Recent changes in stock conditions and mixing on sustainability and economic viability of the fishery - The Danish Baltic cod fisheries

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Thank you!

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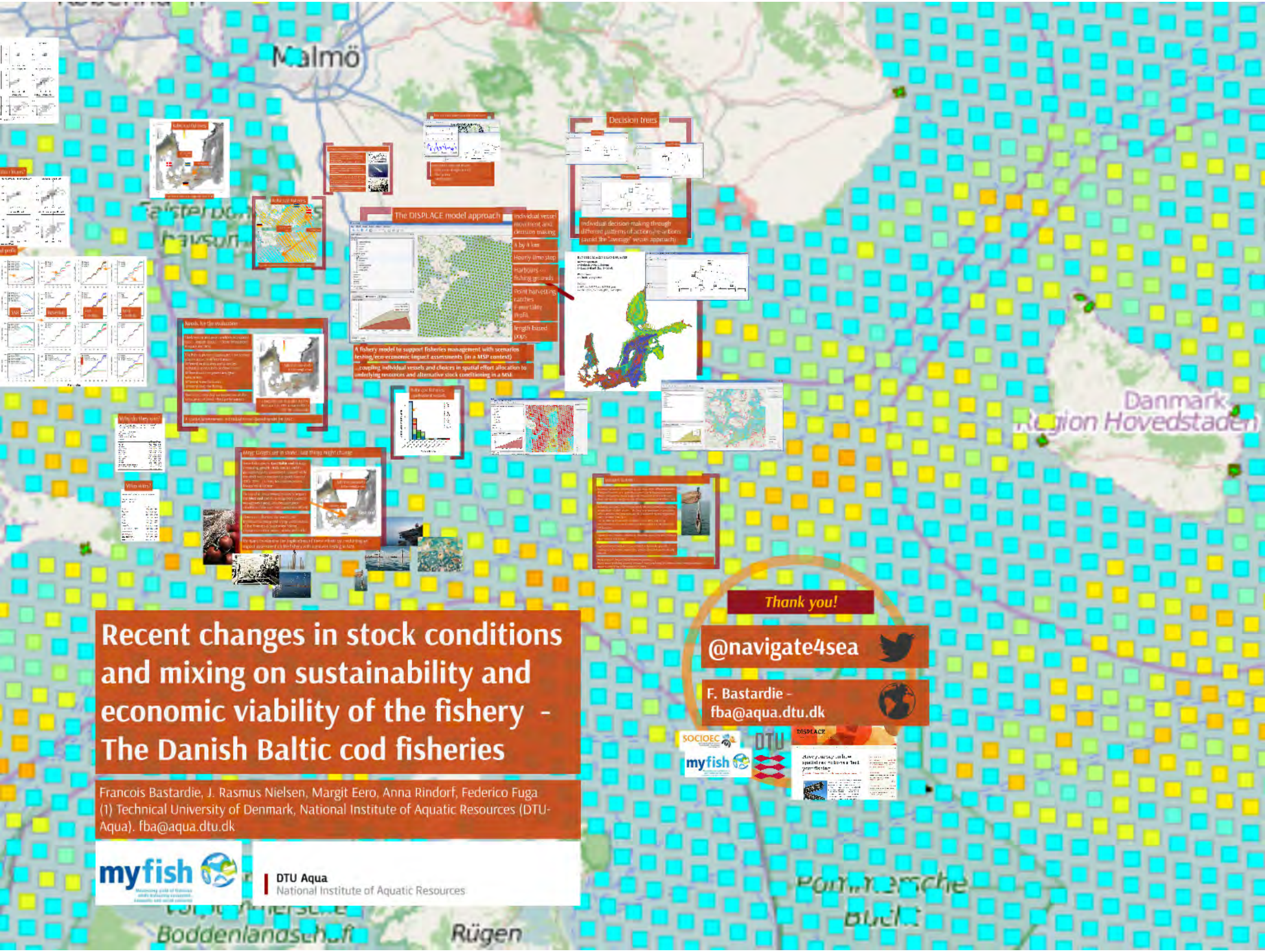
F. Bastardie - fba@aqua.dtu.dk



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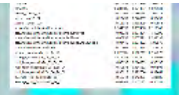

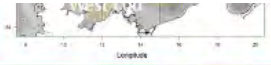

of the fisheries at stake when fishing displaces to other areas / stocks and back?

