

Learning Lab

DORY | IOF | DISPLACE MODEL

Split | 19 July 2019

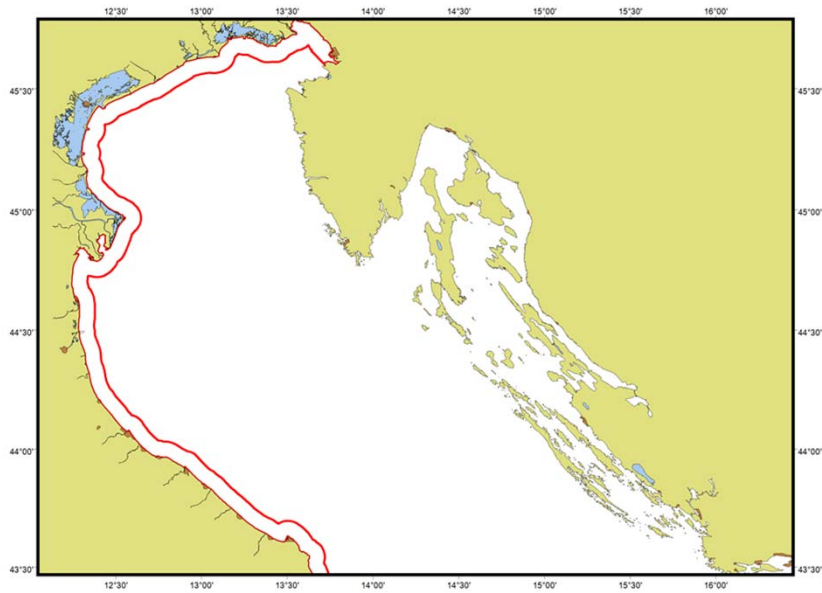
Description of the bio-economic model DISPLACE

- The aim of WP3 is developing a research and advisory platform to transform fishermen's detailed knowledge and micro-decision-making into simulation and management evaluation tools.
- DISPLACE is an agent-based simulation model developed to fisheries, habitat conservation, maritime spatial planning and management issues, especially from the perspective of the fisheries.
- The model integrates process-based mechanistic relationships that should give the advantage of being able to better predict in novel conditions and incorporate the spatial and temporal details.
- DISPLACE models fleet/skipper decision facing changing catch rates and limited by fisheries management including quotas or effort harvest control rule (overall capacity reduction, limits in days at sea, temporal spatial closure to fisheries) embedded in multi-annual management plans in a CFP context (i.e. FMSY).
- A particular feature of the approach is to model processes at the spatial (2×2 km) and the time scale (hourly time steps) closer to the spatial and time dynamics occurring in human decision-making and fish populations dynamics.

