

North Sea, Europe

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Problems and tasks:

1. Create a spatial model of the North Sea based on the comprehensive 1991 Ecopath model
2. Compare and fit to spatial data of functional groups
3. Evaluate existing and potential MPAs in the North Sea

The model structure is set to 69 functional groups including
3 marine mammal,
1 bird,
45 fish,
14 invertebrate,
2 microbial,
1 autotrophic,
1 discards and
2 detritus groups.

Data sources: ICES stock assessment reports, International Bottom Trawl Survey, 1991 Year of Stomachs data and literature sources.

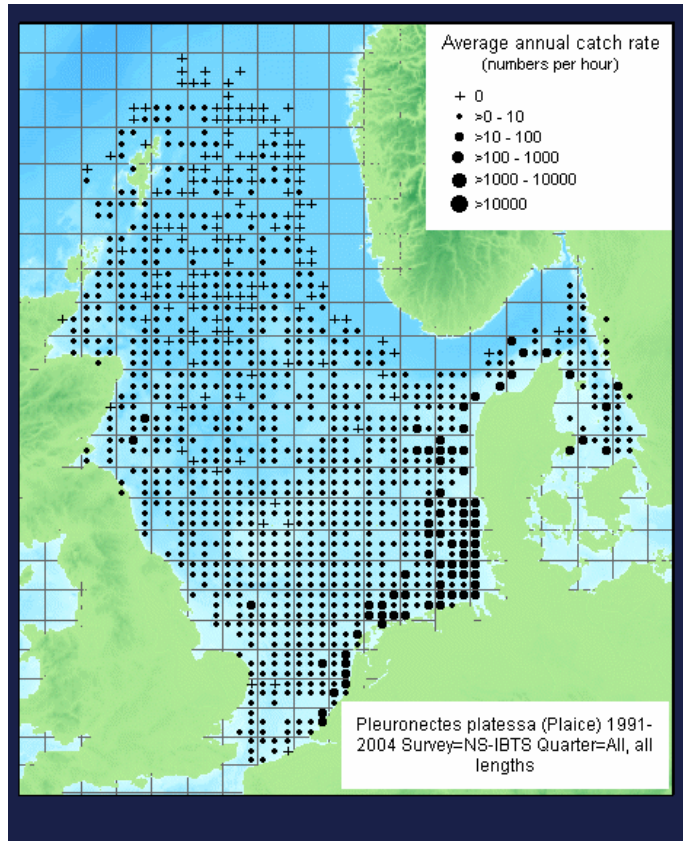
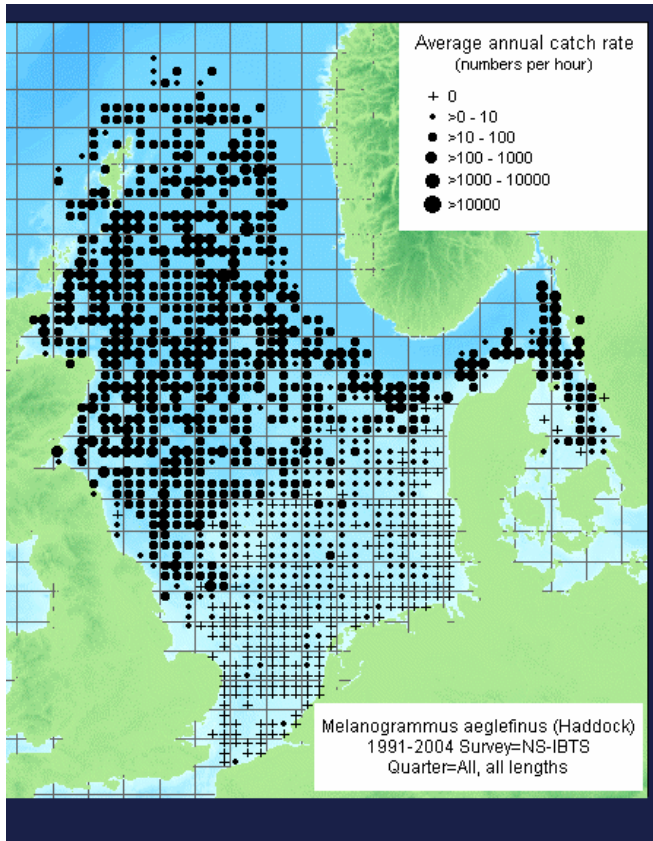
The model also contains information about landings and discards taken with various fishing gears grouped in 12 categories. Data on the landing and discards of 39 different fishing fleets were compiled from the 1991 Scientific Technical Committee for Fisheries data in combination with UK Fishing activity database and Trio Discards database (Cefas).