We want to examine the implications of these effects by conducting an impact assessment on the fishery with scenarios testing in MSE

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Maximising yield of fisheries while balancing ecosystem,

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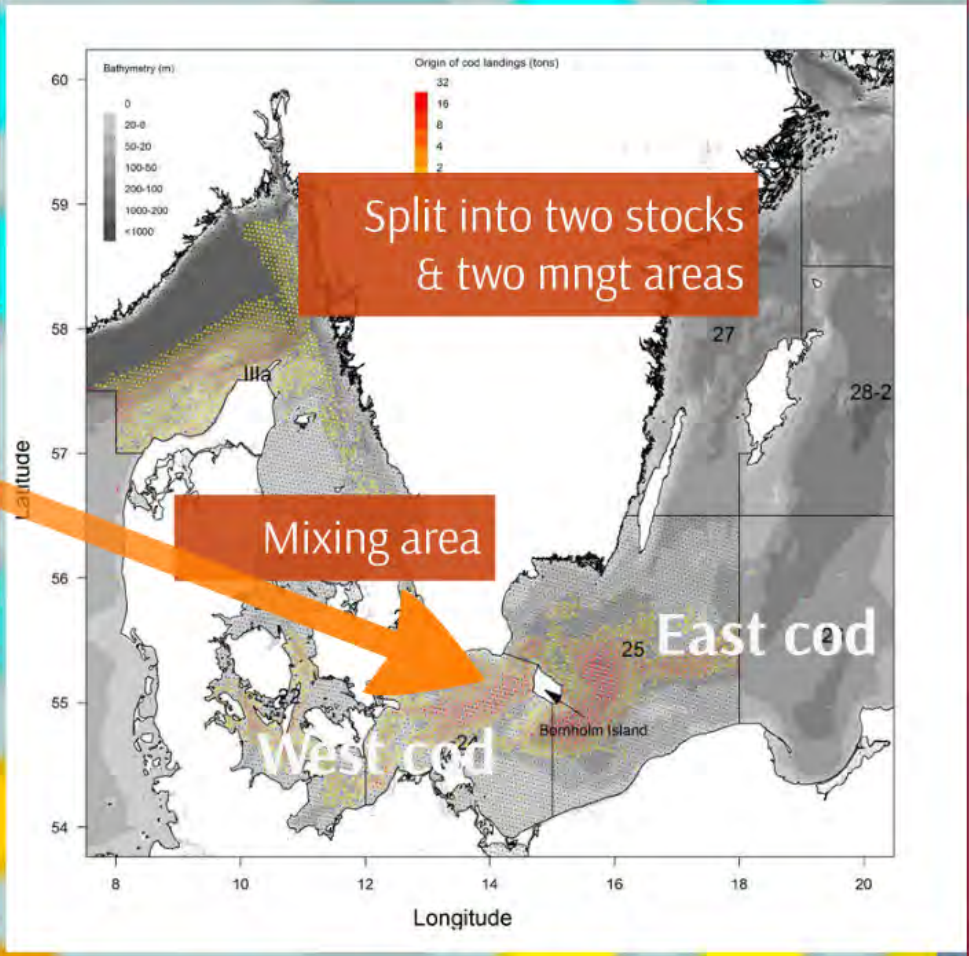
Mngt targets set in stone…but things might change

Recent changes in **East Baltic cod** biology (impacting growth, stock status) and its perception (2015 assessment rejected while the stock was considered in good shape in 2013- 2014…) is likely to create economic losses/redistribution

