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

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BLUEFIN TUNA

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 bring them to floating cage facilities. There the tunas are fed 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 movements along the day related with stimuli like feeding procedures, change in light conditions, etc. Beside that, some authors have pointed out that these vertical movements in certain moments of the day, along the spawning season, could be related with a reproductive behaviour (Lioka et al., 2000). Echosounder system can provide with a non invasive tool to observe this vertical movements as it has been reported in other species like salmonids (Juell et al., 2002).

Figure 1.- Echosounder system

MATERIALS AND METHODS

The vertical movements 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 cm 38 kHz ceramic transducer attached to a platform floating in the center of the cage and connected to a transceiver (Fig 1). Data was stored in a laptop computer. Energy for all the system was provided by two batteries. All these devices were located into an hermetic stainless steel box fixed on the external ring of the cage. In the morning, the system was daily turned off and data was downloaded. The monitoring was made between February and April 2005. Tunas were fed with raw fish once a day, around 10:00 a.m. The mean water temperature was 13.3 ºC. No termocline was observed during this period. Binary data provided by the transceiver in the daily files was observed with the Sonar Data Echoview® software.

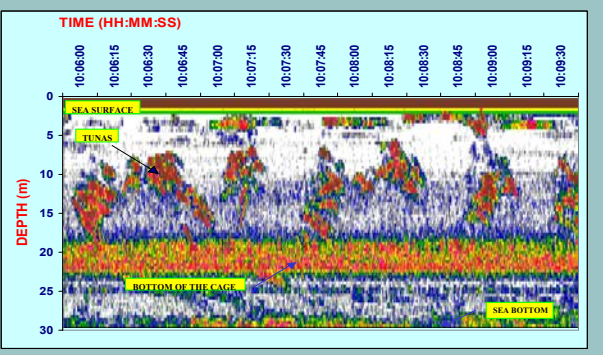

Figure 2.- Detail of an echogram

RESULTS

Figure 2 shows a detail of an echogram. The horizontal axis corresponds to time (hh:mm:ss) and vertical axis corresponds to depth (meters). Two continuous bands in high density color appear. The one at 30 m corresponds to the sea floor, and that at 20 m in the middle of the echogram to the bottom of the net. Single or groups of tuna fish showed high density acoustic stains. It is sometimes difficult to distinguish the tuna fish, particularly under bad sea conditions, where the noise produced by the net increases. Moreover, the usual presence of Navy ships in the area may produce interferences because of its own sonar systems.

During the monitoring period tuna seems to activate at sunrise before the feeding time, with so frequent visits to the surface (Fig. 3). This activity seems to reduce at sunset, resting at the deeper half of the cage at night with occasional visits to the surface (Fig 4).

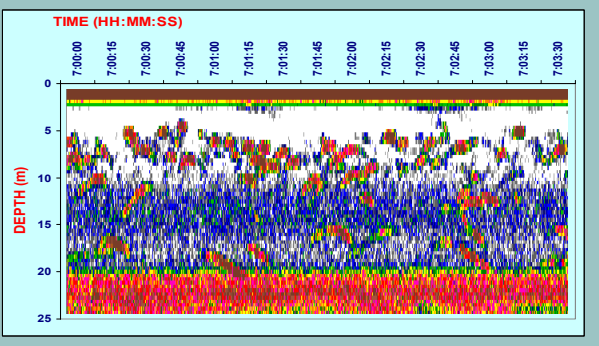

Figure 3.- At sunrise

DISCUSSION AND CONCLUSION

The system may allows monitoring vertical movements of tuna broodstock along the day, but it will be necessary to enhance the reception of echosound, thus discriminating the noise coming from the nets especially at bad sea conditions.

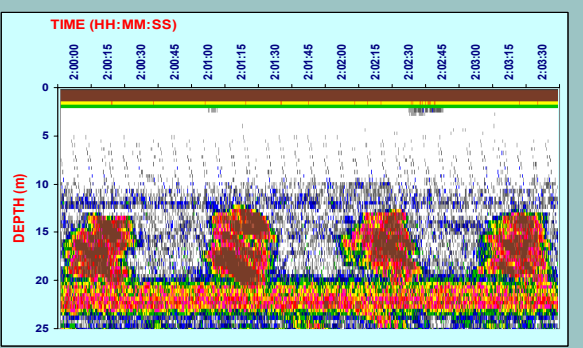

Figure 4.- At night

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