

“REPRO-DOTT”

Reproduction of the Bluefin Tuna in captivity

Bluefin tuna (Thunnus thynnus, BFT) is an important source of seafood, highly demanded by the sushi-sashimi market worldwide, particularly in Japan and America. In recent years, the growing demand for BFT for fattening in cages in the Mediterranean region resulted in an increased pressure on the fisheries of this species, and consequently, in a biomass reduction that has caused serious concern on the status of the eastern Atlantic BFT resources. If BFT reproduced in captivity, domestication and farming could provide a solution by meeting market demand while minimising pressure on wild stocks. Unfortunately, since the first cages were put into use in 1985, a controlled reproduction of captive individuals in the Mediterranean has not been achieved .

Bluefin tuna farming in the Mediterranean is currently based on fattening the fish in “floating cages”. The wild fish are caught from the spawning ground and then brought to the farm at the fattening zone in specially designed cages towed by a slow-moving boat. The tuna are fed on sardines and anchovies and placed on the market after 5 to 7 months when their flesh has reached an optimal fat content capable of satisfying the very specific expectations of gourmets, notably the Japanese.

Controlled reproduction is a crucial step on the road to domesticating a wild species. For this to be happening there is a need to understand the environmental cues and parameters that initiate the maturation process and regulate it. It is essential to know the reproductive potential of the species, the size and age at first spawning in both sexes, the hormonal regulation of such processes as the gonadal development, gamete maturation, spawning and fecundity.

representing 25 different scientific and commercial entities. Using the acronym DOTT, the objective of this group was to lay the foundation for cooperative research and development, in basic and applied scientific disciplines, for the domestication of *Thunnus thynnus* (DOTT), and therefore the establishment of a long-term sustainable farming industry of this promising new finfish species.

The first activity of the DOTT initiative was the conduction of a conference, which was held in Cartagena, Spain in February of 2002. The purpose of this meeting was to inform participants on the state-of-the-art regarding the BFT fisheries biology, physiology and farming, socio-economic aspects of moving towards mass culture of BFT and integrating the fishing industry into the domestication drive. Proceedings were published in Bridges, C.R., H. Gordin and A. Garcia Eds. (203) Domestication of the Bluefin Tuna (*Thunnus thynnus thynnus*) Cahiers Options Méditerranéennes, Vol. 60, 224 pp. CIHEAM, Zaragoza (Spain).

In 1998 an international working group was established with the support of the European Commission Quality of Life programme (contract number Q5AM-CT-2001-00063). It involved some 50 scientists from 12 different countries (European and Mediterranean) and

Following this conference, a 40 month-long research project on the feasibility of controlled reproduction of the BFT, acronym REPRO-DOTT, was funded by the European Commission. The project was aimed at studying the feasibility to achieve reproduction of BFT in captivity conditions.



Project acronym:
REPRO-DOTT

Full title of Project:
Reproduction of the Bluefin Tuna in Captivity - A feasibility study for the domestication of *Thunnus thynnus*

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**“REPRO-DOTT HAS
PROVEN THAT BFT IS ABLE
TO MATURE IN CAPTIVITY
AND PRODUCE VIABLE
EGGS AND SPERM FOR
SUCCESSFUL
FERTILISATION”**

As main results of the research conducted under REPRO-DOTT, the knowledge on the reproductive cycle of the BFT in the Mediterranean has been improved, based on observations and analysis of tissue samples from the reproductive organs collected from over 800 captive and wild BFT individuals. The research has thus provided the necessary basis to characterize the maturation cycle of BFT and their performance in wild and captive conditions. Besides, new tools and procedures have been developed that may facilitate further in depth studies on BFT reproduction.

Several behavioral studies, histological and hormonal analyses carried out on the reproductive status of captive breeders, kept in floating cage for over two years, have produced consistent results, which clearly indicate that BFT are able to mature and spawn in captive conditions.

During the second and third year of the project, the scientists developed and tested means of controlling the reproductive cycle, i.e. of artificially provoking ovulation in the females and the production of sperm by the males. In the summer of 2005, the project team successfully used hormonal induction in captive broodstock of the BFT to obtain eggs and sperm. In other words, hormonal substances were inoculated into the organisms to stimulate ovulation and trigger the production of

sperm. Ovocytes were collected in the cages, and subsequently successfully fertilised in-vitro. The first viable bluefin tuna larvae were born shortly afterwards.

This result has been a very important achievement in controlling the BFT's reproduction as it has proven that BFT is able to mature in captivity and produce viable eggs and sperm for successful fertilisation. This, in turn, is the first step at controlling the whole life cycle of the fish in captivity and for a future mass rearing of the species, as happens in other marine finfish aquaculture species such as sea bass and sea bream. However, it does not mean that BFT farming is just around the corner. Numerous scientific and technical hurdles still have to be cleared. For instance, one major problem – how to handle these very big animals which paradoxically are very fragile – still has to be solved. Therefore, although the REPRO-DOTT project already represents an important step towards the development of BFT farming, years of research are still needed before every stage of BFT farming, from fertilisation to slaughter, can be mastered under the best possible conditions. In order to progress in this endeavor, it is considered essential to have available a land based facility of European dimension where further researches could be done in control conditions for the future development of a sustainable tuna farming industry.