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[Characterization of the spawning habitat of Atlantic bluefin tuna and related species in the Balearic Sea \(western Mediterranean\)](#)

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Abstract: Within the framework of the TUNIBAL project that focused on Atlantic bluefin tuna (*Thunnus thynnus*

) larval ecology, ichthyoplankton surveys were conducted from 2001 to 2005 off the Balearic archipelago, which is recognized as one of the main spawning areas of the eastern Atlantic stock of this species. In each survey, a regular sampling grid of about 200 stations, 10 nautical miles apart were sampled. CTD casts and oblique Bongo 60 and surface Bongo 90 plankton tows were carried out. The occurrence frequencies of Atlantic bluefin tuna, albacore tuna (

Thunnus alalunga

) and bullet tuna (

Auxis rochei

) larvae in quantitative Bongo 60 samples were 0.14, 0.29 and 0.49 respectively. Mean larval abundances in these positive samples were relatively high: 31 larvae 10 m⁻² for Atlantic bluefin tuna, 17 for albacore tuna and 31 for bullet tuna. All species had patchy distributions since more than 90% of the stations showed larval densities under 10 larvae 100 m⁻³ (70% showed even less than 2 larvae 100 m⁻³), whereas in some isolated spots, we recorded abundances as high as 867 (Atlantic bluefin) or 872 (bullet tuna) larvae 10 m⁻². These results allowed us to relate larval distribution to mesoscale hydrographic features and to characterize the spawning habitat of these species. Single Quotient Parameter analyses were applied to spatial (depth), physical (temperature, salinity, dissolved oxygen and geostrophic current velocities) and biological (mesozooplankton biomass) variables to determine the environmental preferences of each species for spawning. Results showed that the complex hydrodynamic scenarios around the Balearic Islands, due to the interaction between the inflowing surface Atlantic water masses (AW) and Mediterranean surface waters (MW), play a key role in determining the abundance and distribution of tuna larvae in this area, especially in the case of Atlantic bluefin tuna.

Spawning of this species seems to take place mainly in offshore mixed waters, as suggested by

their preferences for waters with salinities between 36.9 and 37.7, located near frontal areas in the confluence of AW and MW. Atlantic bluefin tuna start to spawn once sea surface temperatures (SST) are over 20.5 °C, and preferentially in the range of 21.5–26.5 °C. Its larval distribution suggests that spawners reach the Balearic Sea in association with the inflowing AW. However, bullet tuna and albacore tuna larvae, species whose Mediterranean stocks stay in this sea year round, had a more widespread distribution and were found both in MW and AW. Bullet tuna starts to spawn in shallower waters near the shelf break once the SST reaches 19 °C, and shows significant preferences for waters over 23.5 °C. Similar to Atlantic bluefin tuna, albacore tuna spawn in offshore waters, but its spawning peak is later than its congeneric species, since it has a significant preference for even warmer waters, over 27 °C.

Keywords: