*Comparative trophic **ECO**logy of **LA**rvae of Atlantic bluefin **TUN**a (Thunnus thynnus) from NW Mediterranean and Gulf of Mexico spawning areas*

Entidad o programa financiador Convocatoria 2015 - Proyectos I+D+I del Programa Estatal de investigación, desarrollo e innovación orientada a los retos de la sociedad (CTM2015-68473-R) (MINIECO/FEDER)

Financiación total del proyecto: 133.100,00 €

Coordinador principal del proyecto: Centro Oceanográfico de Málaga - IEO

Investigador principal del IEO: Raúl Laiz Carrión

Duración del proyecto: 01/01/16 a 31/12/18

RESUMEN

{rokbox title=| :: Image: ECOLATUN Project| thumb=|images/stories/ieo/gruposinvestigacion/laertes/ecolatun/centro-oceanografico-baleares-ecolatun-project-2016-2018-1-thumb.jpg|}images/stories/ieo/gruposinvestigacion/laertes/ecolatun/centro-oceanografico-baleares-ecolatun-project-2016-2018-1.jpg{/rokbox}

Desde un enfoque comparativo, los científicos estudiarán cómo las diferencias en las estrategias de alimentación pueden explicar la variabilidad del crecimiento en larvas de atún rojo, la cual tiene importantes repercusiones en la supervivencia larvaria y, por tanto, en el reclutamiento. Para ello se desarrollarán y aplicarán métodos científicos novedosos, como son el análisis de isótopos estables, conjuntamente con el estudio del crecimiento diario de larvas y con el análisis de los contenidos estomacales, con el fin de conocer las redes tróficas de las larvas y su relación con el medio ambiente comparando sus ecosistemas en el Mediterráneo y el Golfo de México.

Además, se estudiarán las características oceanográficas de las zonas de puesta, así como la composición y estructura de la comunidad de larvas de peces que cohabitan con las larvas de atún rojo. Por otro lado, a través de la huella isotópica de las larvas, se obtendrá valiosa información no solo sobre el trofismo de los estadios larvarios, sino también sobre la influencia materna en su desarrollo.

El *objetivo principal* de ECOLATUN es mejorar la caracterización de las poblaciones y definir con mayor precisión los hábitats más adecuados para la supervivencia de las larvas, lo que mejorará la incidirá positivamente en el desarrollo de modelos predictivos de supervivencia larvaria, de gran relevancia para la gestión de las pesquerías

Palabras clave: atún rojo, ecología larvaria, cadenas tróficas planctónicas, variabilidad crecimiento diario, diferenciación poblacional, hormona crecimiento, comunidad larvaria, procesos oceanográficos

SUMMARY

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.

{rokbox title=| :: Image: ECOLATUN Project|
thumb=|images/stories/ieo/gruposinvestigacion/laertes/ecolatun/centro-oceanografico-baleares-ecolatun-project-2016-2018-2-thumb.jpg|}images/stories/ieo/gruposinvestigacion/laertes/ecolatun/centro-oceanografico-baleares-ecolatun-project-2016-2018-2.JPG{/rokbox}

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.

The *main objective* of ECOLATUN is to improve the characterization of the populations and define with more precision the most suitable habitats for the survival of the larvae, which will improve the positive impact on the development of predictive models of larval survival, of great relevance for the management of fisheries

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

Participantes del Centro Oceanográfico de Baleares del IEO

- Francisco Alemany
- Patricia Reglero

Participantes del Instituto Español de Oceanografía

- Raúl Laiz Carrión (Investigador principal - Centro Oceanográfico de Málaga)
- Alberto García García (Centro Oceanográfico de Málaga)
- Carolina Johnstone (Centro Oceanográfico de Málaga)
- Jose María Quintanilla Hervás (Centro Oceanográfico de Málaga)
- Amaya Uriarte Ramalho (Centro Oceanográfico de Málaga)
- Jose María Rodríguez (Centro Oceanográfico de Gijón)

Otras instituciones participantes

- Southeast Fisheries Science Center - NOAA
- Woods Hole Oceanographic Institution - WHOI
- City University of New York - CUNY
- El Colegio de la Frontera Sur - ECOSUR