

# Predation hot spots: large scale impact of local aggregations

Axel Temming\*, Jens Floeter and Siegfried Ehrich\*\*

\* Institute für Hydrobiologie und Fischereiwissenschaft, Olbersweg 24, 22767 Hamburg, Germany

\*\* Bundesforschungsanstalt für Fischerei, Institut für Seefischerei, Palmaille 9, D-22767 Hamburg, Germany

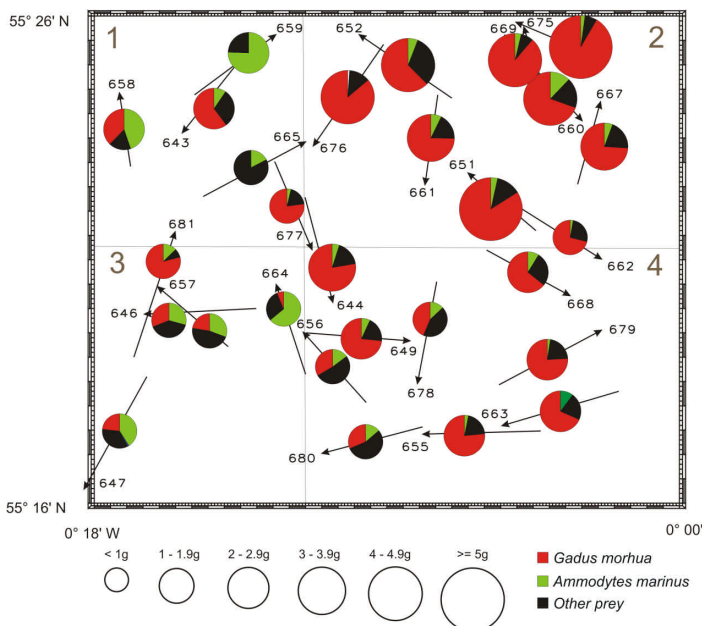
This study demonstrated for the first time that local fish predator aggregations are a key structuring force in the temperate marine ecosystems.

In this study we present a combined analysis of a novel small scale survey nested inside a traditional broad-scale survey time series (12 years). Broad scale survey distributions of demersal piscivorous fish are generally dominated by some extremely high catches, which together represent a large part of the total sampled population. With our new survey design we resolved the fish distribution in the spatio-temporal vicinity of these extreme hauls and could show that they indicate small scale spatial aggregations rather than isolated “random” events.

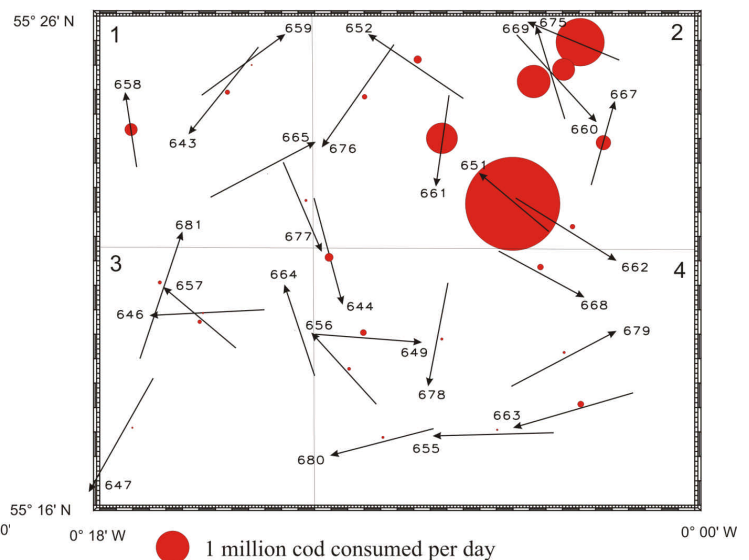
Generally, there are no resources for food web studies during routine broad scale surveys, so the ecological reasons of these aggregations remain uninvestigated. However we sampled fish stomachs during some of our small scale surveys to

investigate the trophic processes in such fish aggregations. We were able to sample the surroundings of three extreme hauls and revealed that these extreme hauls actually indicated aggregations of piscivorous fish predators exploiting local prey aggregations.

We present the analysis of the trophic interactions (Fig. a) in one of these three case studies and demonstrate that the impact of such a "predation hot spot" can reach immense dimensions: a patch of approximately 50 million juvenile cod was entirely wiped out in 5 days by predatory whiting, aggregating on these juveniles in an area of 18 km<sup>2</sup> (Fig. b). As an incoming average year class is theoretically wiped out by only 32 predation hot spots of the magnitude observed in our case study, the magnitude of the predation mortality of 0-group cod may be severely underestimated in the current understanding of ecosystem functioning.



**Figure a:** Spatial distribution of average stomach content weights and diet compositions of whiting (size class 25 - 29.9 cm) observed during the small scale Box B survey.



**Figure b:** Spatial distribution of the total daily consumption of 0-group cod by all whiting in the Box B area. The diameter of the circles scale proportionally to the number of consumed cod.