REPORT OF A PILOT STUDY USING A STEREOCAMERA AT SEA

Libya

SUMMARY

The document presents le results of a pilot study using a stereocamera conducted by Libya and the Republic of Korea to obtain a better estimate of the number and weight of tuna at the time of capture. This study was carried out during the BFT fishing campaign of 2013.

RÉSUMÉ

Le document présente les résultats d'une étude pilote ayant recours à une caméra stéréoscopique menée par la Libye et la Corée en vue d'obtenir une meilleure estimation du nombre et du poids du thon au moment de la capture. Cette étude a été réalisée pendant la campagne de pêche de thon rouge de 2013.

RESUMEN

El documento presenta los resultados de un estudio piloto con esterocámara realizado por Libia y la República de Corea para obtener una estimación mejor del peso y número de los atunes en el momento de la captura. Este estudio se realizó durante la campaña de pesca de atún rojo de 2013.

KEYWORDS

Pilot studies, Stereoscopic cameras, Size measures, Bluefin tuna, Tuna farming

Deployment and use of the stereocamera

As part of the requirements of Recommendation 12-03 (ICCAT, 2012) concerning the multiannual recovery plan for bluefin tuna in the eastern Atlantic and Mediterranean, specifically paragraph 88, Libya and the Republic of Korea worked together to carry out a pilot study using a stereocamera with the objective of obtaining a better estimate of the number and weight of tuna at the time of capture.

This study was carried out during the bluefin tuna fishing campaign of 2013. The stereocamera used was the AM100 stereocamera made by the company AQ1 Systems Pty Ltd (Tasmania, Australia) (**Figure 1**).

The stereocamera was deployed in the following situation.

1. In the fishing net before transfer.
2. The same catch during transfer between fishing net and towing cage.
3. The same catch in the towing cage just after transfer.
4. During release of some fish from a towing cage at sea (different catch to that filmed during 1 to 3).

The experience gained from this exercise was very useful and highlighted a number of issues which have to be considered in any future deployment of the stereocamera at sea.

One of the biggest issues is related to the fact that the whole fishing operation and following transfer to cages is a very complicated intensive situation which involves many parts in the release of the fishing net, drawing in of the fishing net, preparation. At the time of the first transfer, a rough sea was developing and this added a lot to the practical problems related to the whole operation.

When a catch is made and the fishing net has been released, the fish are encircled by the net and the fishing boat making the catch starts to haul in the fishing net which may be over 1,500m long and 200m deep. Whilst this is taking place many boats are required to keep the net in an open position in order to prevent any losses of fish in the net. In this particular operation 9 boats were involved holding the net in the open position. At the same time, the cage into which the fish are to be transferred has to be carefully moved towards the position of the fishing net where the door through which the fish are to pass is situated. This has to be done carefully to make sure that the

doors come into the same position so that when they are opened they are open in the same place. This approach has to be done very carefully taking into account prevalent currents and sea condition as well as the other vessel movements occurring during the preparation for transfer. All this entails the tying up with ropes of the different boats and vessels, fishing net, cage, etc. In the transfer operation where the stereocamera was used, approximately 50 people including fishermen crew, tugboat crew and many divers were involved in the preparation and carrying out of the transfer. The stereocamera itself also has many other cables as well as the cable leading into the water.

Although the stereocamera was in position near the door during the transfer, and held in this position by a diver throughout the whole transfer, it was afterwards found that no images of the actual transfer was recorded by the stereocamera; it was found afterwards, that there was a problem with a cable.

Analysis of the footage

The stereocamea analyser software was used to take the fork lengths of tuna in the fishing net and in the towing net just after transfer. In order to investigate if different numbers of measurements affects the calculation of average length of the sample, 100 fish and 200 fish were measured in both the fishing net and the towing cage. Fish were randomly selected from the frames in the recording and attention was taken to take measurements of fish which appeared as straight as possible. The selection of fish taken was influenced by the clarity of the images and where necessary the frame was zoomed 200x using the options available on the analyzer and the contrast improved with the enhance frames option.

The individual data was transferred to excel and the distribution of fish fork lengths analyzed as shown for each of the measurements in **Figure 2 to 5**.

The averages of the four sets of measurements are as follows:

- 100 fish in fishing net: Av. 1.822m, SD 0.347m.
- 200 fish in fishing net: Av. 1.752m, SD 0.367m.
- 100 fish in towing cage: 1.945m, SD 0.255m
- 200 fish in towing cage: 1.973m, SD 0.238m

From these results it is clear that although the sampling of 100 or 200 fish in either the fishing net or the towing cage gave reasonably similar results, there was a significant difference between (ANOVA, $p = 0.045$). At the same time, when the distributions are considered, there are some quite clear differences between the two sets of samplings and even between samplings from the same net. For example, the % of fish below 1.5m were found to be 18, 27.5, 8 and 4% respectively. However, the % of the sampled fish above 2.0m were found to be 40, 37, 51 and 61% respectively.

