

**Title: Distribution of gadoid spawning in the northern North Sea as determined from fish egg surveys.**

**Study Programme:** Fishery Biology

**Type of study:** Field and laboratory (genetics).

**Contact persons:** Richard D.M. Nash (IMR, Bergen); Geir Dahl (IMR, Bergen)

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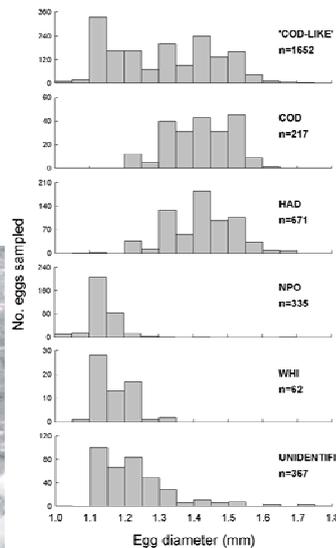
**Cod (*Gadus morhua*)**

**Whiting (*Merlangius merlangus*)**

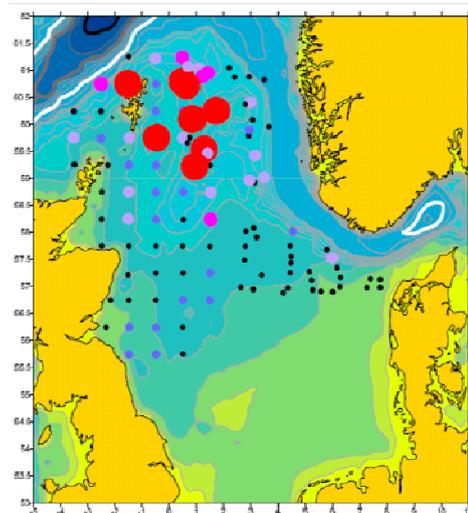
**IMR, RV GO Sars**



**MIK net with MM egg samplers**



**Distribution of egg diameters 2009**



**Distribution Stage I eggs; Norway pout (*Trisopterus esmarkii*) 2009**

**Project description:**

Many of the commercially exploited gadoids (cod, haddock, whiting, Norway pout and saithe) spawn in the northern North Sea, especially in the western region in the vicinity of Shetland. Many of these stocks have a sub-stock structure whereby there are a number of centres of spawning activity across the whole of the North Sea. Due to a combination of spatially targeted exploitation patterns and global warming altering the spatial abundance and hence spawning of each stock there is a necessity to regularly monitor the contribution of each

spawning component. One method is using early development egg distributions as their distribution and abundance give an estimate of the spawning stock, the spatial extent of the spawning grounds and the relative contribution of the various stock components.

One of the problems is that most gadoid early stage eggs (namely stages I and II) are not morphologically distinct, apart from having species specific size ranges. Whilst the ranges differ there is considerable size overlap. The only reliable method at present to separate the various species is using genetic techniques, in this case TaqMan probes. The project will entail sampling the distribution of pelagic eggs across the northern North Sea and applying the probes to determine the species composition. From the compositions abundances and egg production estimates can be made. These data can be compared with survey results taken in 2005 and 2009.

The novel aspect here will be the inclusion of at least saithe. Until 2012 there was not a probe for this species and as such their eggs were part of the unidentified group.

The research will involve shipboard work with egg sampling and preparation of field caught eggs for analyses back in the laboratory. The shipboard work will occur in February and March. Laboratory work on the genetic analyses will also be undertaken back at IMR along with the estimation of egg productions for each of the target species (namely cod, haddock, whiting, Norway pout and saithe).

**Background knowledge:** Fish ecology, early life history, genetic techniques

**Skills to be acquired during Masters work:** Field experience, laboratory analyses of genetic samples, statistics.

**Further information:** The project will involve shipboard work, a seagoing medical certificate is required, ability to work at sea is an advantage, laboratory work in a genetics lab.

**References:**

- Fox, C. J., Taylor, M. I., Pereyra, R., Villasana-Ortiz, M. I. & Rico, C. 2005 TaqMan DNA technology confirms likely over-estimation of cod (*Gadus morhua* L.) egg abundance in the Irish Sea: implications for the assessment of the cod stock and mapping of spawning areas using egg based methods. *Mol. Ecol.* 14: 879–884.
- Nash, R.D.M., Wright, P.J., Matejusova, I., Dimitrov, S. P., O’Sullivan, M., Augley, J. & Höffle, H. 2012. Spawning location of Norway pout (*Trisopterus esmarkii*) in the North Sea. *ICES Journal of Marine Science* 69: 1338–1346.
- Taylor, M. I., Fox, C., Rico, I. & Rico, C. 2002. Species-specific TaqMan probes for simultaneous identification of (*Gadus morhua* L.), haddock (*Melanogrammus aeglefinus* L.) and whiting (*Merlangius merlangus* L.). *Mol. Ecol. Notes*, 2(4): 599-601.