French Research Institute for Exploitation of the Sea

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Mapping & modelling of winter ichthyoplankton distribution in the Channel & Southern North Sea

Method of work & Preliminary results

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Study area - Annual IBTS survey

IBTS 2008

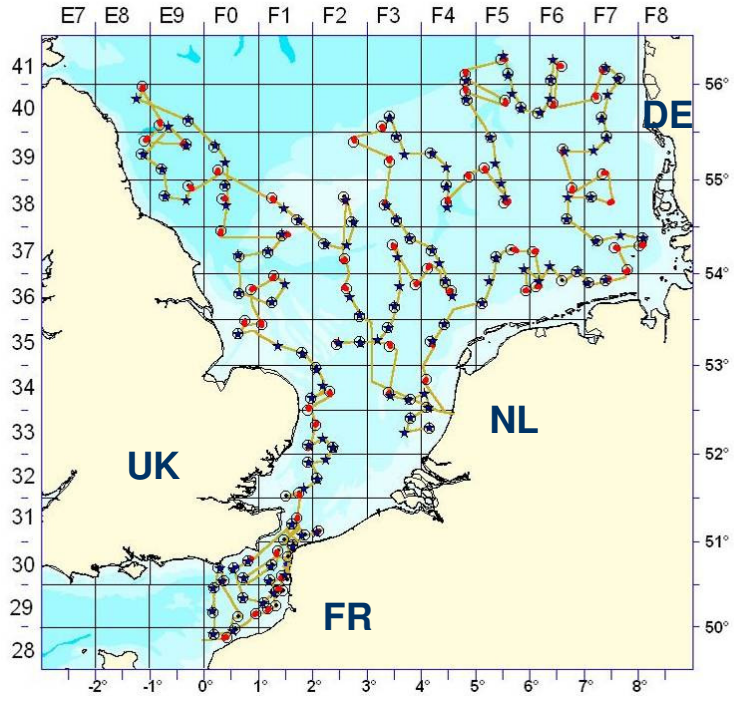
The Channel: 25-31 January

Southern North Sea: 1-22 February

International Bottom Trawl Survey

– fish abundance & distribution

– recruitment indices



New objectives since 2006

The actual fragility of some exploited fish stock leads to consider marine spawning grounds as "sensitive habitats".

Objectives

– Identify the location of ichthyoplankton (fish eggs and larvae) areas

– Characterize the winter spawning & nursery habitats

– Specify the importance of the environmental and trophic conditions on the use of these habitats

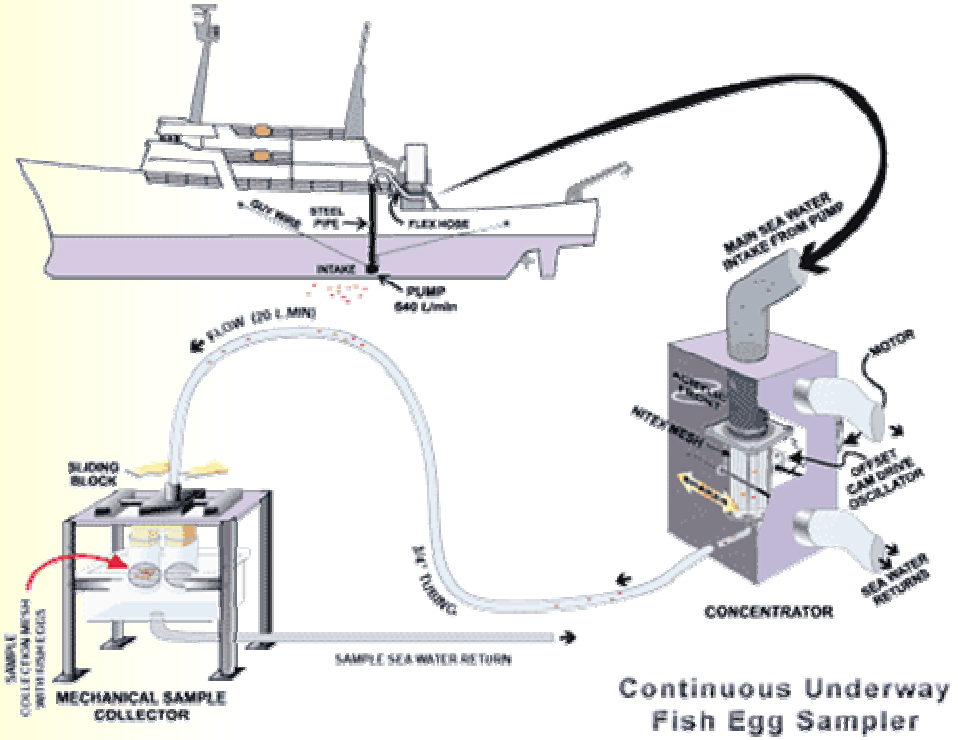
Expected results:

– Mapping spatial distribution of ichthyoplankton abundance for the main species

– Modelling their preferred and optimal habitat to help decision making and planning of human activities (Protected Marine Areas)

