



BREEDING OF YELLOW-FIN TUNA, *(Thunnus albacares)*

DEPARTMENT OF MARINE AFFAIRS AND FISHERIES
AGENCY FOR MARINE AND FISHERIES RESEARCH

RESEARCH INSTITUTE FOR MARICULTURE
GONDOL - BALI
with collaboration
OVERSEAS FISHERY COOPERATION FOUNDATION
(OFCF) - JAPAN
2006

INTRODUCTION

Tuna is one of highly valued fishes in the world. The world demand on tuna has been increasing particularly Japan, so that increases capture effort. However, it caused decreasing in both yield and size of fish caught that indicated degradation of tuna population in natural stock caused by over fishing. Meanwhile, the breeding program has just started with Japan as a pioneered in tuna breeding, and has succeeded in laboratory scale.

Japan considered that Indonesia is responsible for continuity of world tuna fishery since Indonesia is one of the biggest exporter tuna countries in the world. Thus, it is suggested to conduct tuna breeding research in the tropical area.

In 2001, the government of Indonesia and Japan has signed Memorandum of Understanding (MoU) in research on yellow -fin tuna breeding (*T. albacares*) implemented at Research Institute for Mariculture (RIM), Gondol-Bali. In 2003, the program succeeded in improving capture technique, transportation, and acclimations of adult tuna followed by grow out technique and spawning of yellow-fin tuna brood stock.



Boat transportation



Improving capture of Tuna

This leaflet is funded by
Agency for Marine and Fisheries Research
2006

BROODSTOCK DOMESTICATION

Broodstock transportation

Caught tuna are transported in round fiberglass tank with working volume of 1 m³. There are only 2-3 fishes with size of 2 kg or only one fish with size of 3-5 kg can transported alive in one fishing trip.



Broodstock transportation

Treatment

Fishes that survive are put in treatment tank upon arrival and their health being observed for 24 hours. The treatment is done by adding sodium Nifurstirenate (Na-NFS), commonly known as albazu at 10-20 ppm for 2 hours. The healthy fish then transferred to acclimation tank by plastic bag before measuring fork length, tagged and cut of finlet for genetic analysis.



Treatment tank

Acclimation

The broodstock candidates of 2-3 kg are cultured in concrete tank of 150 m³ (8 m diameter, 3 m depth) for several months with growth and health observation before removed to broodstock tank. During acclimation, fish are fed once a day (Monday-Saturday), but not fed on Sunday. The feeds are mackerel and squid at 10-20 % of total fish biomass. To



Medical bath tank

keep fish health and induce gonadal maturation, multivitamins are given (B-complex at 0.06 g, vitamin C 3.75 and vitamin E 0.03 g/kg weight) at 15 g/kg feed or 0.4 g/kg fish in form of capsule. Averages daily growth rate of fish in acclimation tank is 50 g/day, and then they are removed for further grow out in broodstock tank.

BROODSTOCK MANAGEMENT

Fishes which selected in acclimation tank and reach 3 kg, removed to broodstock tank with working volume of 1500 m³ (18 m diameter, 6 m depth) to spawn. All fish have given tagging to encode individually and it is used to predict genetic quality after hatching by genetic analysis.



Broodstock tank and activities

The broodstock are fed once a day from Monday-Saturday (not fed on Sunday) with mackerel and squid at 5-10 % biomass. To keep fish health and induce gonadal maturation, complex vitamin is given at 0.06 g, vitamin C 3.75 and vitamin E 0.03g/kg body weight. Complex



Feed type and Vit. Mix

vitamin and vitamin C is given daily, while vitamin E is given every two day. The environment in broodstock tank is set as close as possible to their natural condition, so that fish are not experiencing of fatness. Differs from other marine fish species, which can be sampled every month to observe growth and gonadal maturation stage, tuna are fast swimming fish that has sensitive skin to handling. It is hard to sampling them, so that growth data can only be obtained if they die. Death always occurs due to hitting tank wall. Based on the data, daily



Feeding trash fish

growth predicted was 30-70 g/day. After one year rearing, several fishes reached gonadal and got spawn. It was predicted that there were 10 fishes of 3 years old. The first spawning occurred in October 2004 for 10 consecutive days and they had never spawned thereafter. LHRH hormonal is given by oral administration method 3 times at dose of 500 mg/kg fish to induce gonadal maturation.



Control window tank

WATER MANAGEMENT

Water quality is very important element for tuna culture such as dissolved oxygen, pH, other chemical content and water transparency as well. To maintain water condition, it is required a package of water supply: seawater pump, sand filter, water collector tank, plumbing to all tanks and bio-filter. By applying this system, water management is a half-close system (50% recirculation) with stabilized water parameters. Dissolved oxygen, pH, and salinity are measured every day and if there is a wide range, early responses are conducted.

To add oxygen supply in water, it is used a 2.2 kW ring blower for acclimation tank and 3.7 kW for broodstock tank. Tanks are cleaned every two month.



Sand filter



water collector tank

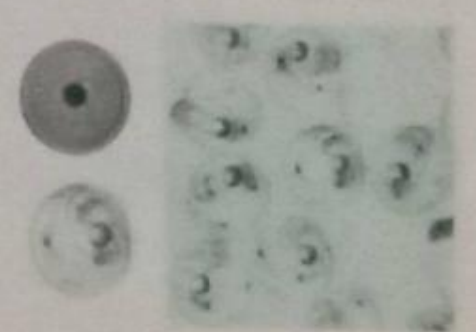
For further information
**RESEARCH INSTITUTE FOR MARICULTURE
 GONDOL, BALI**
 Po. Box. 140. Singaraja - 81101 - Bali
 Telp. : 0362-92278, Fax. : 0362-92272
 E-mail : gondol_dkp@singarajaja.wasantara.net.id

SPAWNING

Natural spawning occurs in the morning until evening and eggs are collected in harvest tank provided with net. Eggs are harvested two hours after spawning and put in incubation fiberglass tanks of 500 liters. Egg will have hatched after 24 hours incubation.



Incubation tank



Eggs development

LARVAL REARING

Newly hatched larvae have similar morphology as other marine fish larvae. The eye, mouth, and anus do not function yet. Larval rearing is similar to other marine finfish larvae but different in feed. The management of larval rearing is carried out by giving *Nannochloropsis* sp. with density of 0.5×10^5 cells/ml with continuous water circulation system.

Management of larval rearing

Type of feed	Days after hatching					
	D-0	D-5	D-10	D-15	D-20	D-30
Rotifer / Copepod (5 ind./ml)		█	█	█	█	█
<i>Artemia nauplii</i> (50 ind. / larva)				█	█	█
Others type of feed						█



Culture of phytoplankton



Larvae development