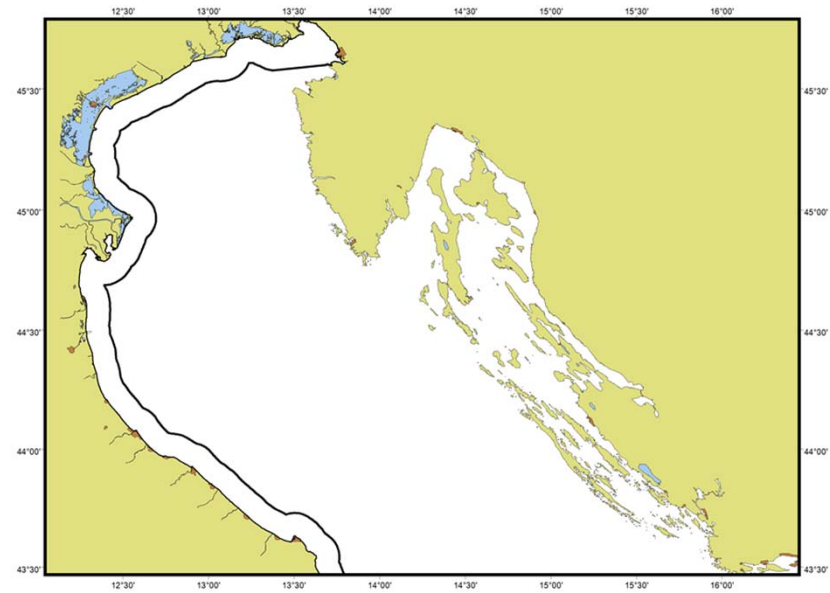
Input parameters

- Fleet dynamics
 - AIS and spatial distribution modeling data
 - In total, 797 “agent” vessels were simulated, comprising 351 set netters, 432 otter trawlers, and 19 rapido trawlers.
- Stock dynamics
 - Spatial population dynamics of six important commercial species – Scientific surveys
 - Fish body size-population structure
 - Abundance and spatial distribution
- Benthic habitats
- Fleet economy
 - Fish prices per marketable category
 - Vessel operating costs
- Management and population scenarios
 - The effects of several spatial management scenarios were analyzed

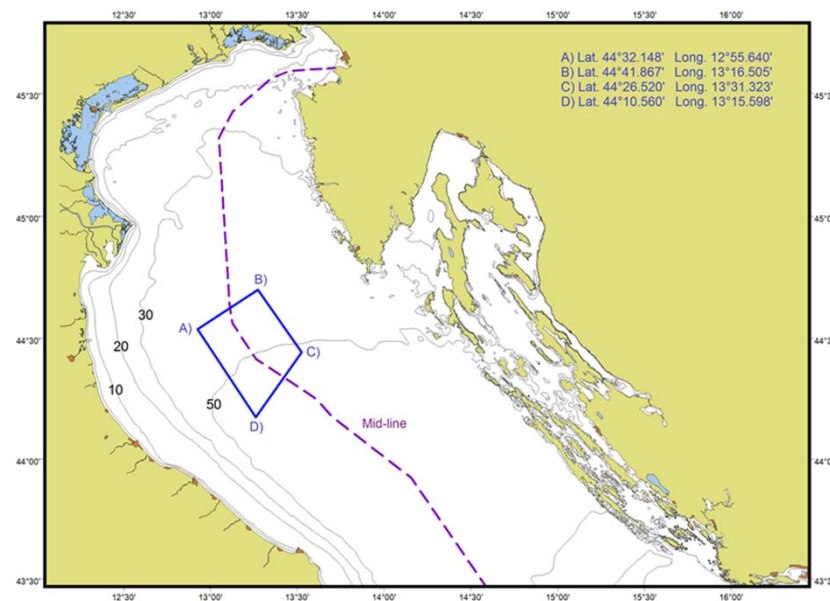
- The scenarios tested referred to:
 - scebaseline – it is the baseline scenario (*status quo*), considering recent fisheries regulation routes in Italy, Croatia and Slovenia.
 - sceallyear4nm - The 4-nm trawling ban along the Italian coasts (GSA17), which is supposed to reduce fishing pressure on this vulnerable area; it represents one of the most relevant nursery area for many species, especially for common sole and cuttlefish;
 - sceallyear6nm - The 6-nm trawling ban along the Italian coasts (GSA17), which is supposed to reduce fishing pressure on this vulnerable area; it represents one of the most relevant nursery area for many species, especially for common sole and cuttlefish.
 - scesolesanctuary - a permanent closure of the “sole sanctuary” area for bottom otter and rapido/rampon trawlers (both Italian and Croatian fleets). Again, the closure of this area highlights the importance of reducing the fishing pressure on vulnerable areas (e.g., spawning areas) that are considered of biological interests for commercial species.
 - scesoleselectivity - Increase the selectivity of gillnet through the adoption of a 72mm stretched mesh size and increase of the common sole minimum landing size to 25 cm TL (the current one is 20 cm TL);