– Specify importance of zooplankton assemblages in these habitats

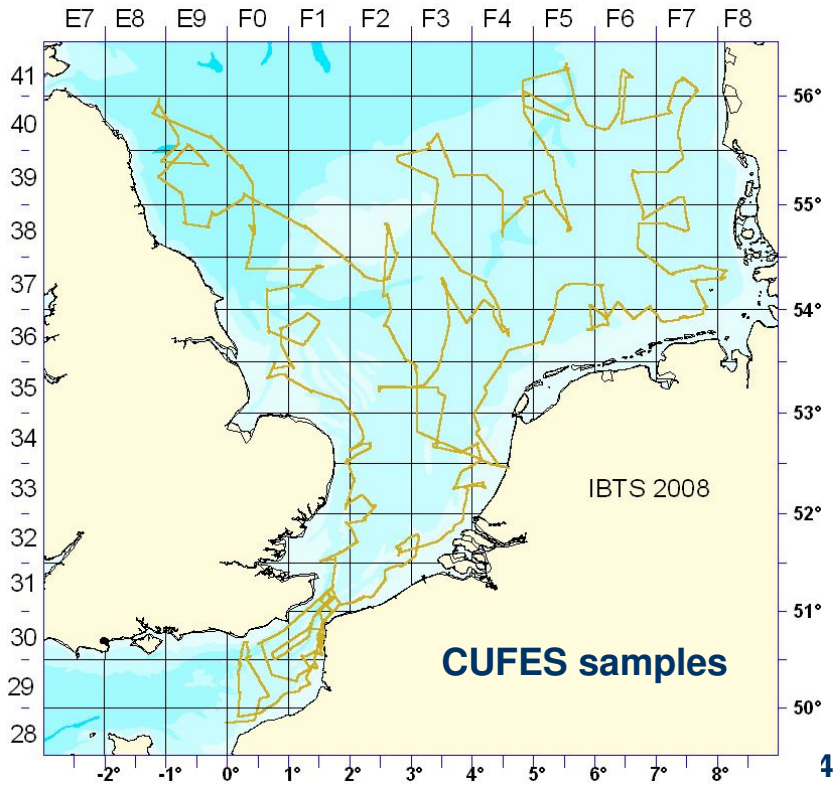
Continuous Underway Fish Egg Sampler (CUFES)



Continuous Underway Fish Egg Sampler

CUFES: a pumping device to collect pelagic eggs of fish from a moving vessel

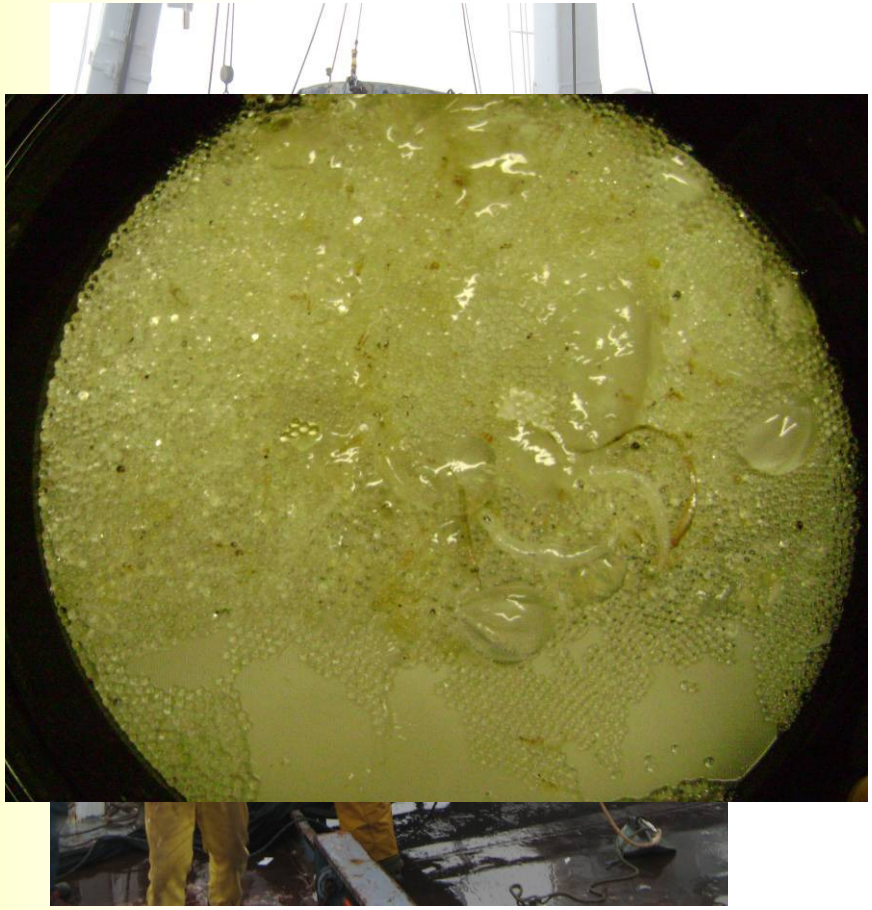
- water pumped at 5 m depth
- collector mesh size: 500 µm



The CUFES operated continuously during the survey :

- sequential sampling interval: 30 min
- 1070 samples collected

Methot Isaac Kidd net (MIK)