Fishing gears

Demersal trawl + dem seine
Sandeel trawl
Drift and fised nets
Gears using hooks
Dredges
Pots

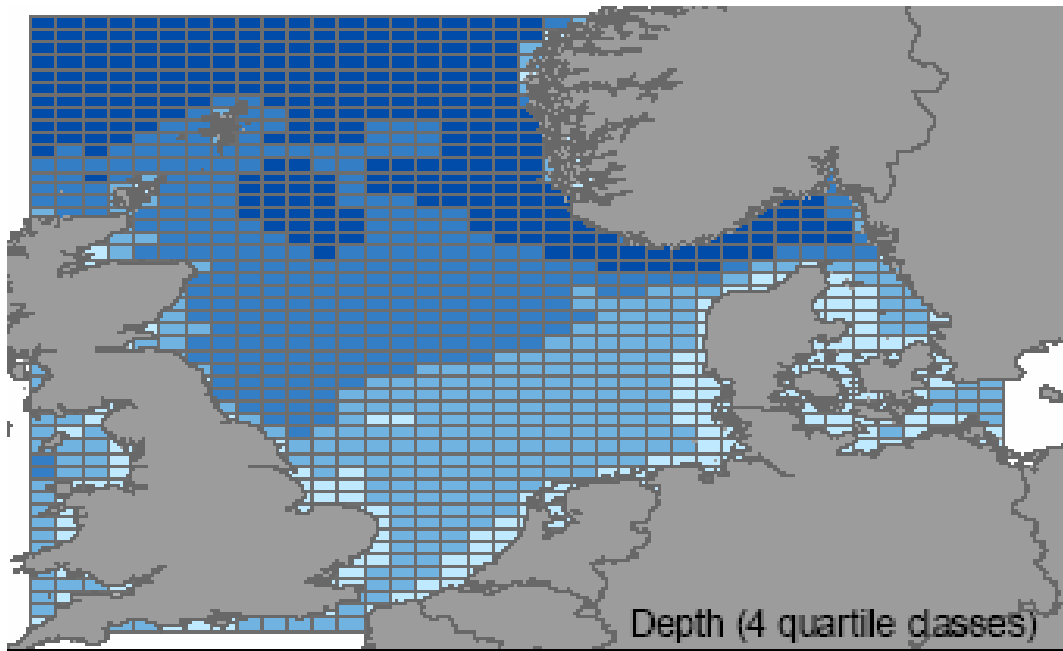
Beam trawl
Pelagic trawl
Nephrops trawl
Shrimp trawlers
Shellfish gear
Others