Map showing the 4-nm buffer along the Italian coast



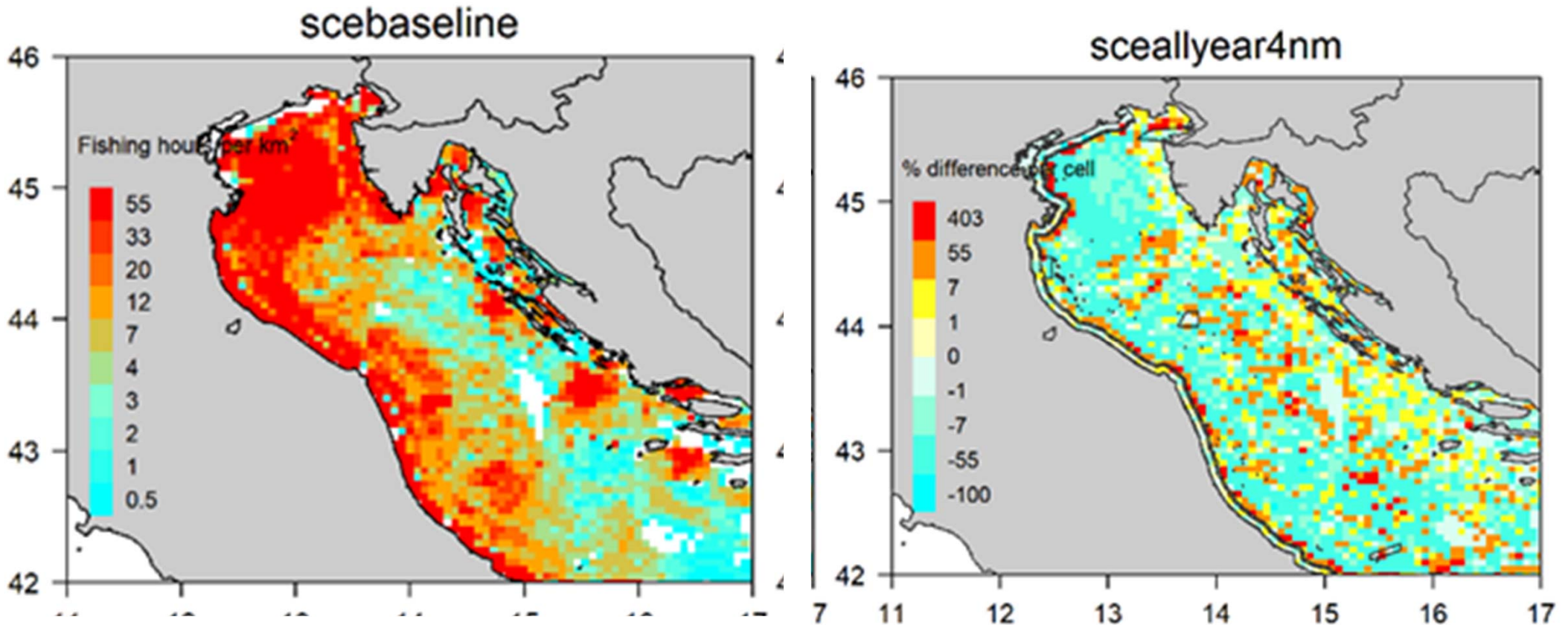
Map showing the 6-nm buffer along the Italian coast



Map of the "sole sanctuary"