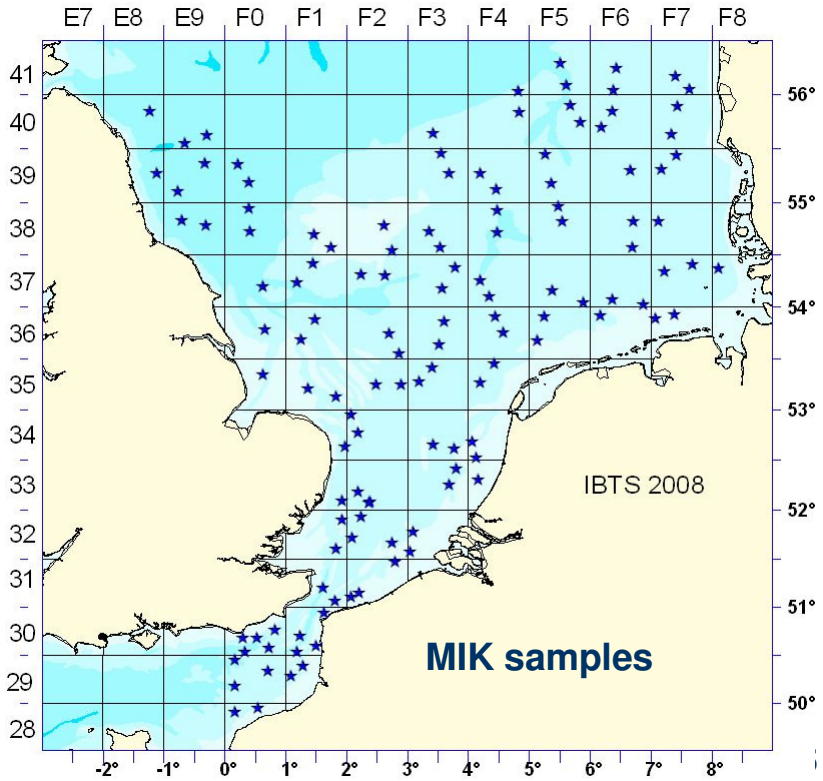


MIK samples were collected at night:

- fish eggs and zooplankton also are collected
- 130 samples collected

MIK: a specialized net for collecting fish larvae

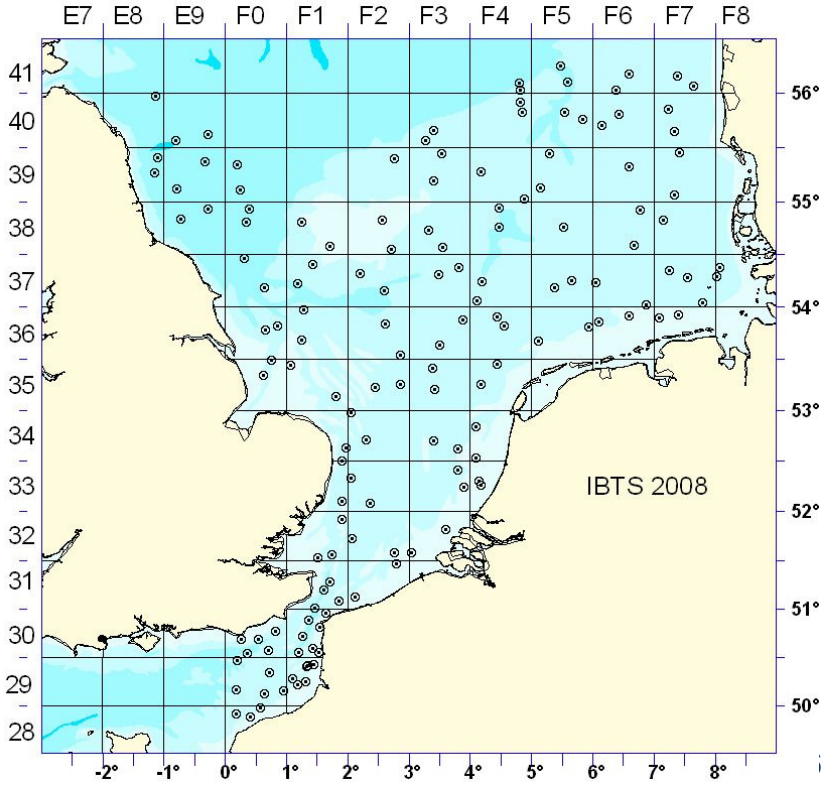
- ring diameter of 2 meters
- black conical net of 13 meter long
- mesh size: 1.6 mm; last meter 500 µm



Bongo nets

Bongo: a two WP2 nets coupled of 200 and 500 µm mesh size for collecting zooplankton

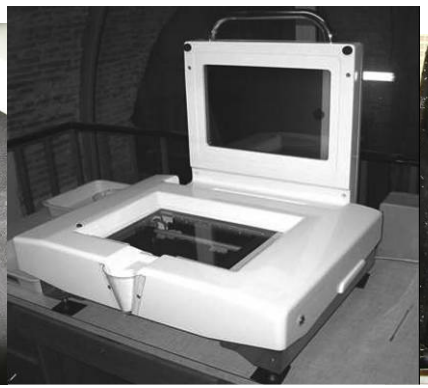
- ring diameter of 2 meters
- 148 samples collected



Taxonomic identification and counting

	CUFES samples	**MIK** samples	**Bongo** samples
Microscope	Eggs (species level)	Clupeidae larvae (herring, sprat, sardine)	
Image analysis (ZooScan)	Eggs (species level)	Fish eggs and larvae & macro-zooplancton	Meso-zooplankton & fish eggs





