Intelligence

Larval tuna research mimics ocean conditions in lab

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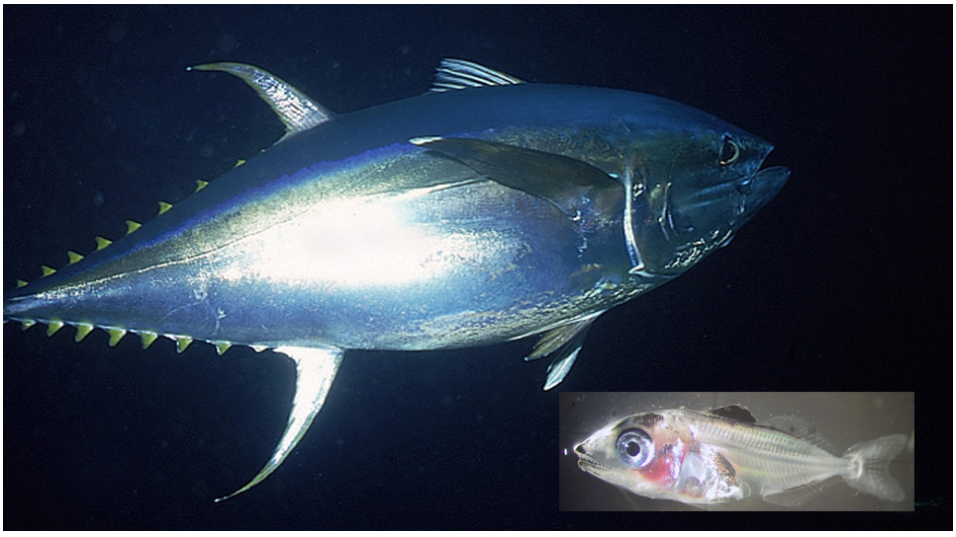
Three levels of turbulence were created in experimental tanks



A population of yellowfin tuna spawns routinely at the Achotines Laboratory. Photo by W. Boyce. (Lower left) Late-larval yellowfin tuna. Photo by D. Benetti.

The Inter-American Tropical Tuna Commission (IATTC) operates the Achotines Laboratory on the southern tip of the Azuero Peninsula of Panama. Research at the laboratory centers on tuna biology, but studies of other marine and terrestrial organisms are conducted by visiting scientists.

A captive population of yellowfin tuna (*Thunnus albacares)* spawns routinely at the Achotines Laboratory. The larvae hatched from eggs spawned by these broodstock are used in experiments to gain a better understanding of the biology of larval, juvenile and adult tuna.

Microturbulence effects

Several recent experiments were conducted to examine the effects of microturbulence on the feeding and survival of yellowfin larvae. During one phase of the experiments, IATTC scientists worked with Drs. Hideaki Nakata of Nagasaki University and Shingo Kimura of the Ocean Research Institute at the University of Tokyo.

A Doppler current meter measured turbulence in the larval tanks

To simulate the ocean environment on a laboratory scale, three levels (low, medium, and high) of turbulence were created in experimental tanks. Daily measurements of the turbulent velocities were made in each tank with a micro acoustic Doppler current meter. This instrument measures turbulence velocities in three dimensions simultaneously on a microscale level. The lowest survival of yellowfin larvae occurred at low and high turbulence. Feeding success and survival were markedly greater at medium turbulence levels.

The experimental turbulence data was used to identify an optimal range of turbulence for larval feeding success and survival. For tuna biologists and ecologists,

comparing the optimal
experimental levels of turbulence
with historical data on levels of wind-induced mixing in the tropical eastern Pacific is of primary interest.

If similar levels of wind-induced mixing are identified, they can be compared to yellowfin recruitment levels for the same time periods to identify patterns of association between wind-induced mixing and yellowfin recruitment. For tuna culturists, the turbulence data can provide a reference to set optimal water flow and aeration levels to promote successful feeding in larval-rearing tanks.

Other research

To enable scientists to culture tuna for biological experiments, research will continue at the Achotines Laboratory on broodstock nutrition and resulting egg quality, artificial feeds for larval and juvenile tuna, and enzyme studies of the developing gastrointestinal tracts of tuna larvae and juveniles.

Further studies are examining RNA/DNA ratios to compare growth potential between wild and cultured fish, and the development of vision in tuna. Such basic biological information will also have practical applications for the mariculture of tuna and other pelagic species.

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