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# On Greenland Halibut Dynamics: an update on environmental forcing and modelling

by

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## Abstract

Currently, we develop a "top down systems approach" on Greenland Halibut (*WGH)* dynamics in order both to understand and describe the causal mechanisms of the spatio-temporal evolution of the stock, link the off-shore and in-shore systems and propose fishing mortality ranges ($F_i$) adapted to life history aspects (derived from survey data and otolith biochemistry analysis), based upon variable population reference points ($K_i$, $r_i$, $M_i$), environmental and multi-species interactions, by-catches from the shrimp fishery and estimated short term (≈ 6 years) trends thereof. Numerical, spatial and geometric system approaches for management proposals are in focus. Description of the systems are to be carried out through a matrix of *GAMs* (difference delayed equations) and polygon based on overlapings between densities and environmental iso-lines (aimed to managers). Sustainable harvesting strategies and conservation are the core of this line of work. There are several highlights from our results (April, 2015) which are both useful for development of models for sustainable spatio-temporal harvesting strategies: *(i)* Both linear and non-linear analysis showed that the *GH* stock has been underestimated/underexploited (during periods of higher abundances) and –what is most important- overestimated/overfished (during periods of lower abundances, when the stock is most vulnerable): this was due to the lack of analysis and an appropriate operational model, basing the assessment in series of mean values and omitting the variability in the data, lags and memories, minima and maxima (typical features for dynamical systems and population processes); *(ii)* Age 1 and abundance lagged 6 years (1997-2011) may be related ($p<.05$) to *(a)* the variability of the SST in the area of the early life drift (mixing layer) and *(b)* recruitment and the fishable stock can be estimated from age class 1 (lagged 5 years); *(iii)* Abundance and CPUE were found to follow cycles at two levels of numbers and *(iv)* the relationships appeared to respond mainly to trends in temperature minima. A priori estimations of abundance as the inverse of the SST variation were validated for years 2012-2014, as well. Further details can be found in *Solari et al. (2013, 2014, 2015).*