Sample processing with ZooScan

http://www.zooscan.com

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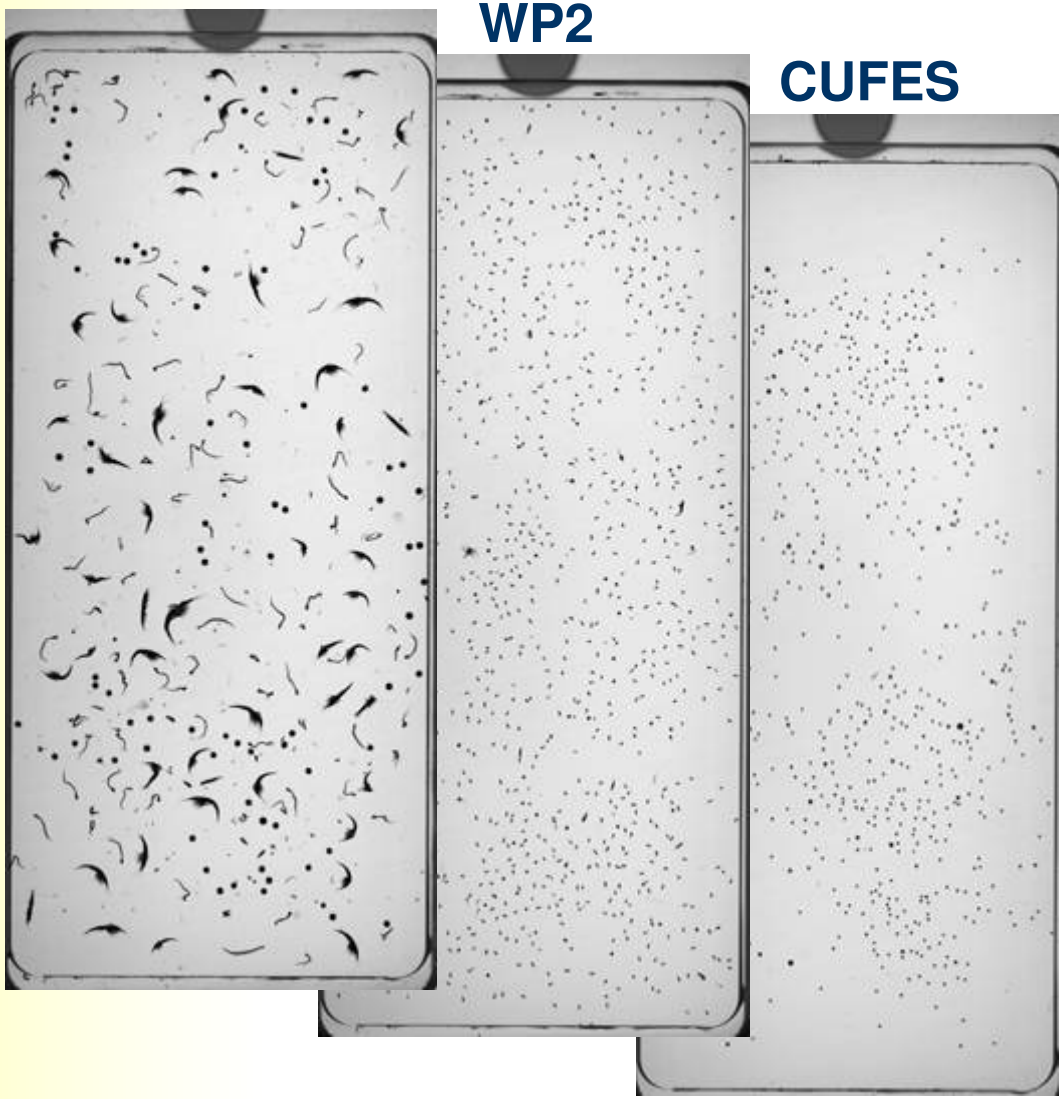

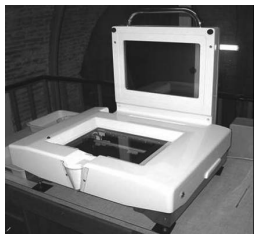

Image acquisition

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Image process & Feature extraction

