in mind that the purse seine catch statistics in the Mediterranean Sea was notoriously bad, almost black box around the time when the 2003 year class originated and the overwhelmingly dominant bluefin catch has been made by purse seiners continuously to the present time. During the period around 2003, the stereoscopic camera and ROB monitoring was not mandatory. In this situation, under reporting of the real catch through intentionally measuring smaller fish could be suspected. In fact, SCRS reported huge amount of non-reporting of the Mediterranean bluefin from the mid 1990s to the 2000s. Size information for the non-reported catch is very poor. This biased information can blur the real strength of the 2003 year class. Lack of transparency in length measurement of bluefin at the start of caging appears to lingering now as previously mentioned. Therefore, I do not feel easy about the optimistic view that the current stock assessment has been improved significantly. Again, I would like to stress mandatory witness inspection of the ROB be materialized for length measurements at caging operations.

Ending remarks

Going back to the start of my talk, i.e., farming of southern bluefin tuna in Australia, the situation with respect to the stereoscopic camera is much worse than that in the ICCAT. Australia is the only member practicing farming of substantial amount of southern bluefin tuna in the CCSBT that manages southern bluefin tuna. However, it has not yet made use of the stereoscopic camera mandatory despite repeated recommendations to do so from its

Scientific Committee. Ironically, many stereoscopic cameras currently used are made in Australia where Australian scientists played a major role in developing the stereoscopic camera for the purpose of measuring length of marine animals. It is regrettable and hard to understand with respect to this situation. Finally, it seems that the farming of Pacific bluefin tuna is facing the same problems as Atlantic and southern bluefin farming. All stake folders should work hard together to secure transparency of tuna farming. In this regard, I would suggest increased and effective utilization of the stereoscopic camera, as a means of establishing truly responsible fisheries.