Tuning data

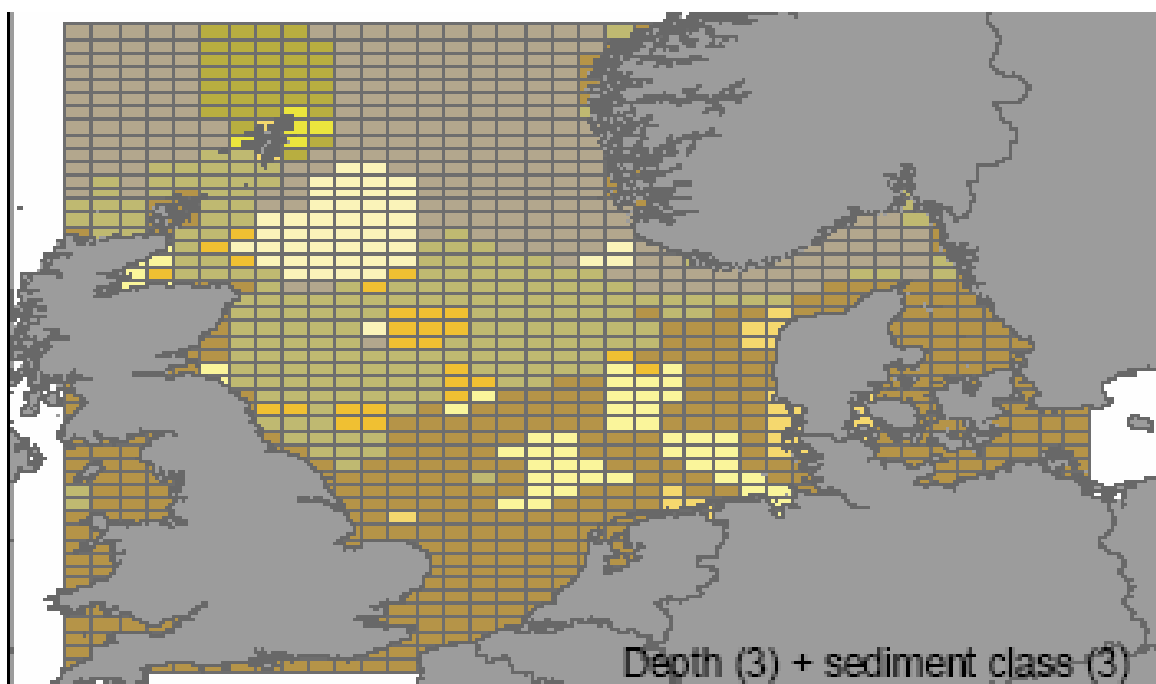


Habitat map

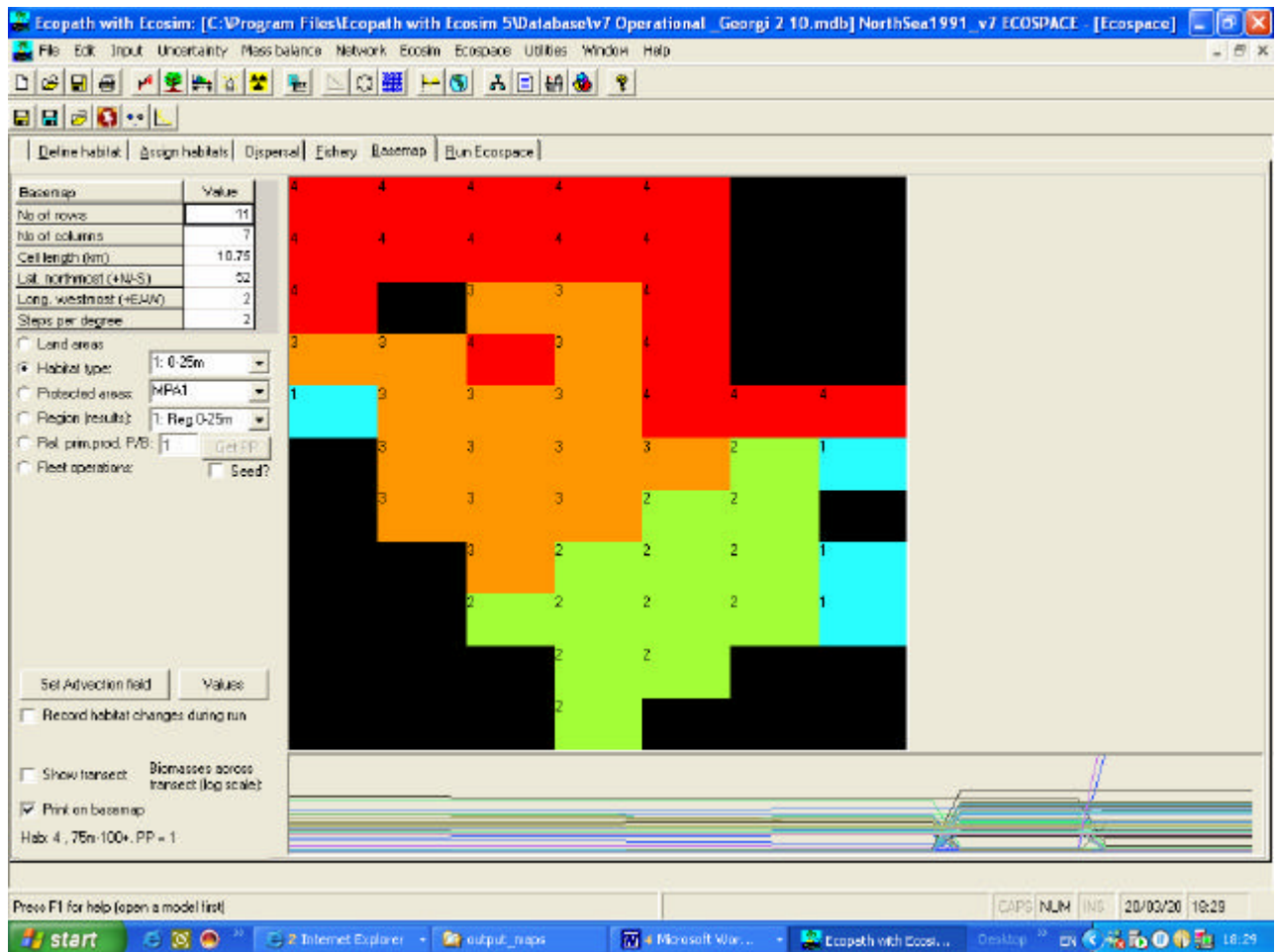
4 habitats are defined by dept: 0-25; 25-50; 50-75; 75+