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Training sets building

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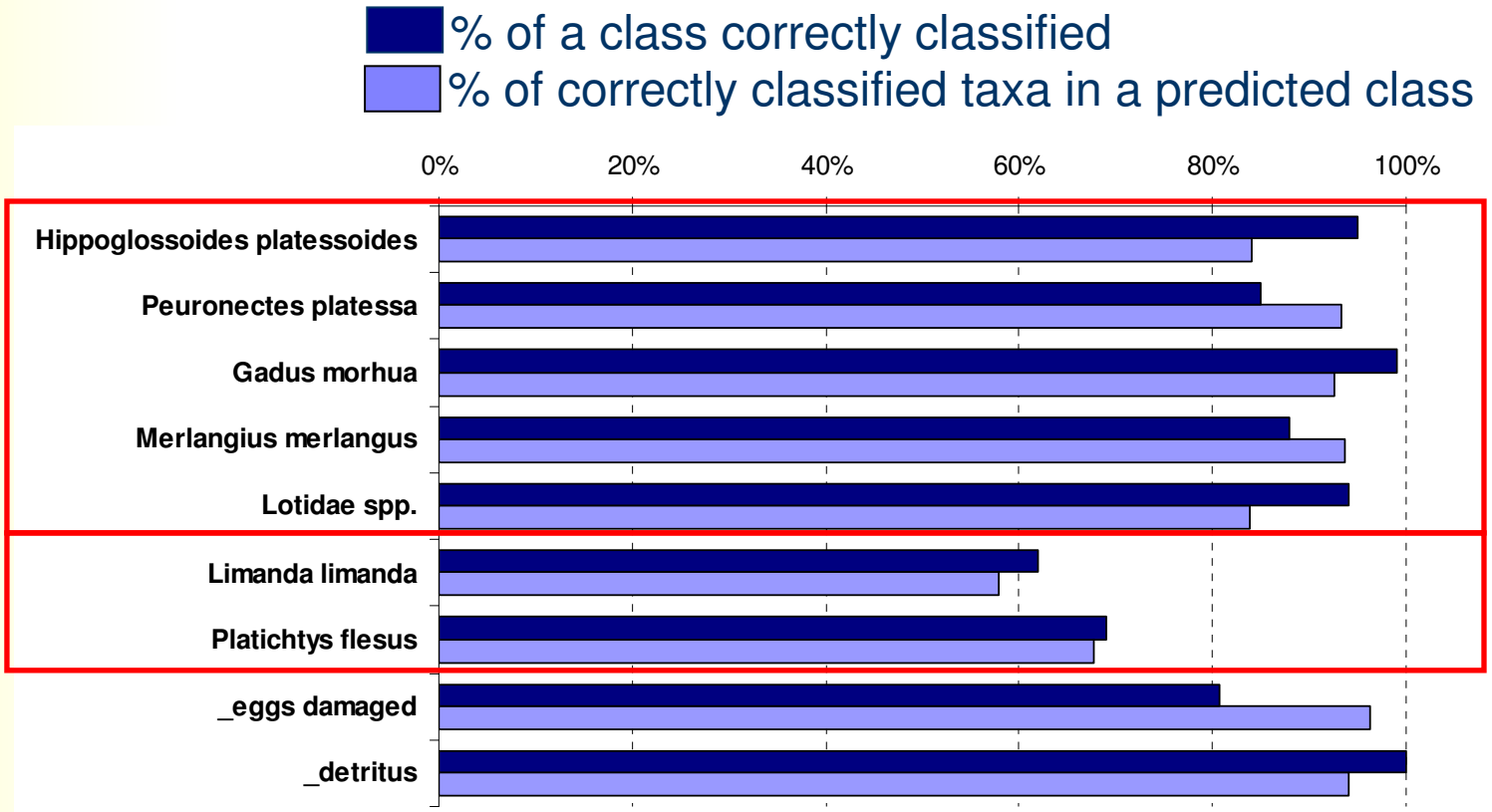
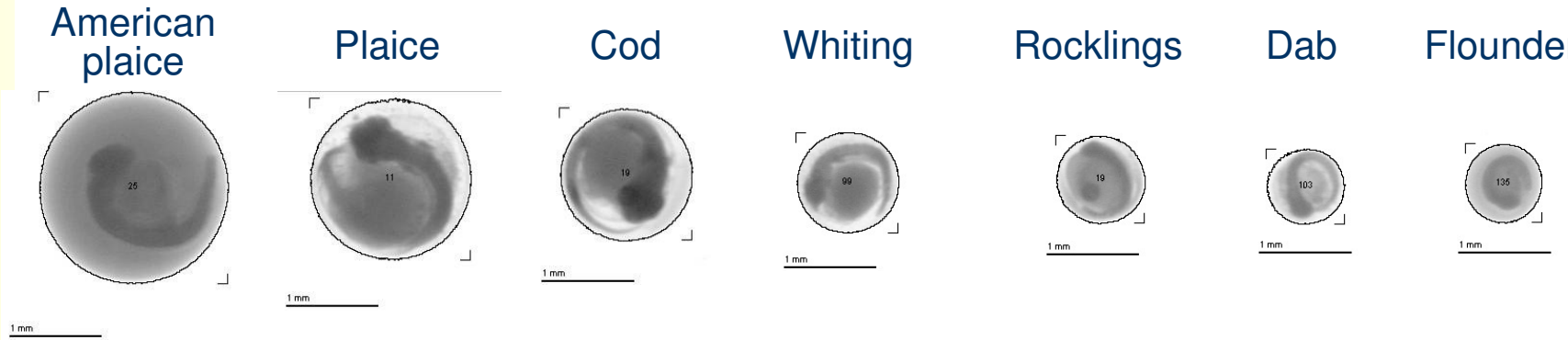
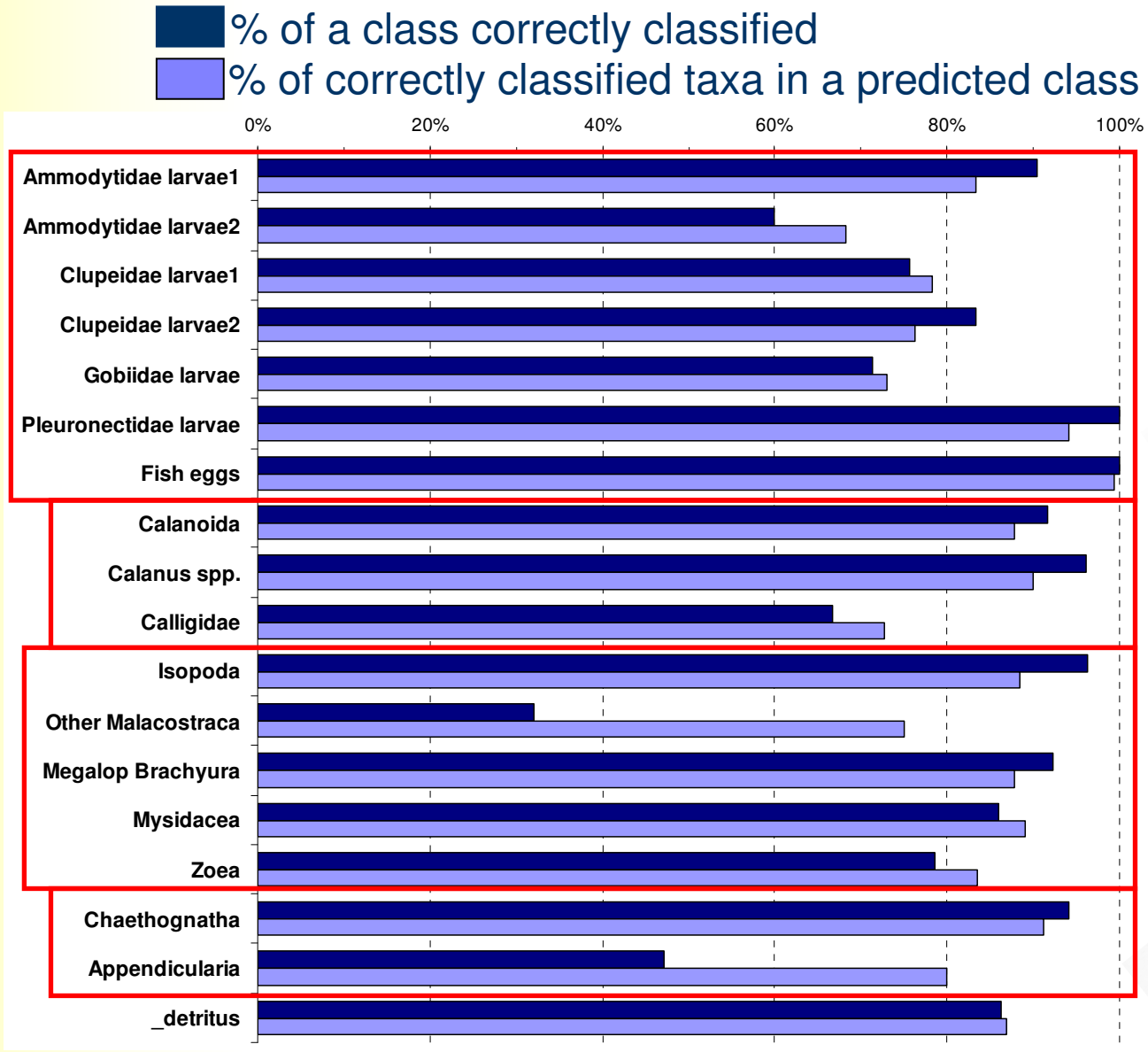
Validation of classifier performances on an **independent Test set**