The results clearly show that there is a lack of agreement between the sets of data from the fishing net and the towing cage. In the towing cage there was a greater representation of fish having larger fork lengths whilst the smaller fish appeared to be underrepresented. On the other hand, the middle group, between 1.5 and 2.0 was similarly represented in the samples (42, 35.5, 41 and 35% respectively).

Analysis of the footage of the released fish gave a count of 655 fish. However, it is possible that not all fish were counted since some footage was not clear and some fish may have been hidden behind fish counted in the front of the footage. The fork lengths of 51 fish were taken with an average of 1.415m (**Figure 6**). The range of fish sampled was quite large between 1.048m and 2.517m although the majority (about 65%) were lower than 1.4m.

In general, it took a long time to take the measurements and carry out the counts of fish. This is an important fact that has to be taken into consideration since, if this process was to be carried out at sea for the purpose of controlling the tonnage of fish caught, getting an accurate indication of number and fork lengths (to be converted to round weight) takes a long time again considering that this has to be done at sea on the fishing vessel in whatever weather conditions may be prevalent at the time. Other factors also affect the measurement, such as the clarity of the water, the way the fish swim in relation to where the stereocamera (straight at the camera or at an angle, etc) and the distance from the stereocamera. These are all factors that may affect the accuracy of the stereocamera measurements which then have to be agreed before the appropriate documentation has to be filled in.

Figure 1. Strereocamera system from AQ1 Systems Pty Ltd (Tasmania, Australia).

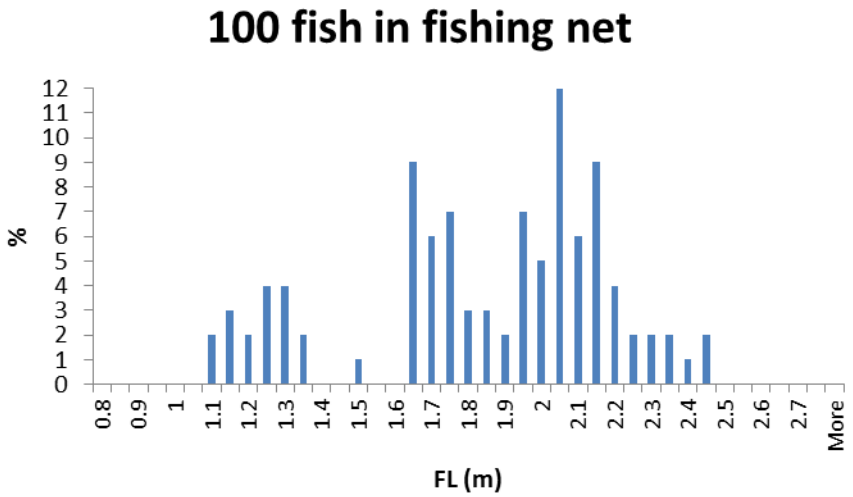

Figure 2. Fork length distribution of 100 fish presented as a percentage of the sampled population in the fishing net before transfer to the towing cage.

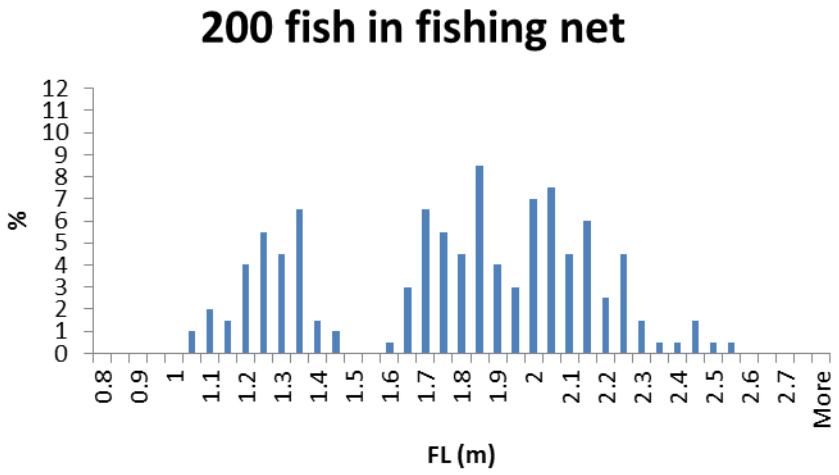

Figure 3. Fork length distribution of 200 fish presented as a percentage of the sampled population in the fishing net before transfer to the towing cage.

