**Juvenile albacore distribution and oceanographic conditions in the northeastern Atlantic during the 2013 fishing campaign**

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# Abstract

Albacore (*Thunnus alalunga*) is a highly migratory tuna with a wide geographic distribution, covering the North Atlantic Ocean up to 55ºN. Although it is a temperate species, it occupies both temperate and tropical waters depending on the season. Both adults and juveniles spend the winter in central tropical waters of the North Atlantic Ocean. In spring, with the onset of the sea water warming, adults migrate to the Sargasso Sea for reproduction. Spawning takes place from April to September. In late spring, immature individuals start a trophic migration to higher latitudes, towards productive waters of the Bay of Biscay and the southeast of Ireland.

Despite its large geographic distribution, albacore shows environmental preferences to optimise its physiologic functions. One characteristic is its thermoregulatory capacity, which allows it to keep an internal warmer temperature in comparison to the environment; this characteristic enables it to swim through water masses in a wide range of temperatures, both horizontally and vertically. In the North Atlantic Ocean, albacore latitudinal migrations follow the isotherms-range between 16 and 21ºC. Further, thermal preferences are different according to the age. The variability of the latitudinal distribution of the warm Gulf Stream current (as measured by the Gulf Stream Index, GSI) might explain some of the variability in the tuna fisheries of the Northeast Atlantic.

Albacore CPUE distribution is not only related to water temperature, but also to chlorophyll concentration at the sea surface. What is more, previous studies suggested a potential association between albacore catches and chlorophyll high gradient magnitude areas in the Bay of Biscay. In addition, albacore observations in the northwestern Pacific Ocean were found to occur in waters with high Eddy Kinetic Energy (EKE) and strong geostrophic currents, showing that tuna aggregations could be related to anticyclonic gyres.

In its trophic migration to northern latitudes, albacore is fished by the Basque surface fleet, since it is a commercially important species. Actually, approximately 25-30% of the total catch of albacore stock is exploited by this fishing fleet. It targets juveniles of 1-4 ages. Fishing season starts in late-May or June, in waters close to Azores Islands (25-30ºW); and then it moves northeastwards, following the seasonal trophic migration of albacore, to finally reach the Bay of Biscay and the south of Ireland in mid-summer. The fishing activity finishes in October, when albacore leaves Northeast Atlantic waters to go back to central Atlantic waters, where it overwinters.

In 2013, a high part of the fishing effort of the Basque vessels was located in the Bay of Biscay, as shown by CPUE data collected from logbooks. At present, the main fishing gears used for albacore fishing are trolling line and baitboat. Trollers operate in a wide area covering the Bay of Biscay and the adjacent oceanic waters, whereas baitboats mainly centre their activity within the Bay of Biscay, occasionally reaching waters south of Ireland. Data available for 2013 comprise 5,030 daily observations from 90 vessels (3,386 observations for trollers and 1,644 for baitboats). In the case of trollers, whilst from May to June albacore catches were mainly located in the oceanic area, from August to October, most of the

catches were associated to the Spanish-French-English continental shelf and slope. July was a transition month when albacore was found both in oceanic and slope/shelf areas; and, during November, catches were concentrated in the Spanish shelf/slope. In the case of baitboats, catches distribution was different. From May to June and in October, catches were located within the Bay of Biscay. In July, they also found albacore in the oceanic area west of the Bay of Biscay. Finally, during August and September, they fished both in the Bay of Biscay and in waters south of Ireland. The representation of albacore catches superimposed to EKE maps show that the location of those catches registered during summer 2013 may be related to eddy edges, where frontal conditions are found. With regard to the GSI, from January to July 2013, it was mostly negative, favouring the albacore distribution in the study area.

During part of the albacore fishing season, a two-month oceanographic campaign (so-called GESSEB), from 23 July to 24 September 2013, took place within the southeastern Bay of Biscay. During this campaign, data from a Slocum-1000 type glider (equipped with a CTD and dissolved oxygen and fluorescence-turbidity sensors), two drifters with a holey sock drogue centred at 50 m depth and altimetry, as well as near-real time SST (AVHRR 1 km) and Chlorophyll-a concentration (MODIS 1 km) maps were obtained. These measurements will allow us to study the vertical structure of the water column within the southeastern Bay of Biscay, as well as to better characterise its mesoscale activity during the study period. Preliminary results show that the seasonal thermocline during the study period was located around 50 m depth, where the fluorescence was maximum. At this same depth, there was also a relative maximum in the dissolved oxygen concentration, below which the concentration decreased significantly.

The present work intends to improve our knowledge regarding optimal habitat as well as spatial distribution of albacore in the Bay of Biscay. Particularly, it will study if the albacore distribution within the Bay of Biscay is related to the presence of mesoscale structures in the area. Further, the structure of the water column will be studied in order to look for links between oceanographic conditions at different depth levels and the presence/absence of albacore. Finally, the information collected during the GESSEB campaign will be used to obtain in situ environmental 3D data of the water around the place and date of these catches.

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