Results

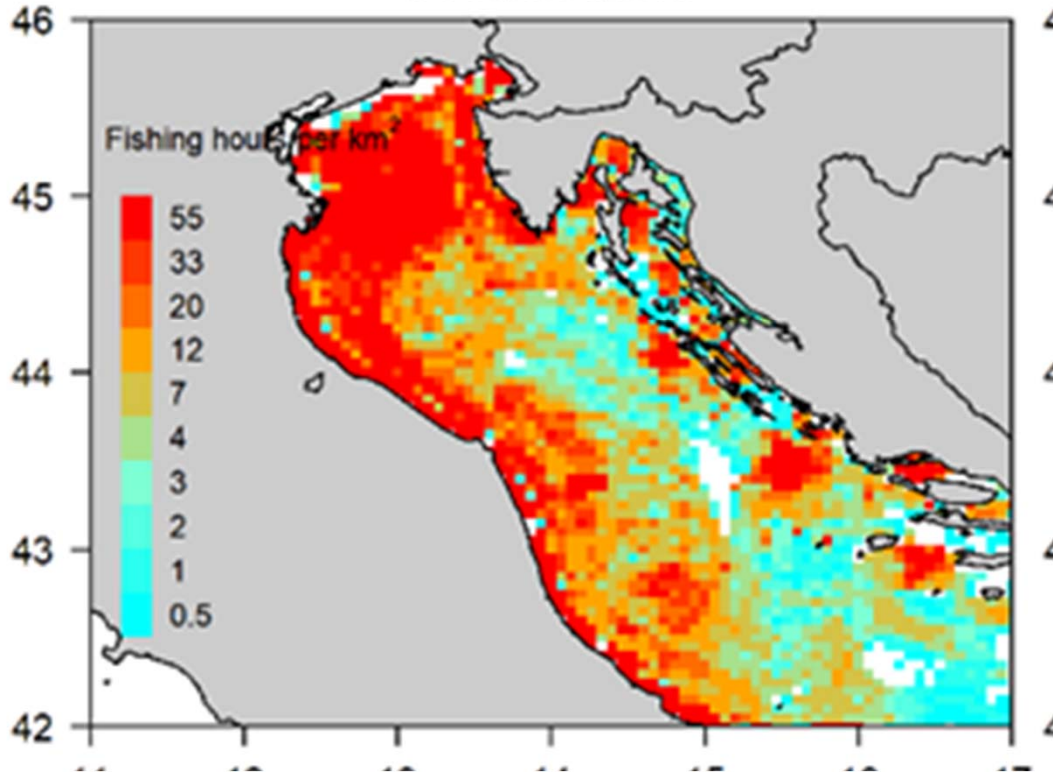
Fishing effort redistribution



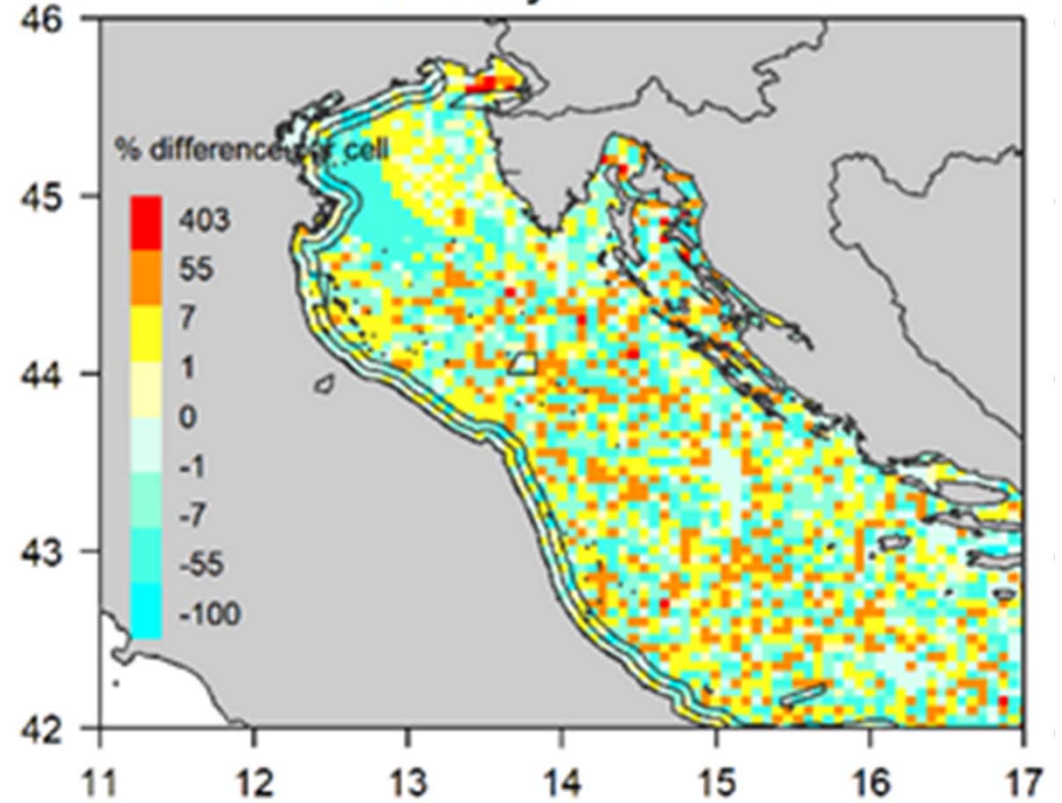
The baseline scenario highlights that the highest fishing pressure concentrate in the northern and western parts of the GSA17, with peaks of 55 fishing hours/year per km² (all gears combined).

The 4-nm ban would mostly increase the fishing effort along the external border of this buffer and, with less extent, also to the fishing grounds located more offshore.