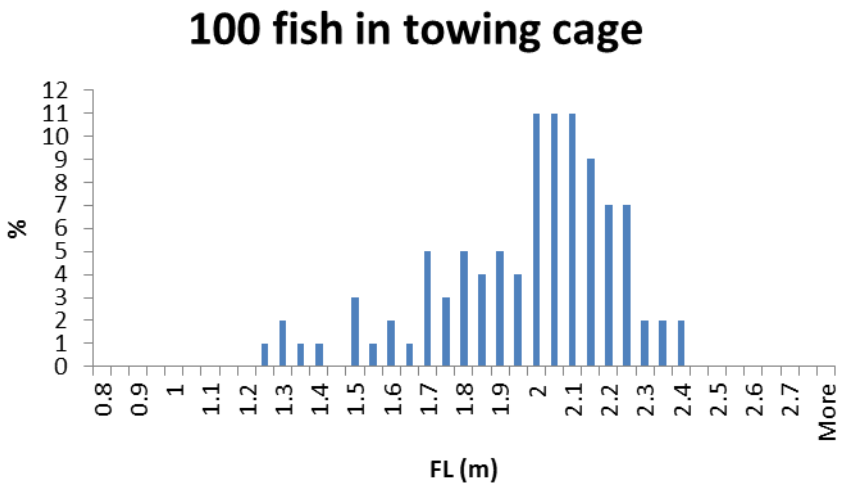

Figure 4. Fork length distribution of 100 fish presented as a percentage of the sampled population in the towing cage after transfer.

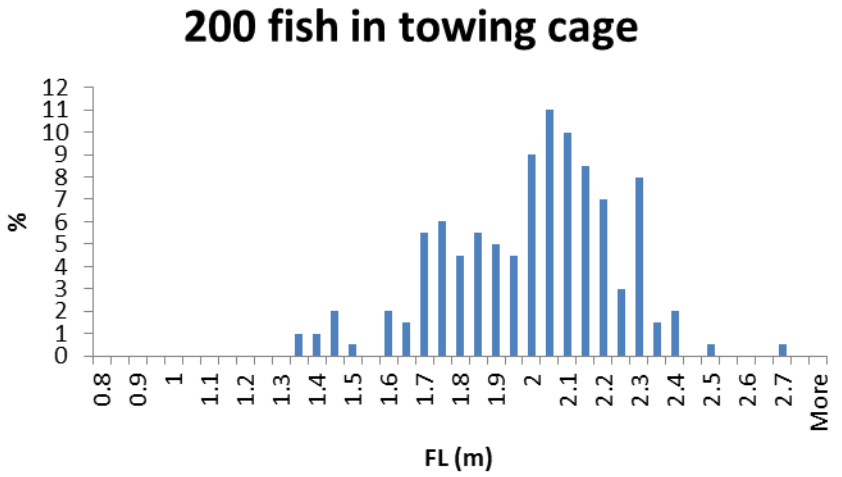

Figure 5. Fork length distribution of 100 fish presented as a percentage of the sampled population in the towing cage after transfer.

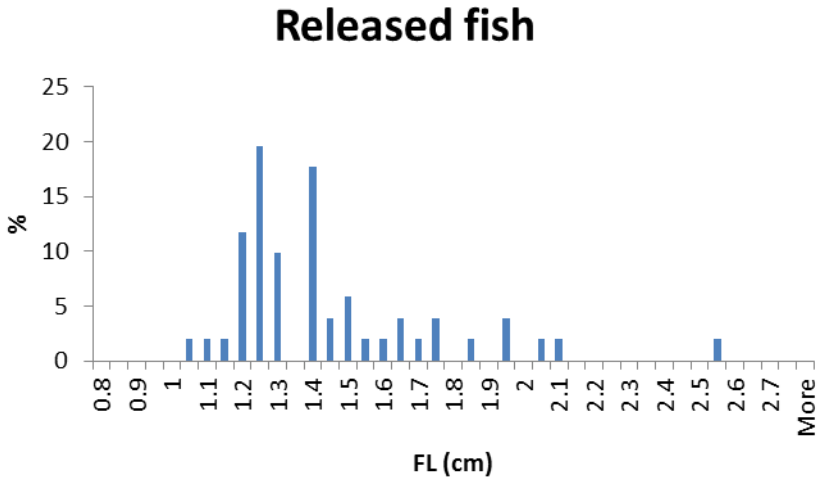

Figure 6. Fork length distribution of 51 fish presented as a percentage of the sampled population after release.