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**PhD project: Changes in the overexploited demersal fish assemblages in the Northwest Atlantic: the Southern Grand Banks and the Flemish Cap**

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**Summary:** An ecosystem approach to fisheries (EAF) is widely recognized as desirable for fisheries management. To progress towards the implementation of an EAF, a first step is to identify which species co-occur by quantifying assemblage structure in these habitats. A second step is the selection and development of ecological indicators to evaluate and to quantify the ecological state of exploited marine ecosystems. The groundfish assemblage structure in relation to depth was examined in the Southern Grand Banks of Newfoundland and the Flemish Cap, using multivariate analysis. The status of the two ecosystem using a suit of ecological indicators was evaluated, and tested different trajectories at two different depths to examine the population structure of the three species of redfish using Multivariate Autoregressive State Space Models (MARSS). The data used were obtained from two multispecies bottom trawl surveys performed by the Spanish Administration in the Southern Grand Banks (3NO survey) from 2002 to 2014, and the European Union (EU) in the Flemish Cap (3M survey) from 1991 to 2015, in the Northwest Atlantic Fisheries Organization Regulatory Area (NAFO RA).

Three major main fish assemblages were identified (38–300, 301–600, and 601–1460 m depth in 3NO; 129–250, 251–600, and 601–1460 m in 3M). Indices responded to different exploitation patterns, management, and environmental regimes in each assemblage. MARSS analysis identified separate trajectories for each species in each depth but one overall population growth rate with commercial catch as a covariate. Thus, while biomass trends for each species in each depth showed some temporal independence, all showed the same long-term changes. Thus there was data support to confirm that species could be treated together as a single management unit and to suggest that fishing is an important driver.

This study revealed important spatial structure in the fish assemblages in the two fishing grounds and highlights the importance of calculating indicators in each assemblage in order to compare areas and periods under different fishing pressure. This thesis represents a contribution towards the management through a multispecies approach in NAFO.