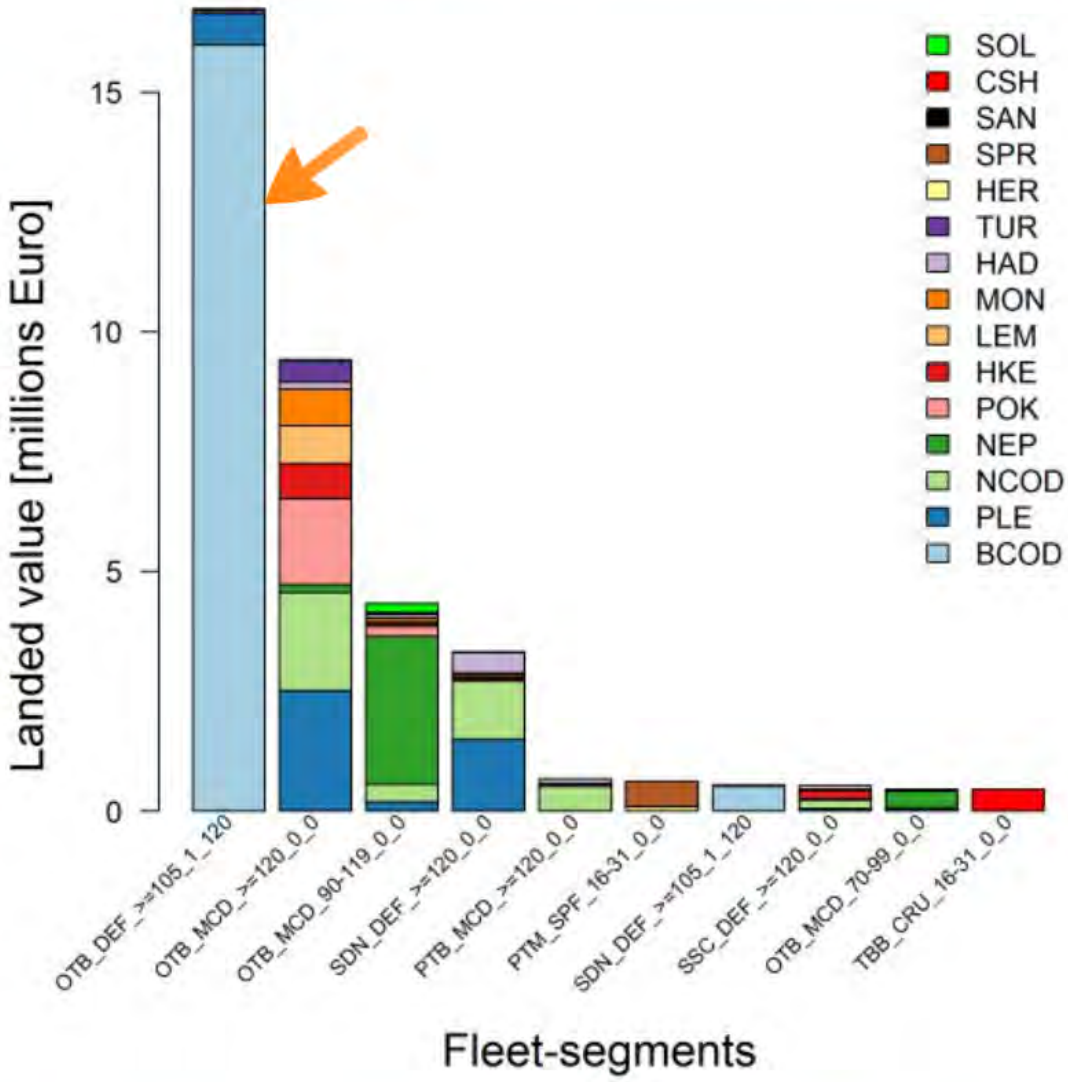
On top of it, stock mixing is likely to impact the **West cod** and its management (western management area), also because poor condition of the East cod (cumulative effect)

How is this affecting the overall and individual economy and energy performance of the fisheries at stake when fishing displaces to other areas / stocks and back?