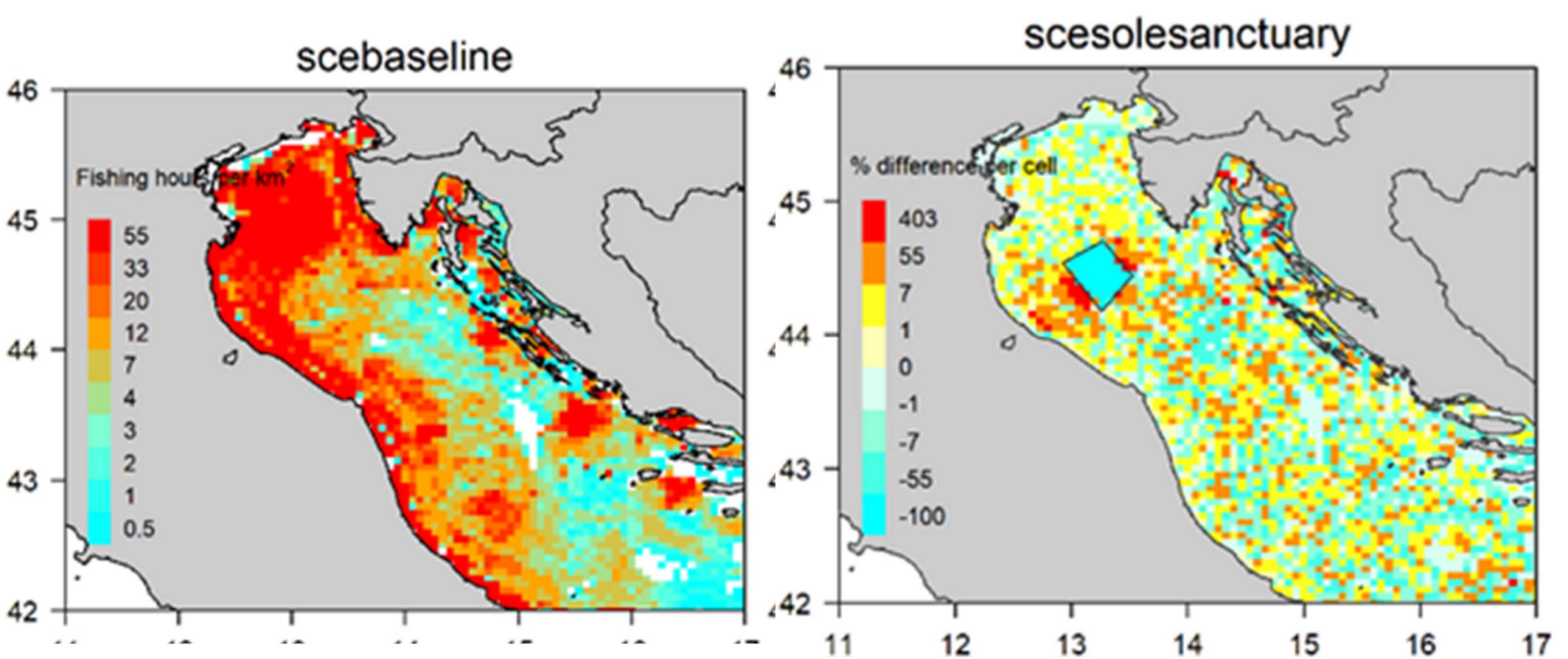
scebaseline



sceallyear6nm

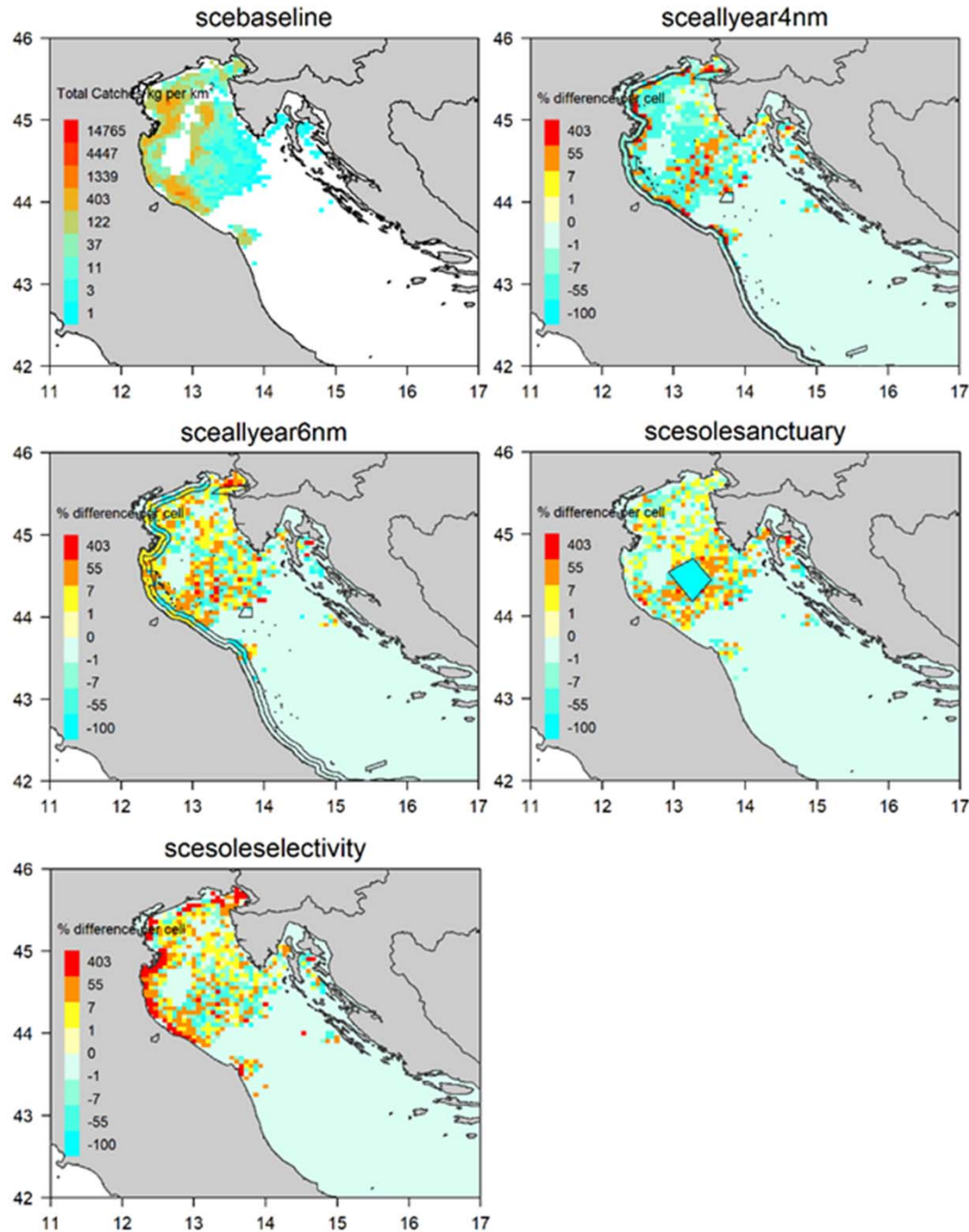


The 6-nm limit for trawlers would have the effect of pushing the vessels more offshore (outside the 12 nm), discouraging the exploitation of more coastal fishing areas.



The “sole sanctuary” would concentrate the fishing effort in the proximity of the FRA, but mostly in fishing grounds located close to Italy and Croatia. As a consequence, the highest concentrations of the fishing pressure would be expected in the surroundings of the sanctuary, with two hotspots in correspondance with the Italian and Croatian sides, South-West and North-East, respectively. The scenario “sole selectivity” would generate a slight increase of the fishing pressure only offshore.

Catches of common Sole



The likely distribution of common sole catches as the effect of the four scenarios tested with DISPLACE.

