SPONTANEOUS SPAWNING OF ATLANTIC BLUEFIN TUNA *Thunnus thynnus* KEPT IN CAPTIVITY

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Introduction

One way to alleviate the pressure on the wild fishery of the Atlantic bluefin tuna (BFT) and aid in its conservation would be the domestication of this fish and the development of a self-sustained industry, which will propagate this species in captive conditions, rear the larvae and produce fingerlings for further grow-out. Continuing on the success of a 5th FP research program (REPRODOTT), which was the first ever study of the reproductive biology of this species in captivity, and developed a hormonal method for the induction of spawning (Mylonas et al., 2010), the SELFDOTT project (From capture based to SELF-sustained aquaculture and Domestication Of bluefin tuna, *Thunnus thynnus*) has implemented the knowledge already obtained on the reproduction of the BFT in captivity, in order to obtain viable eggs, and study embryonic and larval development for the production of juveniles.

Materials and methods

The broodstock used was composed of 62 BFT placed in two floating cages located at El Gorguel (Cartagena, SE- Spain) (25 m diameter x 20 m depth). Cage R1 contained initially 38 BFT with an estimated mean body weight of 100 kg, caught in the Balearic Sea in June 2007 and kept in captivity for 4 years. Cage R2 contained 24 BFT with an estimated body weight of 80 kg, also caught in the Balearic Sea in June 2008 and kept in captivity for 3 years. Both cages were fitted with a 2 cm mesh net to restrict the entry of opportunistic small pelagic fish that can eat the eggs being released. The broodstock in both cages were fed to satiety once a day with raw fish consisting mainly of mackerel (*Scomber scombrus*) and Spanish mackerel (*S. japonicus*). A system for collecting BFT eggs in the broodstock cages was designed. The system consisted of a curtain that was 6 m high. The curtain surrounded the entire perimeter of the cage and hanged from the surface down into the water. In each cage six cones protruded outwards from the curtain and each cone had a cylindrical collector at the end of it, which was where the BFT eggs were to be collected. To avoid the entering into the collector of opportunistic fish that could eat the BFT eggs, a "predator mesh" was placed at the entrance of the cones. The entire system was made with a polyethylene 500 µm mesh. The collecting systems were placed in the cages on 14th – 16th June, when the mean water temperature exceeded 20ºC regularly. On 29th June 2009, 15 individuals of 90 kg body weight in cage R1 were administered a gonadotrophin releasing hormone agonist (GnRHa) implant underwater. Cage R2 was not induced in 2009 and egg collection in this cage was not monitored. In 2010, a similar approached for the induction of spawning was planned, but the fish in both broodstock cages begun spawning spontaneously, so no hormone administration took place.

Results

Beginning 48-72 h after GnRHa treatment in 2009, massive spawning occurred for 17 days, with a daily maximum of 34 million eggs collected (SELFDOTT, 2010). On 17th June 2010 spontaneous spawning started in cage R2. From this day onwards and more or less daily viable eggs were obtained from both cages so no hormonal implants were used. Fish

spawned intermittently for a period of 34 days in both cages, with a total of 58 million eggs collected. Cage R1 spawned for 26 days and produced 48 million eggs and cage R2 spawned for 28 days and produced 10 million eggs (Figure 1). As happened in 2009 (SELFDOTT, 2010), due to the almost non-existence of currents throughout the spawning period, almost all the eggs were collected at the surface, held by the plastic curtain. Only a small amount of eggs were captured by the egg collectors, which were designed to operate under current. Eggs were transported to the IEO facilities in Mazarrón (SE- Spain) where they were incubated. On average, the hatching rate was above 90%. No difference in hatching success was observed between 2009 (from hormonally treated cage) and 2010 (from spontaneously spawning fish).

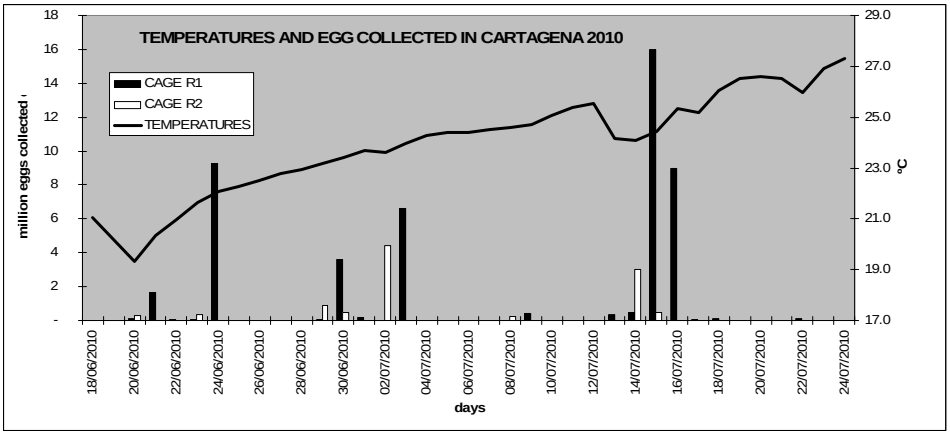

Fig. 1. Daily fertilized egg collection and water temperature in broodstock cages at El Gorguel, Cartagena, SE-Spain.

Discussion and conclusion

The fact that the captive BFT broodstock spawned spontaneously in 2010 is something that has never previously happened in aquaculture facilities far from the BFT natural spawning areas and this, therefore, shows that (a) the fish have reached an important degree of domestication as a result of their stay at the experimental farm for several years and (b) the conditions present in the area are sufficient to allow completion of the reproductive cycle. The spontaneous spawning in cage R1 in 2010 was longer in duration (26 days) but smaller in fecundity (48 million eggs) than in 2009 (SELFDOTT, 2010), when 15 individuals of this cage were administered GnRHa. Moreover, the spawning in 2009 was more regular (SELFDOTT, 2010).

References

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