

Broodstock Tagging in BFT – Applications of Data Logging for Behaviour Monitoring



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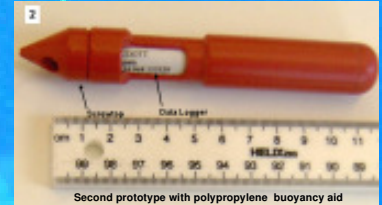
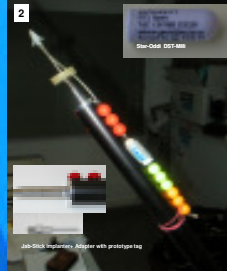
Implantation of Data loggers in BFT in floating cages



WHY DO IT ?
 Recently the Aquaculture of Atlantic BFT has become a reality and there is a need to monitor spawning behaviour within broodstock cages (50m x 20m) as shown here in Mazarrón Spain.

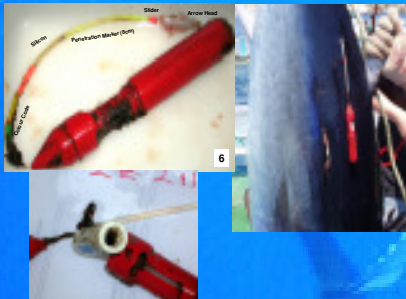
RATIONAL
 When studying the behaviour of captive fish, in this case *Thunnus thynnus*, the most important criteria are to determine when the fish will spawn and in a cage situation when they have released eggs. Normally constant surveillance is time consuming, expensive and requires considerable technological expenditure, also normal tagging techniques require the trapping of fish. Especially in the case of BFT this can become dangerous for the fish because of his high vulnerability to stress.

Materials, Tag Construction, Implantation and Program



Newly designed Data-Logger-System. It consists of a polypropylene body with a nylon monofilament leader attached to a Floy Arrow head. The proplene body is made up of a screwtop through which the Star-Oddi ST milli - TD logger (Star-Oddi, Reykjavik) could be inserted

Recovery of Data-Loggers



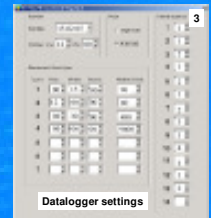
Underwater Observations



Flotation after attachment and scouring effects after 1 week



Skin-diver using the spear-gun for data-logger implantation.



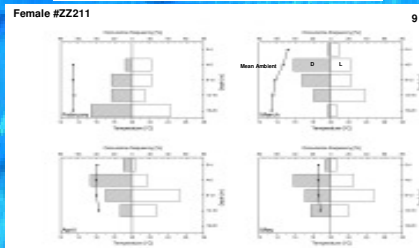
Datalogger settings

As can be seen from the underwater observations the tags streamed behind the fish. After 1 week some chaffing was observed but this later healed. On slaughtering the fish the data-loggers were recovered. Note the amount of bio-fouling already evident and the presence of mussel spat on the DST module.

The data-loggers had been individually programmed such that the battery and the number of data acquisition points were set that during the period from February until May recordings were made at a relatively lower rate. During the spawning season from June to July the chip was switched on to record both depth and temperature every six minutes

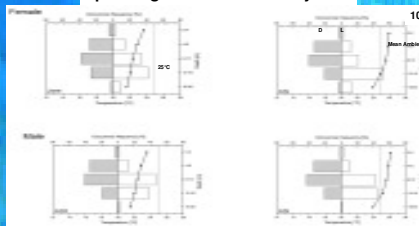
The present device records temperature and depth changes. The rationale behind these measurements are that spawning will usually take place at temperatures above 25°C. An accurate estimation of the length of time spent above 25°C is required therefore the need to continually assess water temperature during the spawning season in June / July. Secondly it is known from previous studies in Japan that Females approach the surface of the water at night during spawning bouts so the vertical position in the cage could also give clues to the spawning behaviour of the fish.

Integrated Measurements Feb. – May 2005



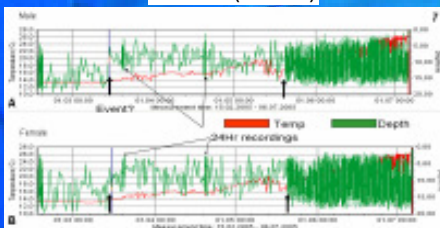
This figure shows a more detailed examination of the mean values over 12 hour light/dark recording periods (measurements every 6 minutes) for the months from February to May 2005 in a female fish. Mean ambient temperature with depth are shown by the linked points, no standard deviations are shown. The horizontal bar diagram shows the percentage of occurrence at a given depth class during night (black bars) and day time (white bars). Bottom of cage was at 20 m. Tuna spend more time in deeper water during daylight hours and then move towards the surface at night. No thermocline is present at this time.

Spawning Season June – July 2005



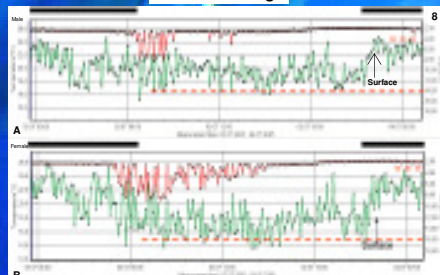
Recordings made at 6 minute intervals for both female and male fish in the spawning season for the months of June and July. The dotted lines indicate the suggested 25°C preferred spawning temperature. In June a 2°C thermocline has developed between the surface and the bottom of the cage. Female fish spend almost all of their time in warmer water. The same behaviour as before is observed with nightly migrations although these are not so pronounced.

Total Data (6 Months)



The data shown in the figure above summarizes the total recording of depth and pressure in the two tagged fish, a male (A) and a female fish (B). The dark arrows indicate an event (?) probably involving movement of the base line of the cage depth.

24 hr Recordings



Comparison of 24 hr movement between a male (A) and female (B) tuna in the water column (green- depth) and also water temperature (red). The dotted red line indicates the maximum depth attained by the fish. The dark bar indicates periods of darkness. Data acquisition every 15 minutes. Surfacing at the onset of darkness may be spawning behavior.

Conclusions:

- The use of the data-logger-system provided an excellent means of monitoring behaviour of the BFT both before and during the spawning season.
- Advantageous is that the fish records the actual temperature regime of the fish itself and not just a fixed point in the surrounding water. This is very important if one is looking at spawning behaviour during particular temperature regimes and for the identification of local thermoclines even within cages.
- A different behaviour patterns of swimming could be observed from both male and female fish during daylight and darkness. Increased movement in single fish towards the surface at sunset may be indicative of spawning behaviour or the precursors of such activities.
- Remote application techniques, modified tags, buoyancy aids and attachment tested used in this enclosed system study can be exported to open system studies.

REPRODOTT partners



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