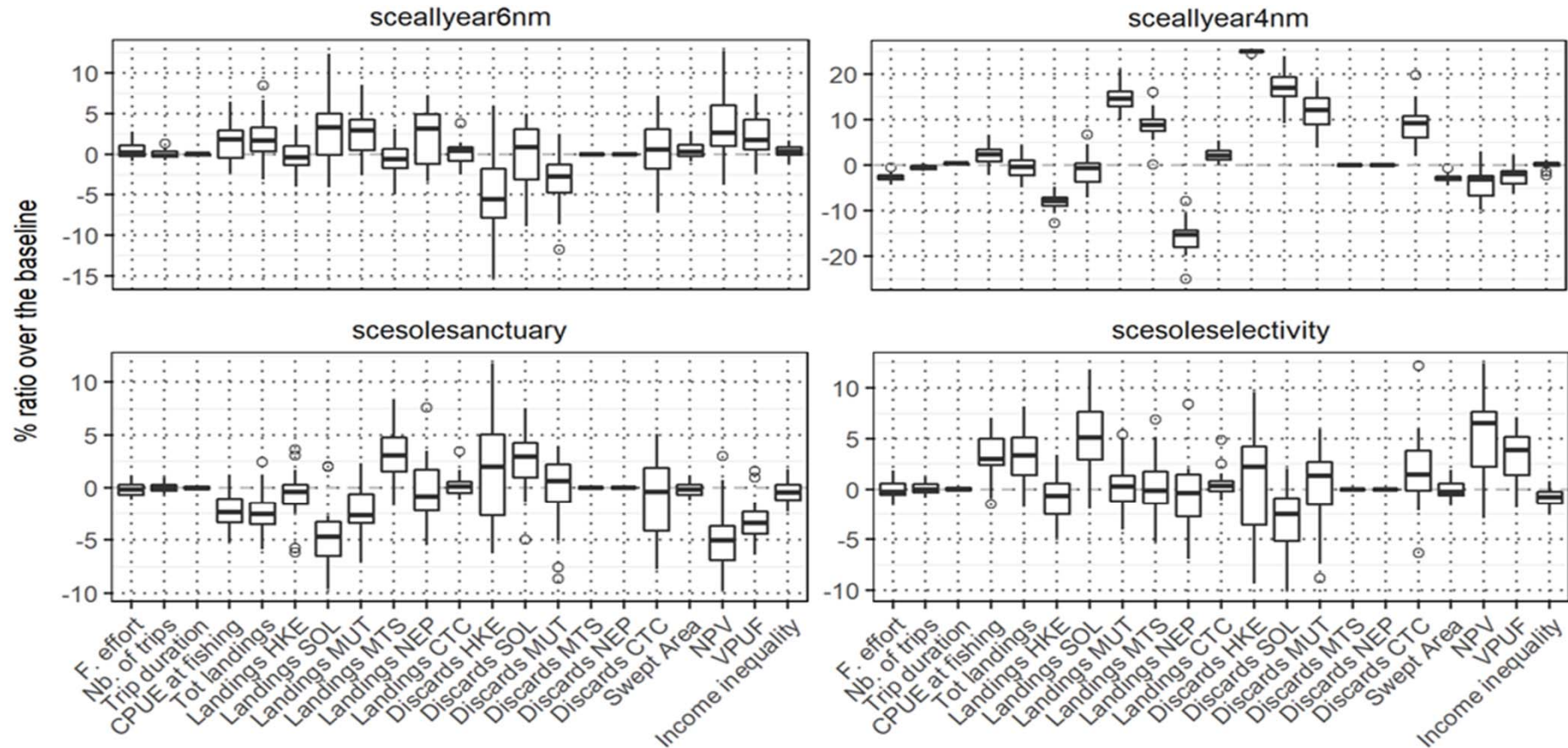
The closure of the 4 and 6-nm would slightly increase the sole catches along the buffer zones and more consistently in the central portion of the basin, where larger specimens concentrate.

The “sole sanctuary” would slightly increase sole catches only in the surroundings of the buffer area in the directions North-East, South-East and South-West.

The scenario concerning the sole selectivity would produce a general increase of sole catches, which would be more evident along the Italian coast, thanks to both the higher selectivity of gillnets used inside the nursery areas of this species, and to the larger MLS.

