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USING AN ECHOSOUNDER SYSTEM TO STUDY THE VERTICAL MOVEMENTS OF CAPTIVE BLUEFIN TUNA (THUNNUS THYNNUS) IN FLOATING CAGES

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Introduction

Since the nineties, the fattening of bluefin tuna (*Thunnus thynnus*) has been developing in the Mediterranean, mainly in the Region of Murcia (SE Spain). This activity consists on catching adult individuals in the spawning grounds in May-July and transporting them to floating cage facilities. There the tunas are fed actively with low commercial price raw fish in order to increase their fat content and to be sold at a high price in the Japanese market (Miyake et al, 2003). It is known that bluefin tuna in captivity shows vertical migrations along the day related with stimuli as feeding procedures, change in light conditions, etc. Besides, some authors have pointed out these vertical migrations in determinate moments of the day, in the spawning season, could be related with the reproductive behaviour (Lioka et al., 2000). Echosounder system can provide a non invasive tool to observe this vertical migrations as it has been reported in other species as salmonids (Juell et al., 2002).

Materials and Methods

The vertical migrations of bluefin tuna (27 individuals averaging 100 kg body weight) held in a 25 m diameter x 30 m deep "Polar Cycle" floating cage has been monitored using a SIMRAD EY 500 Echosounder. The system was composed by a 10x20 38 K cycles ceramic transducer attach to a platform floating in the center of the cage and connect to a transceiver. Data were stocked in a laptop. Energy for all the system was provide by two batteries. All these devices were located into an hermetic stainless steel box fixed on the external ring of the cage. Daily, in the morning, the system was stopped and data were downloaded The monitoring period was between February and April 2005. Tunas were fed with raw fish once a day, over 10:00 in the morning. The mean water temperature was 13.3 ºC. No termocline was observed in this period. Binary data provided by the transceiver, in daily files were visualized with the Sonar Data Echoview® (SonarData Pty Ltd, GPO Box 1387 Hobart, Tasmania, Australia).

Results

Figure 1 shows a detail of an echogram. The horizontal axis correspond to the time (minutes) and vertical axis correspond to the depth (meters). Two continuous bands in high density color appear corresponding to the sea bottom (30 m) and the net bottom in

the middle of the echogram (20 m). Tuna individuals or groups appear as high acoustic density stains. Sometimes it is difficult to distinguish the tunas, especially in bad sea conditions where the net noise increase. Also due to the presence of the Navy ships, habitual in the zone, because to their own sonar systems.

During the measurements period tunas seem to activate at sunrise with frequent visits to the surface, before the feeding time. The activity seems to reduce at sunset and they rest in the inferior half of the cage during the night with occasional visits to the surface.

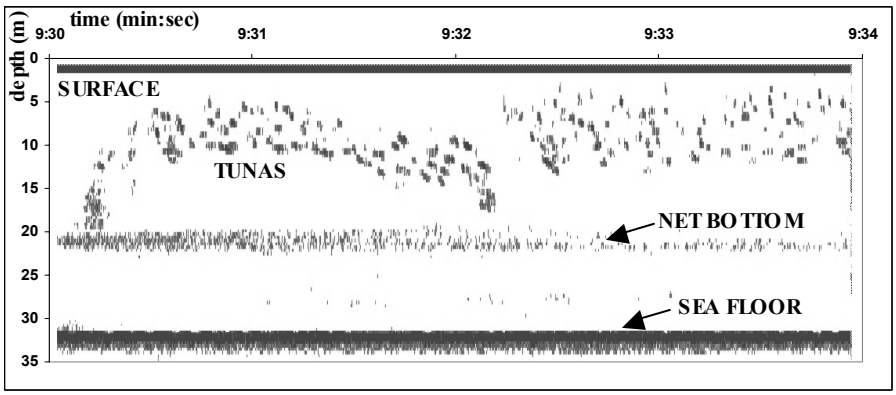

Fig. 1. Echogram showing the bluefin tuna broodstock vertical distribution.

Discussion and Conclusion

The system allows monitoring the vertical migrations of tuna broodstock along the day but it will be necessary to enhance the reception of echosound discriminating the noise coming from the nets especially when the sea are in bad conditions.

References

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