3 Dept +3 sediment classes



Working version (11x7, 2x2 ICES rectangles, 1 ICES rectangle=1deg long x 0.5deg lat)of habitat map in ECOSPACE

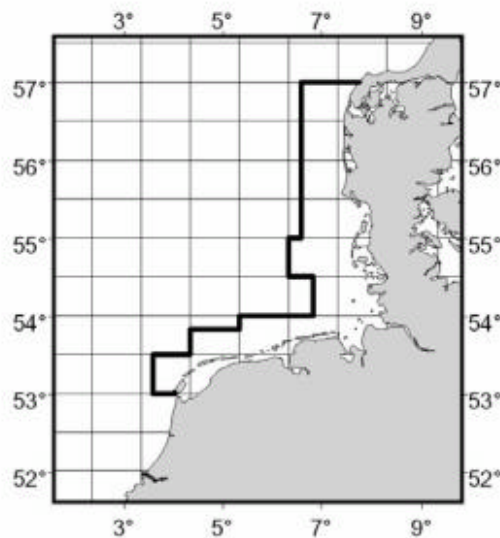


Evaluate existing and potential MPAs in the North Sea

Several large MPA's have been established in the North Sea under the Bergen declaration and under the EU Habitat and Bird directives, many more are planned. In addition various closed "boxes" have been established as a result of European Commission efforts to protect fish stocks under the Common Fishery Policy (CFP).

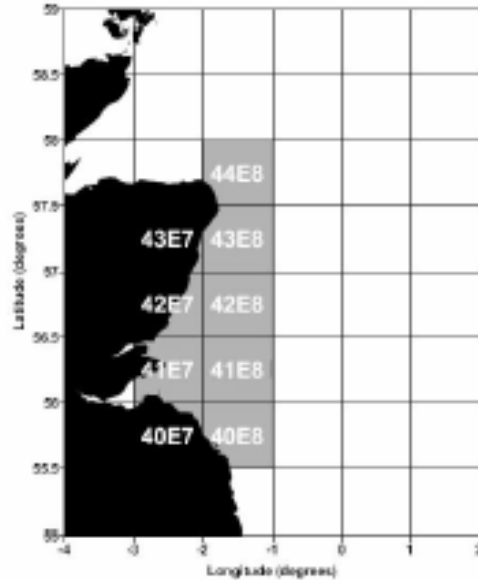
By integrating organism dispersal rates, ecosystem interactions and fishing effort dynamics, ECOSPACE, allows to compare the ecological consequences of different management options, including existing and potential North Sea MPAs.

Partially closed (to certain fishing gears) 'fishery MPAs' will be compared with wholly closed MPAs established for protection of habitats and/or biodiversity. Implications in terms of fishery yield, spatial patterns of fishing effort displacement and impacts on predators, competitors and prey will be considered.