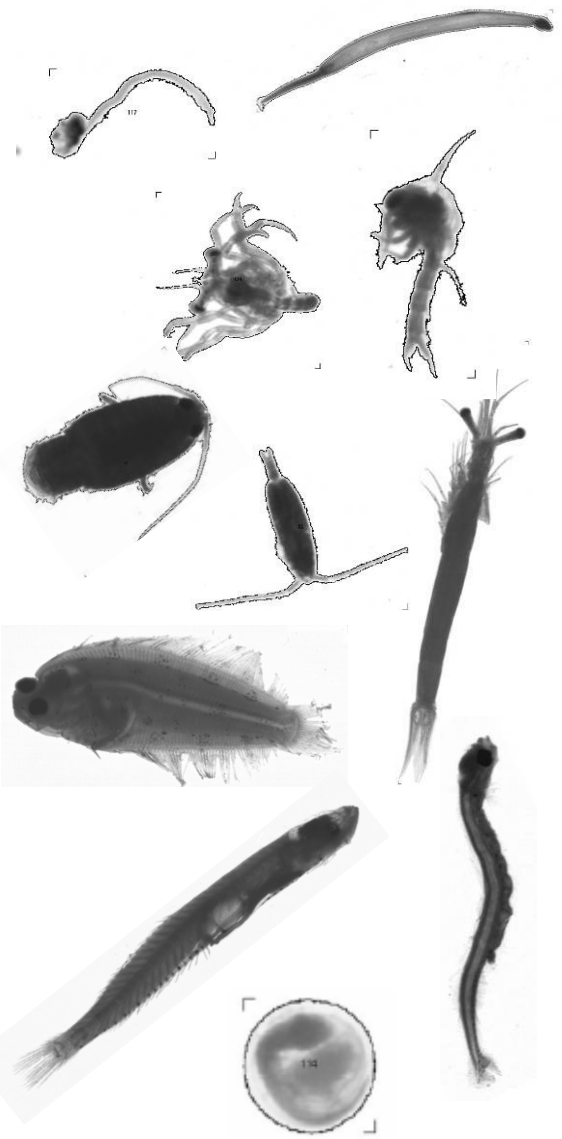
Automated recognition of fish eggs





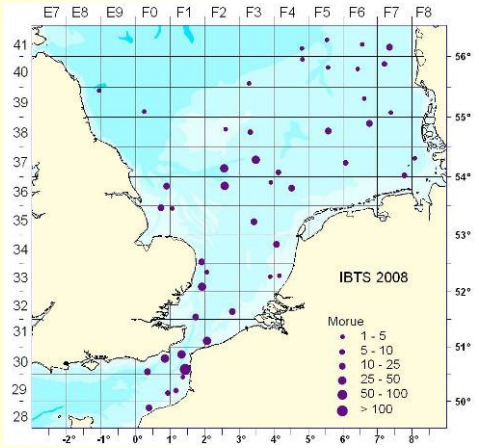
Automated recognition of fish larvae and associated zooplankton





