

ECOLATUN SUMMARY

Comparative trophic ECOlogy of Larvae of Atlantic bluefin TUNA (*Thunnus thynnus*) from NW Mediterranean and Gulf of Mexico spawning areas

KEY WORD: bluefin, fish larval ecology, planktonic trophic pathways, daily growth variability, stocks differentiation, growth hormone, larval fish community, oceanographic processes.

Atlantic bluefin tuna (ABFT, *Thunnus thynnus*) mainly reproduces in the NW Mediterranean Sea (MED) and the Gulf of Mexico (GOM), which are two highly contrasting sites from a geographic, climatic and hydrographic standpoint. This population segregation has led fisheries assessment managers to categorically differentiate between a Western and Eastern ABFT stock. Genetic cross ABFT population structure exclusively based on larvae of known natal origin from MED and GOM will be analyzed as part of the proposed work. In addition, the development and implementation of innovative scientific methods, such as simultaneous bulk stable isotope analyses and daily growth, together with stomach content analysis of ABFT larvae, will increase the understanding of their early life trophodynamics in relation to environmental stressors. Moreover, compound specific amino acids stable isotopes will be analyzed for ABFT larvae in both spawning scenarios. The composition and structure of the larval fish communities associated to the Atlantic bluefin tuna spawning habitats of the MED and GOM regions will be described and compared. This knowledge of differential composition and structure will lay the foundations to analyze the influence of selected environmental variables and the surface ocean dynamics on larval fish abundance and diversity.

Predator-prey interactions of ABFT larvae with other co-occurring apex species (top predator larvae) in the MED and GOM could differ substantially, and the proposed work would fill an important knowledge gap in this respect. The inter-comparison of apex species, medium and small tuna species (*Auxis rochei*, *Euthynnus alleteratus*, *Katsuwonus pelamis*), and other large pelagic species (*Sphyraena sphyraena* and *Coryphaena hippurus*) will provide a solid understanding to the comparative ecology of ABFT larvae in different spawning grounds. Furthermore, it will increase our ability to estimate the amount of the stable isotope of nitrogen of maternal origin in larvae, and then test the capacity of estimating maternal condition and its link to the growth variability of the offspring.

It is generally accepted that larval survival is growth-rate dependent and small variations of the growth rates may lead to significant recruitment oscillations. Slow growth rates during the larval stage may cause high mortality. Otolith microstructure analysis together with ontogenetic development of the growth hormone gene expression (GH) will be analyzed to assess daily growth variability within MED and GOM areas.

The proposed study will investigate changes in the food sources and the trophic levels of ABFT larvae and how these changes may explain daily growth variability. The expected results will produce novel information on the early life ecology of ABFT from both regions in relation to early life trophodynamics that drive specific growth strategies resulting from specific dietary shifts during the ontogenetic development of the different larval ABFT populations. This research will have direct relevance to current management issues, in terms of definition of stock population units, examining stock-recruit relationships, and for the prediction of observed high recruitment events. In addition, improved understanding of the connections between environmental variability, larval ecology and recruitment processes can inform future management strategies. This is particularly important for ABFT, which has been shown to be highly vulnerable to climate-induced increases in sea surface temperature.