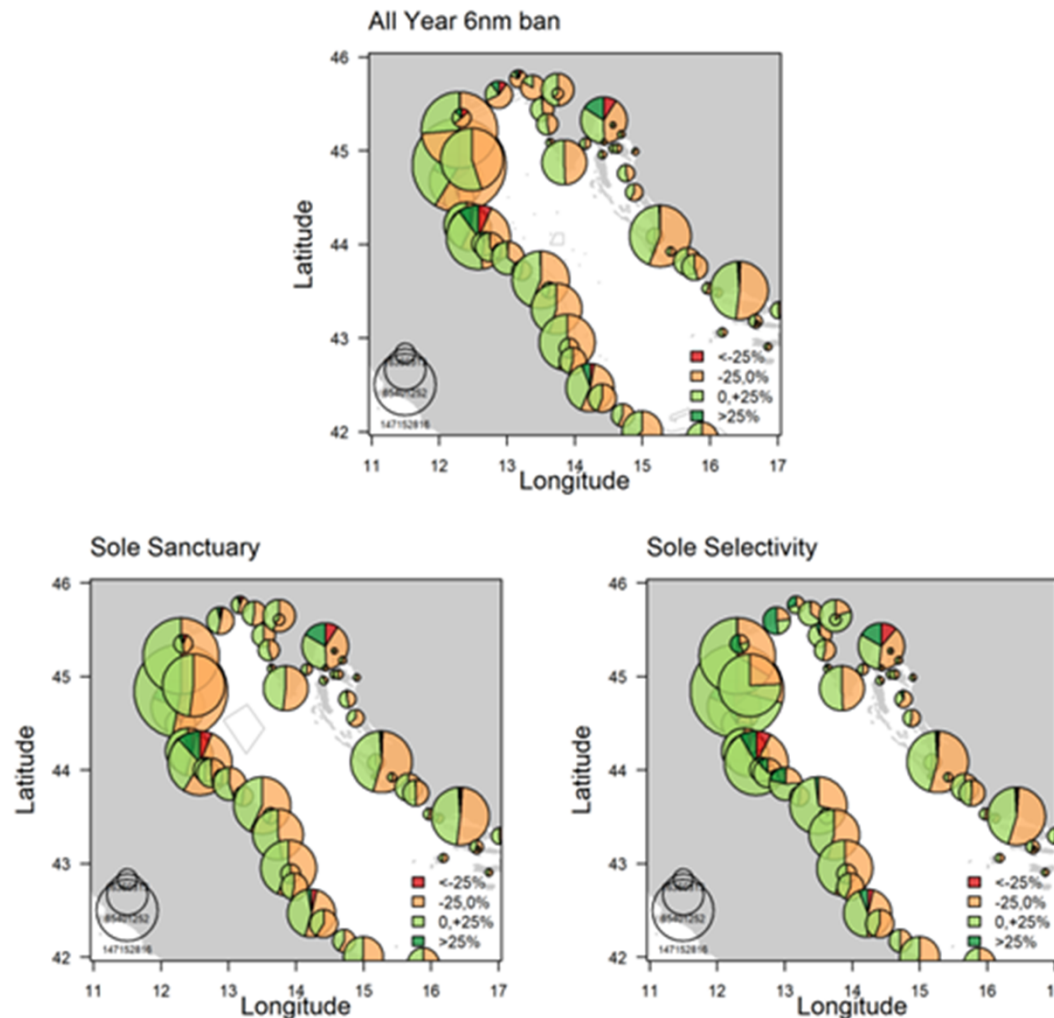
Indicators

- The biological and economic indicators for bottom rapido trawlers calculated by DISPLACE for the four scenarios



The closure of the 6-nm would slightly increase common sole landings, as well as Catch Per Unit Effort (CPUE) and total landings. This is an interesting result confirming the importance of preserving nursery areas from impacting fishing gears, as the rapido. The closure of the “sole sanctuary” to rapido trawlers would decrease sole landings and increase sole discards, as the vessels would concentrate more fishing effort on coastal fishing grounds, which are characterised by the presence of smaller specimens. The scenario “sole selectivity” shows worthy results for this species increasing the landings (+5%) and decreasing the discard rates (-2.5%).

Income inequality between Italian and Croatian fishing harbors for the revenues of all the species combined.



- The 6-nm ban and the “sole sanctuary” will affect in a similar way the fishing harbors of both countries. The “sole selectivity” scenario will favor mostly the fleets operating in the north-western Adriatic Sea, as a result of the nursery grounds protection for many species.