



HATCHERY PRODUCTION OF YELLOWFIN TUNA



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International ISS Institute/DEEWR Trades Fellowship

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Executive Summary

Tuna are amongst the fastest growing and most valuable fish in the ocean. Their high regard with consumers has led to their over exploitation and stocks of the most sought after species are now in serious danger of collapse. This over exploitation has been exacerbated by the practice of 'tuna ranching' whereby juvenile or sub-adult tuna are caught for fattening. Closing the life cycle of tuna in captivity and developing commercial-scale hatchery rearing techniques is therefore essential to satisfy the growing demand for tuna and to alleviate the subsequent fishing pressure on wild stocks.

The culture of tuna in captivity is a relatively new science, with few facilities and experts engaged in this endeavour throughout the world. This Fellowship, sponsored by the Australian Government's Department of Education, Employment and Workplace Relations (DEEWR), aimed to obtain the skills required to develop a hatchery capability for yellowfin tuna in Australia and to identify the current bottlenecks to commercial-scale production of the juveniles of this species. Key objectives were to:

- Seek the skills required to capture and transport yellowfin tuna over long distances and time frames while minimising stress and maintaining optimum health.
- Obtain the skills required to produce commercial quantities of larval tuna to the pre-metamorphic stage.
- Learn the techniques required to successfully wean these pre-metamorphic larval tuna onto an artificial diet.

In order to achieve these objectives, the Fellow travelled to Central and North America, where he learnt from international experts in the field of tuna propagation.

Appropriate fishing and fish handling techniques were identified to minimize stress and physical damage, and designs and advice for the most appropriate vessels to transport these fish over long distances were obtained. Being such large, fast-swimming fish, broodstock tuna have different housing requirements to most marine fish to ensure they remain sufficiently comfortable to allow natural spawning to occur. During his time at the Inter American Tropical Tuna Commission (IATTC) in Panama, the Fellow studied the design criteria for such tanks and the appropriate cues required to encourage spawning.

The Fellow reviewed and documented the current practices used to rear tuna larvae and also contributed to the design and implementation of a study aimed at overcoming the high rates of mortality typical of early stage larvae. A recently hypothesized factor for this mortality is that the larvae's body density is greater than water and when they stop swimming at night they subsequently sink to the bottom of the tank and die. An experiment was therefore conducted in which the growth and survival of pre-flexion tuna larvae were compared under a standard photoperiod of 12 hours of light and 12 hours of darkness, against a continuous photoperiod. The results of this experiment were highly significant. Those larvae reared under continuous light for nine days experienced a highly significant, nine-fold improvement in survival and a 22 per cent improvement in growth.

The Fellow was able to observe weaning-aged juveniles and test their response to various artificial diets. Although these advanced larvae clearly preferred the newly hatched tuna larvae, to which they had been accustomed, it was very encouraging to witness at least some interest and ingestion of the various artificial diets.

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The findings of this Fellowship are to be disseminated through a number of channels. The Fellow has been invited as a speaker at a number of seminars and conferences including The 2009 Second Global Centre of Excellence Symposium of Kinki University on 'Sustainable Aquaculture of the Bluefin and Yellowfin Tuna – Closing the Life Cycle for Commercial Production' hosted at the South Australian Research and Development Institute in Adelaide.¹ The symposium will be attended by Australian tuna researchers, industry representatives and other international experts. The findings will also be shared through invited presentations in the tuna propagation session of the World Aquaculture Society conference in San Diego in March 2010² and the Australasian Aquaculture Conference to be held in Hobart in May 2010.³

The Fellow has also been invited to participate as a co-investigator on a yellowfin tuna aquaculture project funded by the Australian Centre for International Agricultural Research. Based at the Gondol Research Institute for Mariculture in Indonesia, this project has been endorsed by Australian industry and will provide the Fellow the opportunity to implement the skills and findings of the Fellowship for the benefit of Australian industry.

It is the recommendation of this report that the Australian government continues to support all existing tuna projects it currently has an interest in and to seek other opportunities to increase Australian understanding of tuna propagation and farming. This approach will enable the Australian industry to keep abreast of the latest developments and techniques in tuna propagation and enable them to make an informed decision as to if or when commercially viable hatchery propagation of yellowfin tuna is going to become a reality. The Fellow also recommends that the current Australian bluefin tuna aquaculture industry investigate the potential of using the techniques described in this report for improving survival and growth of tuna larvae.

¹ www.misa.net.au/_data/assets/pdf_file/0013/120910/Kinki_University_Tuna_Symposium_Flyer_2009.pdf

² www.was.org/WasMeetings/meetings/Default.aspx?code=AQ2010

³ <http://www.australian-aquacultureportal.com/austaqua/sponsors.html>