Geostatistics: abundance data mapping

Principle: spatial auto-correlation described by the variogram

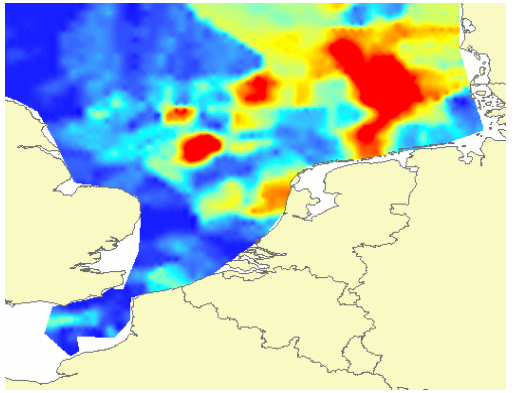


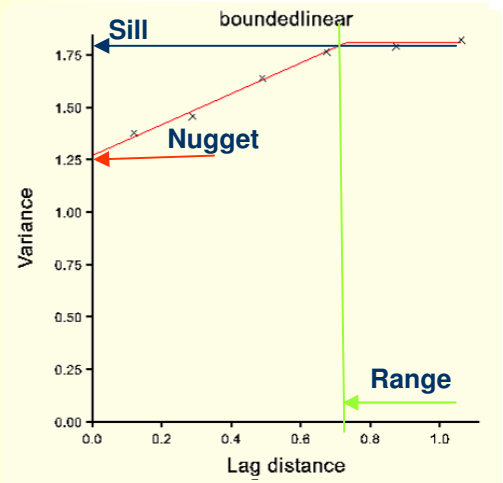
Station information

- Position
- Value

Kriging

Interpolated spatial distribution



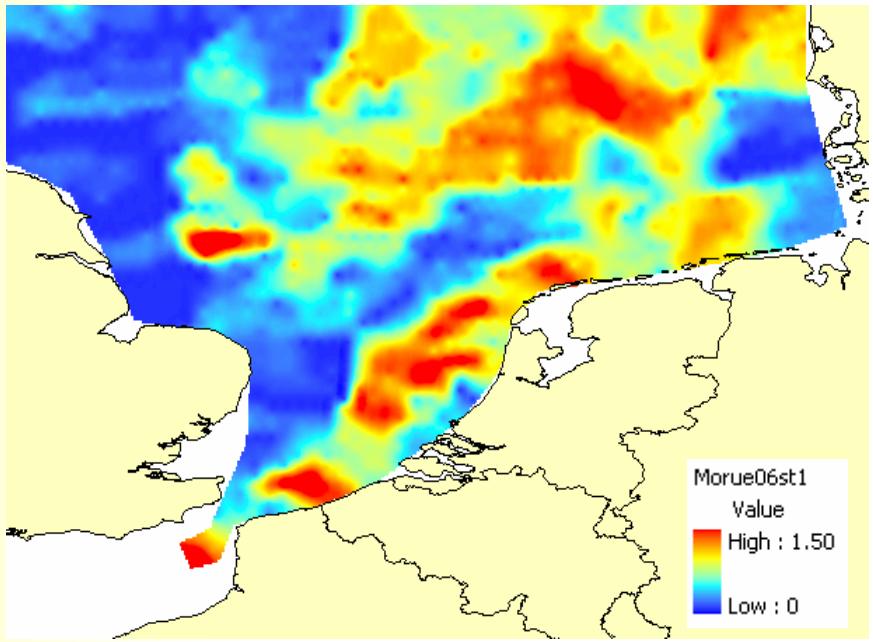


Experimental variogram

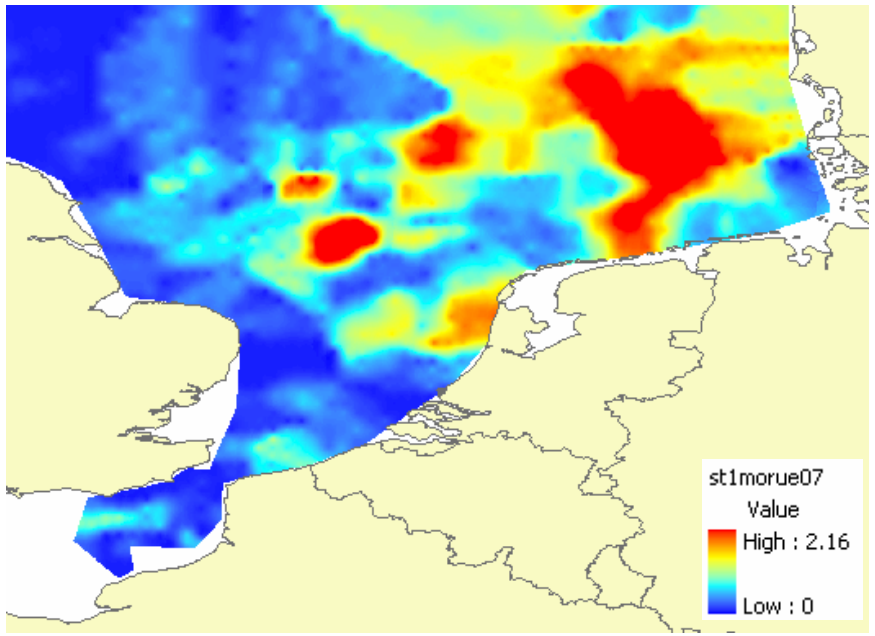
It describes how the abundance varies as the function of the distance

Variogram model Adjustment

Mapping of cod spawning areas



Gadus morhua winter 2006



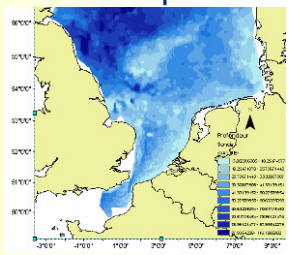
Gadus morhua winter 2007

Modelling ichthyoplankton habitat

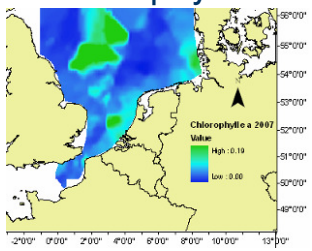
Habitat: set of environmental factors defining the conditions of presence, survival, growth and reproduction of a given species