Place box: flatfish nursery area

| | |
|-------------------------|---|
| <i>Name</i> | The Plaice Box |
| <i>Boundary</i> | 0 to ~30 nm offshore (to ~40m deep) from 53°00' to 57°00' and 0-12nm offshore from 51°00' to Hertshals Lighthouse. |
| <i>Established</i> | 1989; current format legislated in 1995 |
| <i>Size</i> | 38,000 km ² |
| <i>Networked</i> | No |
| <i>Habitats</i> | Shallow sand and mud |
| <i>Bathymetry</i> | 0 to ~40m |
| <i>Legislation</i> | EEC Council Regulation No 4193/88 (>12nm offshore) and No. 3094/86 (<12nm offshore) through the Common Fisheries Policy |
| <i>MPA Type</i> | Fisheries management via protection of juvenile flatfish |
| <i>Protection</i> | Vessel, catch and gear restrictions |
| <i>Designation Body</i> | European Union |

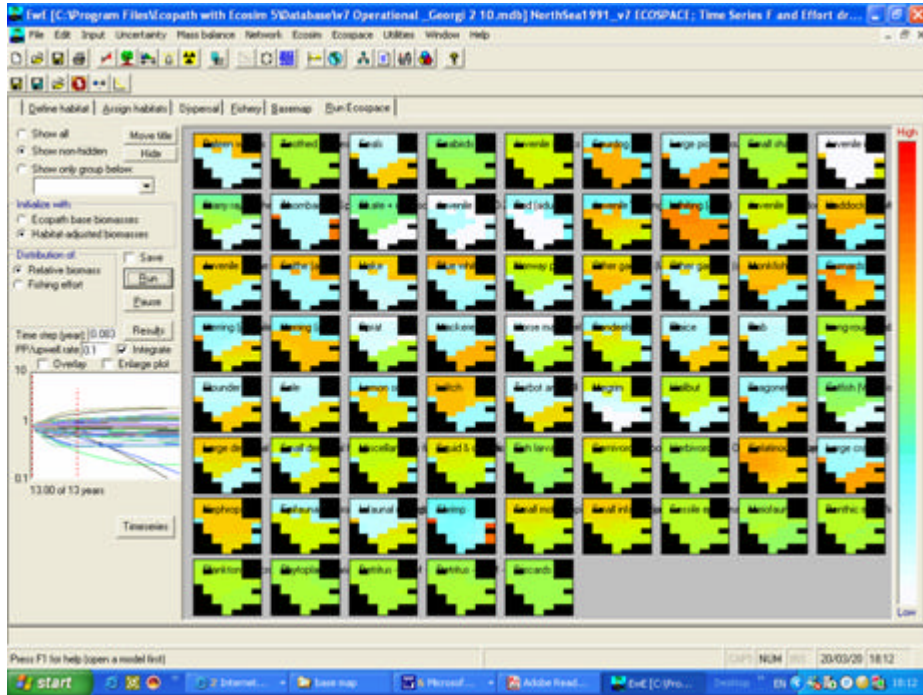


Sandeel box: suitable habitat (sand) for sandeel

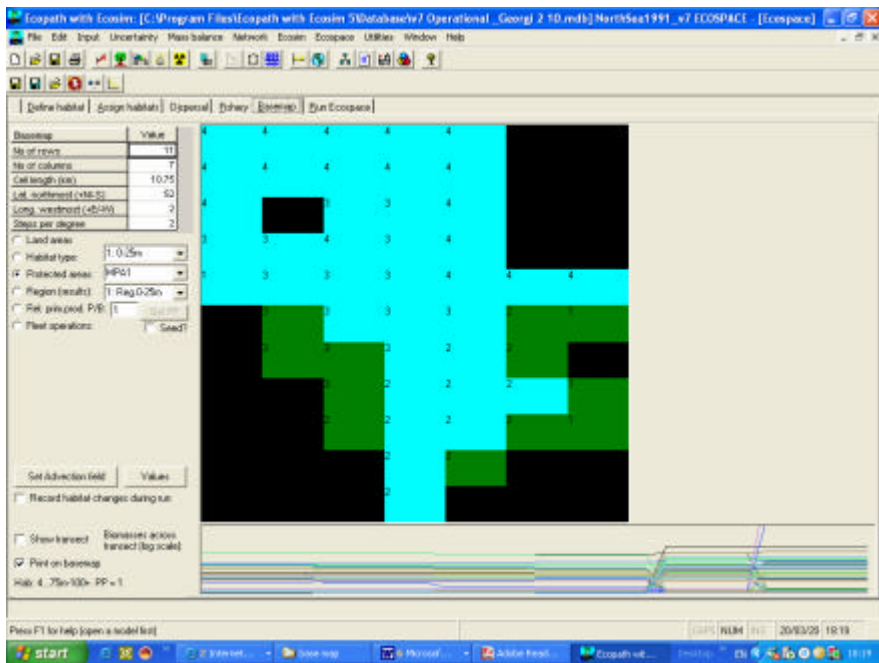
| | |
|-------------------------|--|
| <i>Name</i> | The Sandeel Box |
| <i>Boundary</i> | East coast of England at 55°30'N - 55°30'N, 1°00'W - 58°00'N, 1°00'W - 58°00'N, 2°00'W – east coast of Scotland coast at 2°00'W excluding Firths of Tay and Forth >3°00'W |
| <i>Established</i> | 2000 |
| <i>Size</i> | 18,000 km ² |
| <i>Networked</i> | No |
| <i>Habitats</i> | Shallow sand banks with predominant sand or gravel sediment |
| <i>Bathymetry</i> | To ~70m |
| <i>Legislation</i> | Council Regulation (EC) no 850/98 of 30/031998 March 1998 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms extended duration with No 2287/2003 |
| <i>MPA Type</i> | Fisheries management and Seabird Conservation via elimination of industrial fisheries |
| <i>Protection</i> | Exclusion of industrial fishery vessels |
| <i>Designation Body</i> | European Union |

