

## Climate Related Variability and Stock-Recruitment Relationship of the North Pacific Albacore Tuna

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**Abstract :** The North Pacific albacore (*Thunnus alalunga*) is a temperate tuna species distributed in the North Pacific which is of significant economic importance to the Pacific Island Nations and Territories. Despite its importance, the stock dynamics and ecological characteristics of albacore still, have gaps in knowledge. The stock-recruitment relationship of the North Pacific stock of albacore tuna was investigated for different density-dependent effects and a regime shift in the stock characteristics in response to changes in environmental and climatic conditions. Linear regression analysis for recruit per spawning biomass (RPS) and recruitment (R) against the female spawning stock biomass (SSB) were significant for the presence of different density-dependent effects and positive for a regime shift in the stock time series. Application of Deming regression to RPS against SSB with the assumption for the presence of observation and process errors in both the dependent and independent variables confirmed the results of simple regression. However, R against SSB results disagreed given variance level of  $< 3$  and agreed with linear regression results given the assumption of variance  $\geq 3$ . Assuming the presence of different density-dependent effects in the albacore tuna time series, environmental and climatic condition variables were compared with R, RPS, and SSB. The significant relationship of R, RPS and SSB were determined with the sea surface temperature (SST), Pacific Decadal Oscillation (PDO) and multivariate El Niño Southern Oscillation (ENSO) with SST being the principal variable exhibiting significantly similar trend with R and RPS. Recruitment is significantly influenced by the dynamics of the SSB as well as environmental conditions which demonstrates that the stock-recruitment relationship is multidimensional. Further investigation of the North Pacific albacore tuna age-class and structure is necessary for further support the results presented here. It is important for fishery managers and decision makers to be vigilant of regime shifts in environmental conditions relating to albacore tuna as it may possibly cause regime shifts in the albacore R and RPS which should be taken into account to effectively and sustainability formulate harvesting plans and management of the species in the North Pacific oceanic region.

**Keywords :** Albacore tuna, *Thunnus alalunga*, recruitment, spawning stock biomass, recruits per spawning biomass, sea surface temperature, pacific decadal oscillation, El Niño southern oscillation, density-dependent effects, regime shift

**Conference Title :** ICMFE 2017 : International Conference on Marine and Freshwater Environments

**Conference Location :** Singapore, Singapore

**Conference Dates :** September 11-12, 2017