Describe the taxa – environment relationship

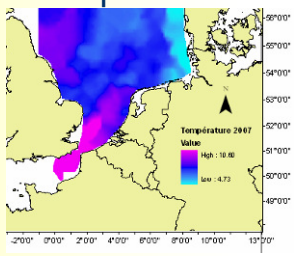
Depth



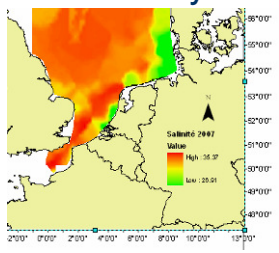
Chlorophyll a



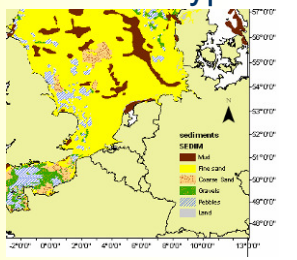
Temperature



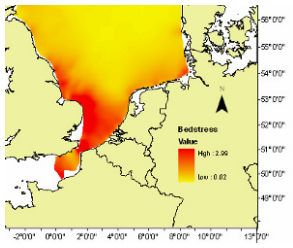
Salinity



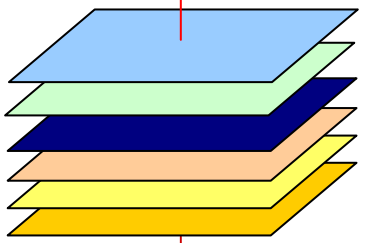
Sediment type



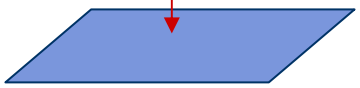
Seabed stress

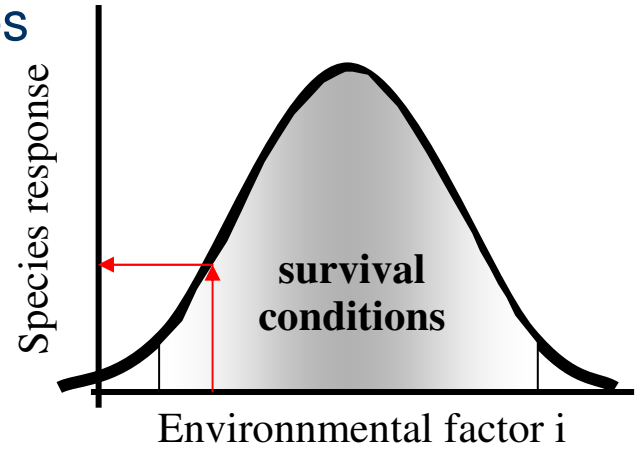


Habitat model



Map the predicted abundances

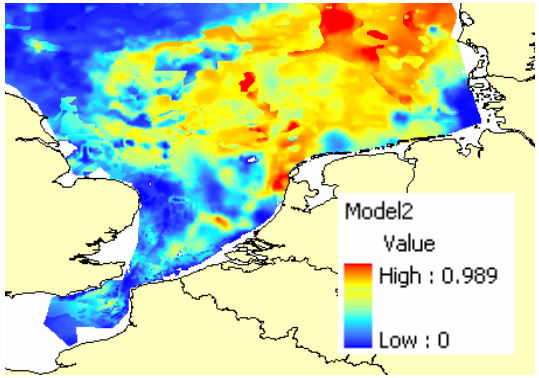




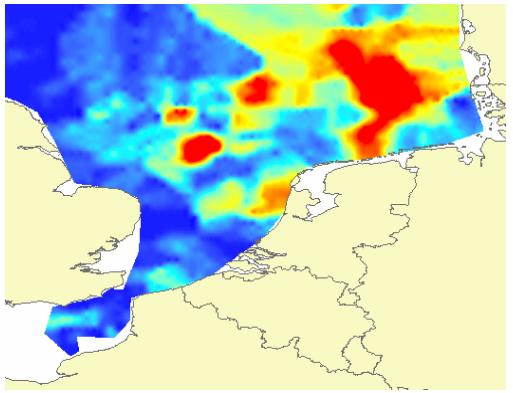
Modelling of Cod spawning habitat

Generalized Linear Model (GLM):
Average response of a species → preferred habitat

Predicted preferred cod spawning habitat

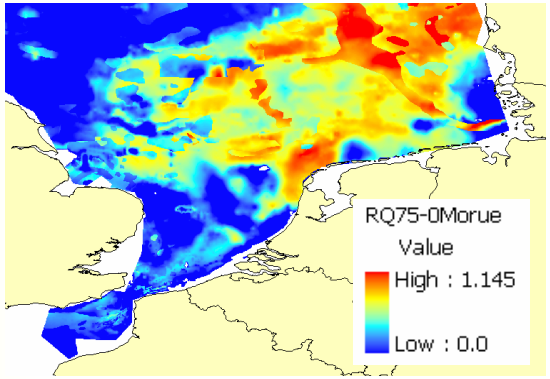


spatial distribution observed (interpolated)



Quantile Regression (QR):
Maximum response of a species → suitable habitat

Predicted optimal cod spawning habitat



Thank You for your attention ☺