We want to examine the implications of these effects by conducting an impact assessment on the fishery with scenarios testing in MSE

Baltic cod fisheries
= polyvalent vessels

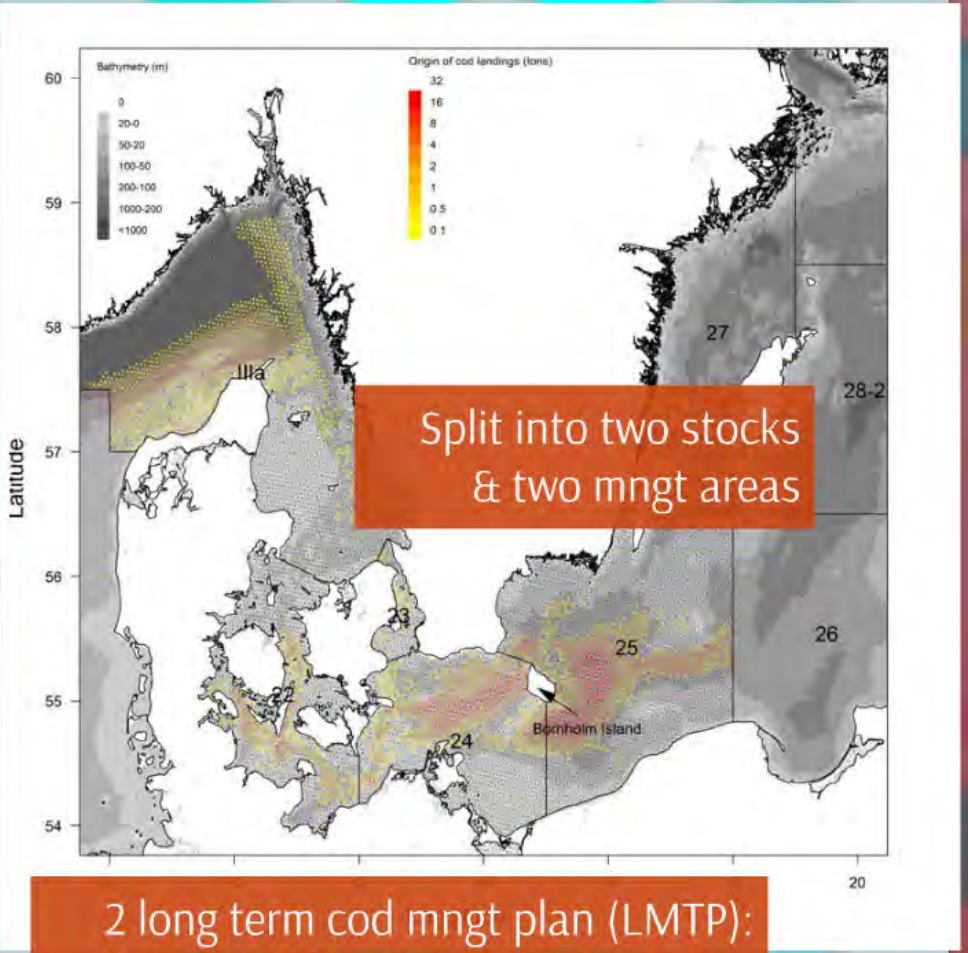


Needs for the evaluation

Stock mixing and poor condition is a spatial issue... require stocks <-> fleets interactions in space and time

The fishing pressure aggregates from various players active in different areas:
Different motivations and priorities
Individual quotas incl. on other stocks
Different catching power and gear selectivities
Different home harbours
Different costs for fishing

Overall vs. individual consequences on the trajectories of stock - fleet performances