Some results

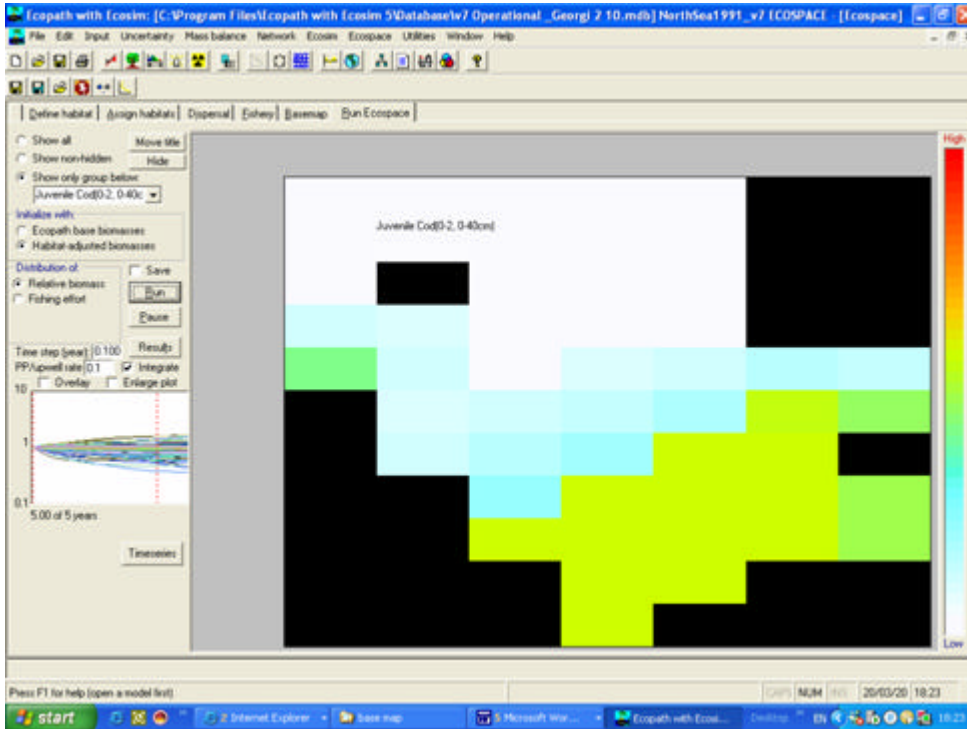
Cod is very sensitive to trophic interactions and overlap with predators



