Preferred habitat of juvenile southern bluefin tuna in the Great Australian Bight

J.P. Eveson[a], A. Hobday[a], J. Hartog[a], T. Patterson[a], M. Basson[a], K. Rough[b] and C. Spillman[c]

[a] Division of Marine and Atmospheric Research
CSIRO
Hobart, Australia
paige.eveson@csiro.au
alistair.hobday@csiro.au
jason.hartog@csiro.au
toby.patterson@csiro.au
marinelle.basson@csiro.au

[b] Australian Southern Bluefin Tuna Industry Association
Port Lincoln, Australia
kirstenrough@bigpond.com

[c] Centre of Australian Weather and Climate Research
Bureau of Meteorology
Melbourne, Australia
c.spillman@bom.gov.au

Abstract: Large numbers of juvenile southern bluefin tuna (SBT) are found, and caught by commercial purse-seine vessels, in the Great Australian Bight (GAB) during the austral summer. We used data from a large-scale archival tagging experiment conducted on juvenile SBT in the mid to late 2000s to investigate habitat preferences in the GAB. This involved a number of steps: first, estimating the most probable track of each fish from the light and temperature records on the returned archival tags (done using an in-house geolocation method); second, using a state-space model to estimate periods of residency versus migration; third, matching up remote-sensing data for candidate environmental variables (sea surface temperature (SST) and chlorophyll a (chl a)) with estimated fish locations when in a resident state; and fourth, comparing environmental observations for the entire GAB to observations where fish were resident to see if fish were concentrated within given ranges (indicating preferred habitat) or randomly distributed (no habitat preference). Both SST and chl a were found to influence the distribution of SBT. Once habitat preferences were established, we produced maps of the GAB showing regions of preferred SBT habitat for specified time periods. In addition, seasonal forecasts of environmental variables (produced by the Bureau of Meteorology (BoM)) were used to predict regions of preferred SBT habitat in the GAB up to two months in future. Because the BoM seasonal forecasting model is strictly a physical model and does not simulate chla a levels, only SST data could be included in the habitat forecasts. These habitat forecasts are being used by members of the Australian SBT fishing industry to help plan their fishing operations. As the fishery is managed under a quota system, this application does not lead to more fish being captured, but should improve the economic efficiency of the catching operations.