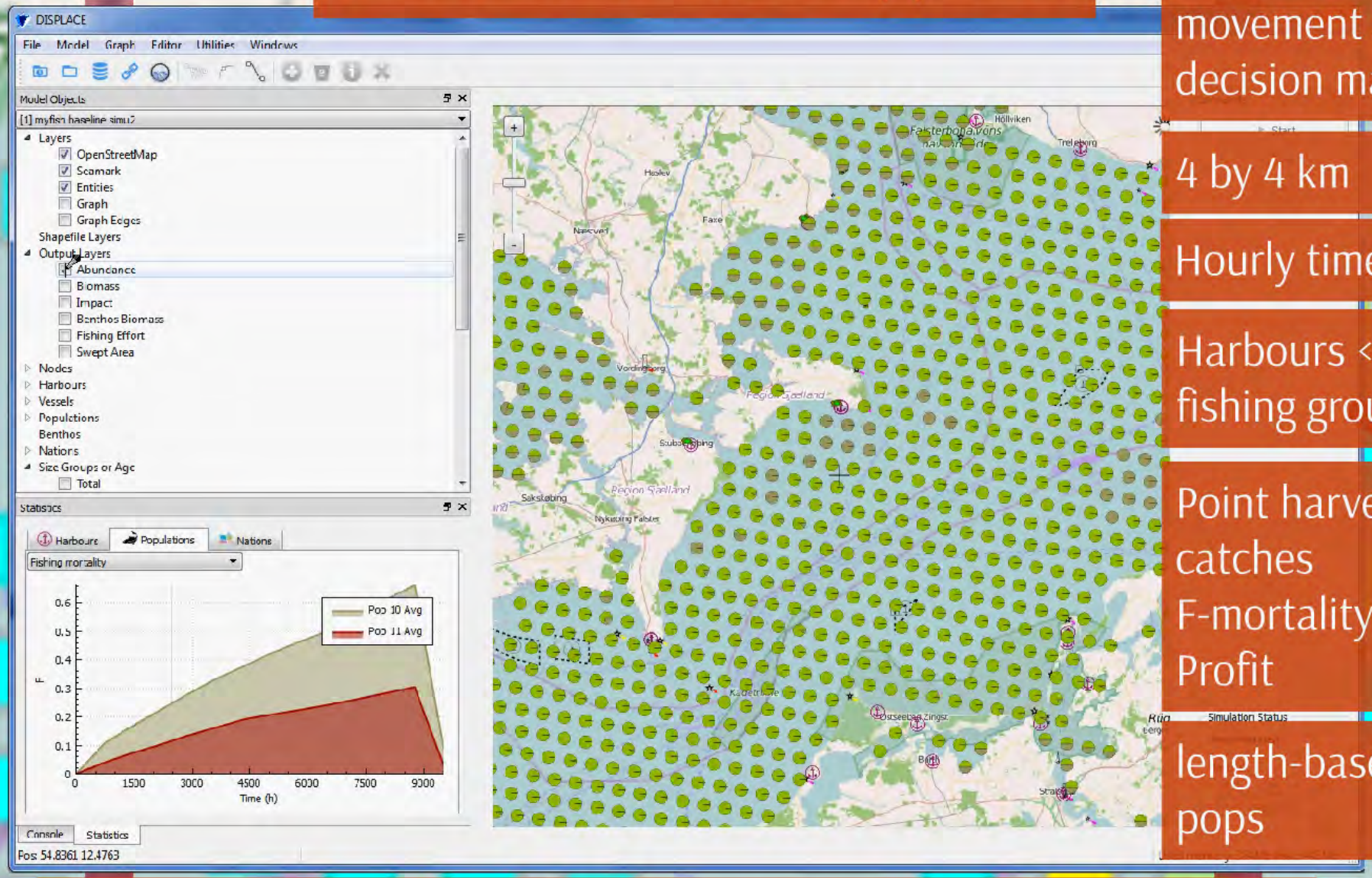


Split into two stocks & two mngt areas

2 long term cod mngt plan (LMTP): decrease F by 10% a year to MSY + 15% TAC comstraints