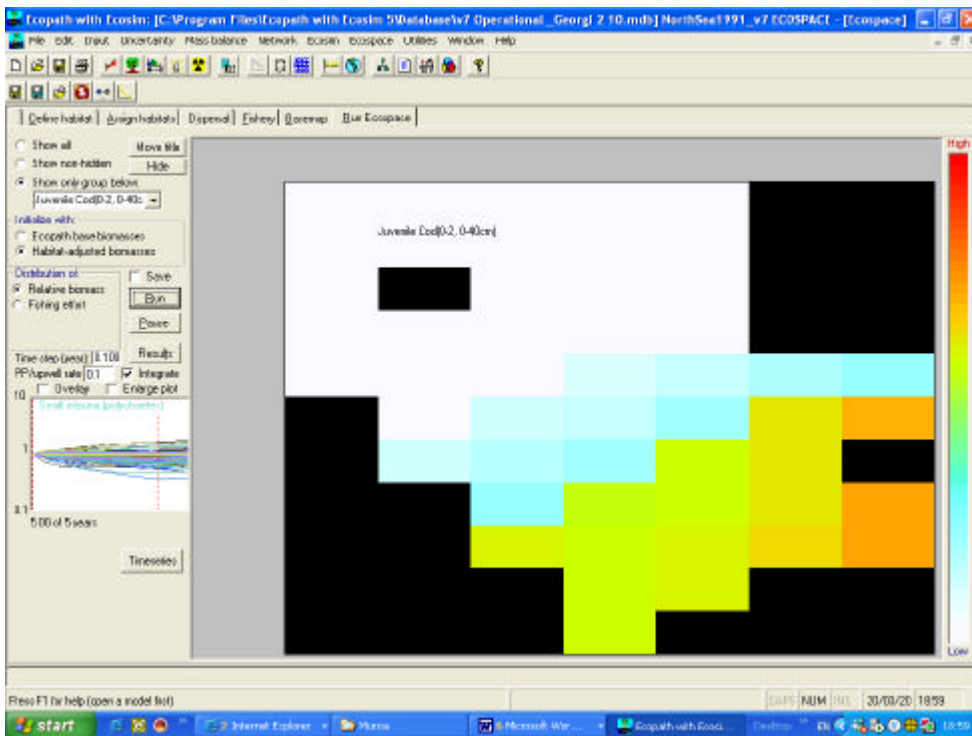
Modelling experiment with closed areas: **No fishing**



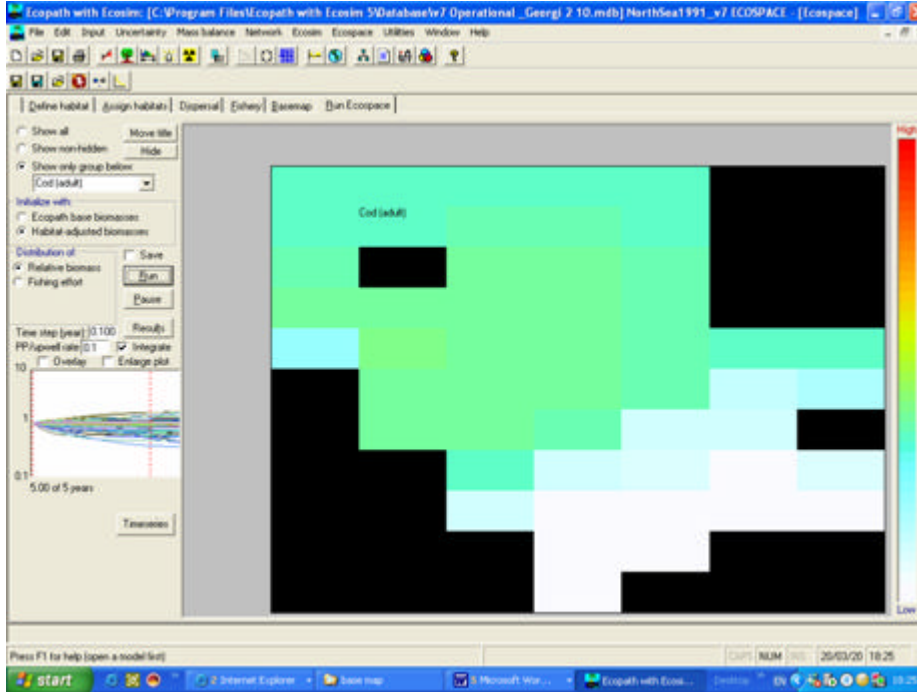
BEFORE CLOSURE: JUVENILE COD



After closure: Juvenile cod



BEFORE CLOSURE: ADULT COD



AFTER CLOSURE: ADULT COD

