## Selective fishing, balanced harvesting and sustainability of fisheries and ecosystems: the effects of selective fishing on species and sizes to fish communities.

More and more evidence appears that selective fishing on species and sizes to target large, mature fish and avoid by-catch of juvenile fish and non-target species as dolphins or turtles has unexpected side effects on fish populations and fish communities.  These range from phenotypic and possibly even genotypic effects (fishery-induced evolution) on size and reproductive capacity of species like cod in the North-Sea to an increase in by-catch of sharks, marlins and other species by avoiding dolphins in tuna fisheries in the Eastern Pacific. The selectivity paradigm in fisheries is 50-year old and turns out not to fit very well in an Ecosystem Approach to fisheries.  The paradigm is to avoid catching juveniles and only catch fish when they have grown to commercially optimal sizes. However, it ignores trophic relations and predation and the fact that big old fecund female fish (BOFFF’s) are important to maintain stable reproduction.  From model studies it appears that non-selective fisheries, in other words, fisheries that fish the whole fish community and target all sizes and species relative to their production, may maintain ecosystem structure and lead to higher long-term yields. An Ecosystem-Approach to Fisheries requires maintenance of ecosystem structure and processes. In that perspective, selectivity regulations on individual species may diminish rather than enhance the sustainability of the fishery and ecosystem. So the selectivity paradigm needs to be reassessed in an ecosystem perspective! This is a large subject that can be approached in many ways. Specific subjects could be:

1. On by-catch in specific fisheries as the tuna purse seine fisheries; how to assess these in the light of an ecosystem approach?
2. The effects of fishing on juveniles that are discarded?
3. The impact of the ban on discarding by the European Union to force fishers to be more selective?
4. Model based approaches to size selection and what we can learn from those?
5. Fishery induced evolution: has the long term pressure on larger individuals in the plaice fisheries in the North Sea lead to slower growth? And what would that mean for stock recovery now that fishing pressure has reduced?

Possible tasks include literature study, data analysis on specific examples from African lakes (Kariba, Mweru), Tuna fisheries in the Western Pacific or the North-Sea

**Supervision:** Paul van Zwieten, Leo Nagelkerke and Adriaan Rijnsdorp can assist in defining the subject further

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**Number of possible student subjects:** 3