A spatial bioeconomic individual vessel-based model for MSE

The DISPLACE model approach



Individual vessel movement and decision making

4 by 4 km

Hourly time step

Harbours <-> fishing grounds

Point harvesting
catches
F-mortality
Profit

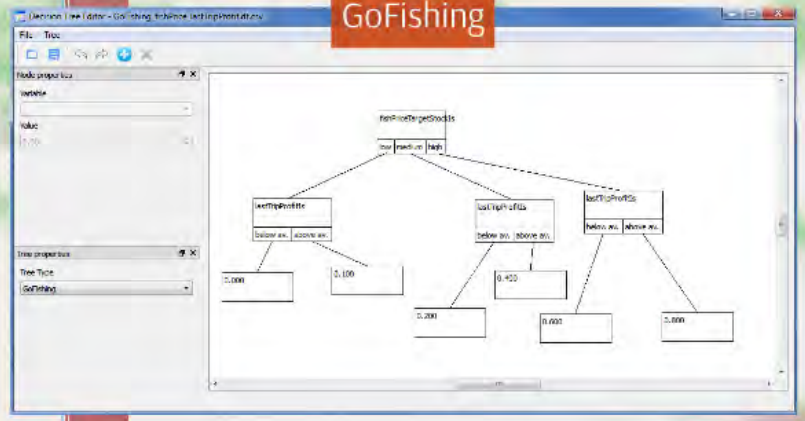
length-based pops

A fishery model to support fisheries management with scenarios testing/eco-economic impact assessments (in a MSP context)

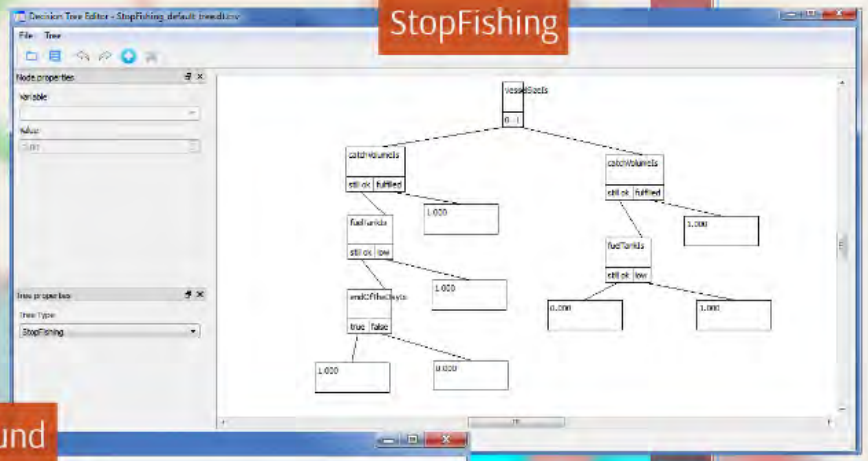
...coupling individual vessels and choices in spatial effort allocation to underlying resources and alternative stock conditioning in a MSE

