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USING THE ECOPATH II APPROACH TO ASSESS KRILL BIOMASS AND DYNAMICS

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Summary

Krill represents, in all systems where it occurs, a major element of the diet of commercial fishes, and/or of marine mammal, and hence would be important group to study even if they had no direct use as feedstock for e.g. mariculture.

The biomass and hence dynamics of krill are difficult to estimate directly using direct sampling or acoustic methods, and it is proposed that these can be inferred indirectly based on the predation rates of krill consumers, and estimates of the production/biomass ratio of krill.

The mass-balance approach implemented in the ECOPATH II software (Christensen and Pauly 1995, Pauly 1996)*, can be used for this, and an application example is presented, pertaining to the Georgia Strait, British Columbia, for which a trophic model has recently been constructed by graduate students of this author. The many uncertainties associated with this approach can be quantified, using the Monte Carlo routine built in the recently released Windows version of ECOPATH II, and entering ranges or distributions about all imputs, including the fraction of krill in the diet of its consumers. The corresponding outputs are expressed in a semi-Bayesian context, either as posterior distributions of acceptable inputs (i.e. of those enabling mass balance), or as probabilistic distributions for estimates such as mean krill biomasses over a conventional period (e.g. a year). It is suggested that such estimates of biomass will compare favourably, both in precision and accuracy, with estimates extrapolated from catch samples, or from hydroacoustics.

[Following the workshop where the above was presented, Dr Carl Walters of the Fisheries Centre, UBC, developed an approach now implemented as an ECOPATH II subroutine called ECOSIM, which reexpresses the linear equation system that the ECOPATH approach relies on, into a system of differential equations which can be integrated over time (Walters et al 1996). Thus, once an ECOPATH II model is constructed, its outputs can be used to run, without further input, a simulation model of the system in question; perturbations can be studied (by changing the temporal pattern of fishery mortality, e.g. on krill predators) and the temporal responses (e.g. of krill) studied. Preliminary examination with ECOSIM, of the dynamics of 50+ of the ecosystems so far described with ECOPATH II was found to be useful in characterizing the key role of prey species (such as krill) in ecosystems, thus providing additional reasons for recommending the modeling approach suggested above.]

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*available free of charge from V. Christensen, contact villychr@centrum.dk