Decision trees

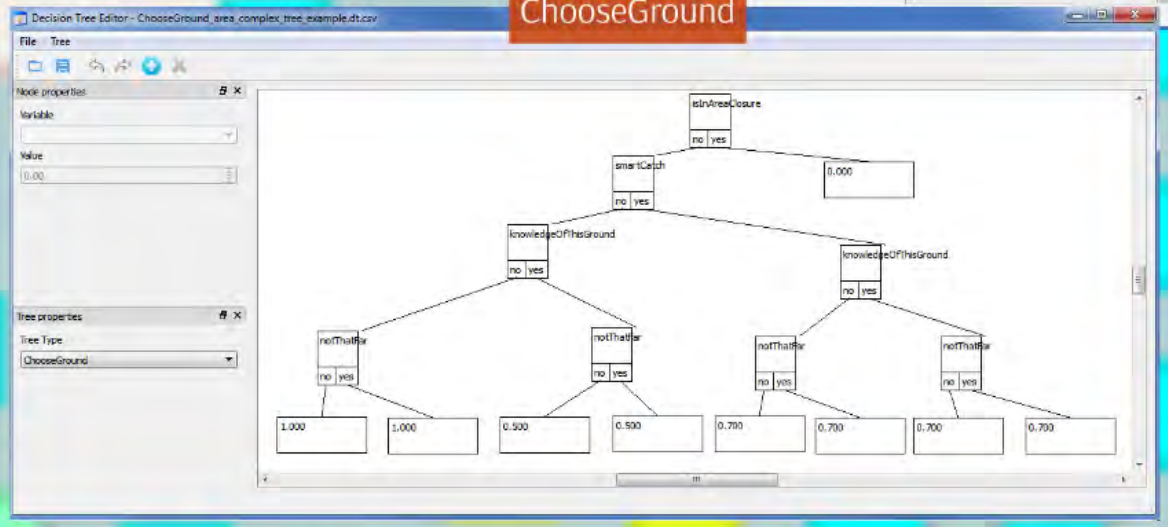
GoFishing



StopFishing

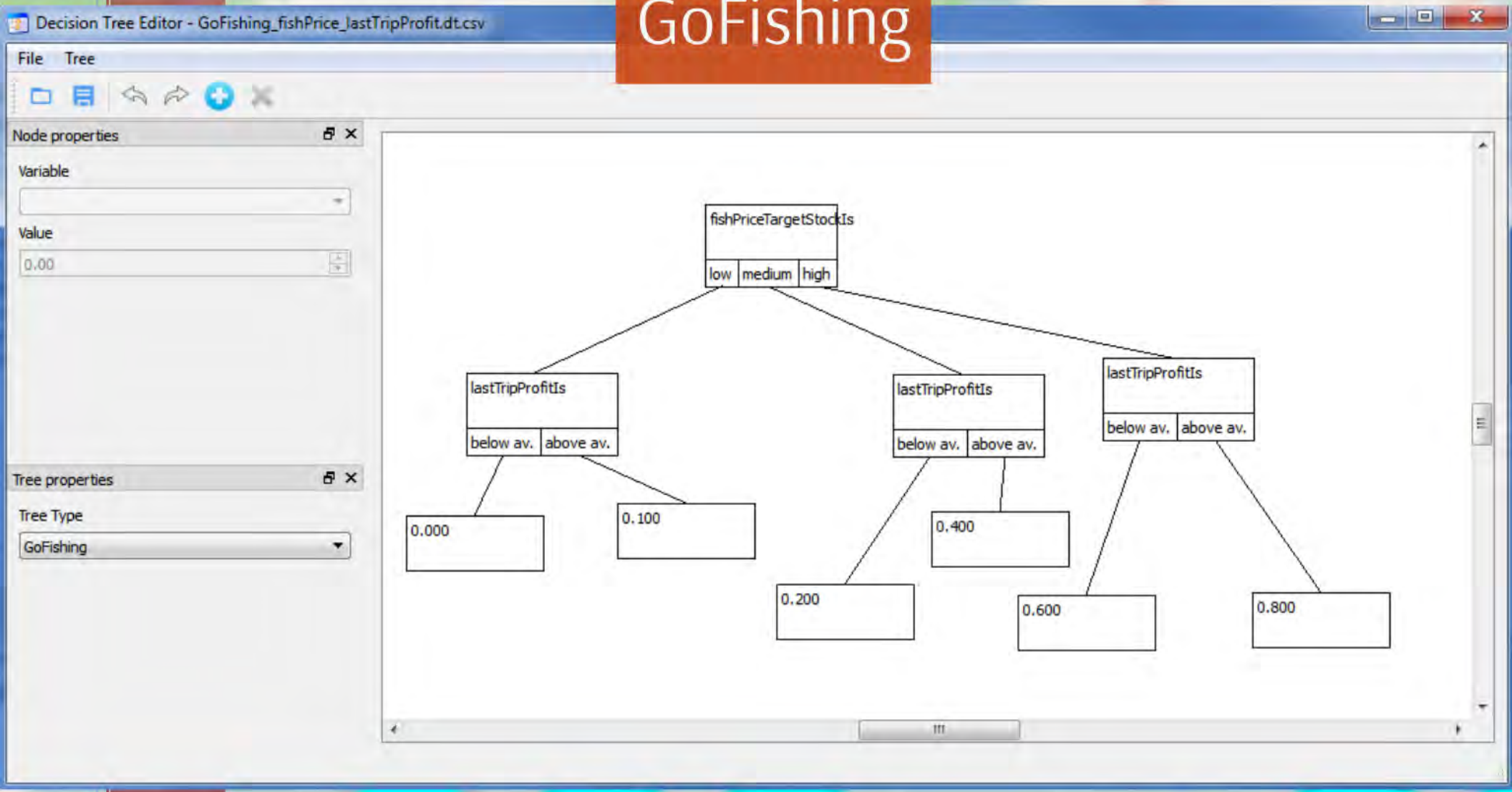


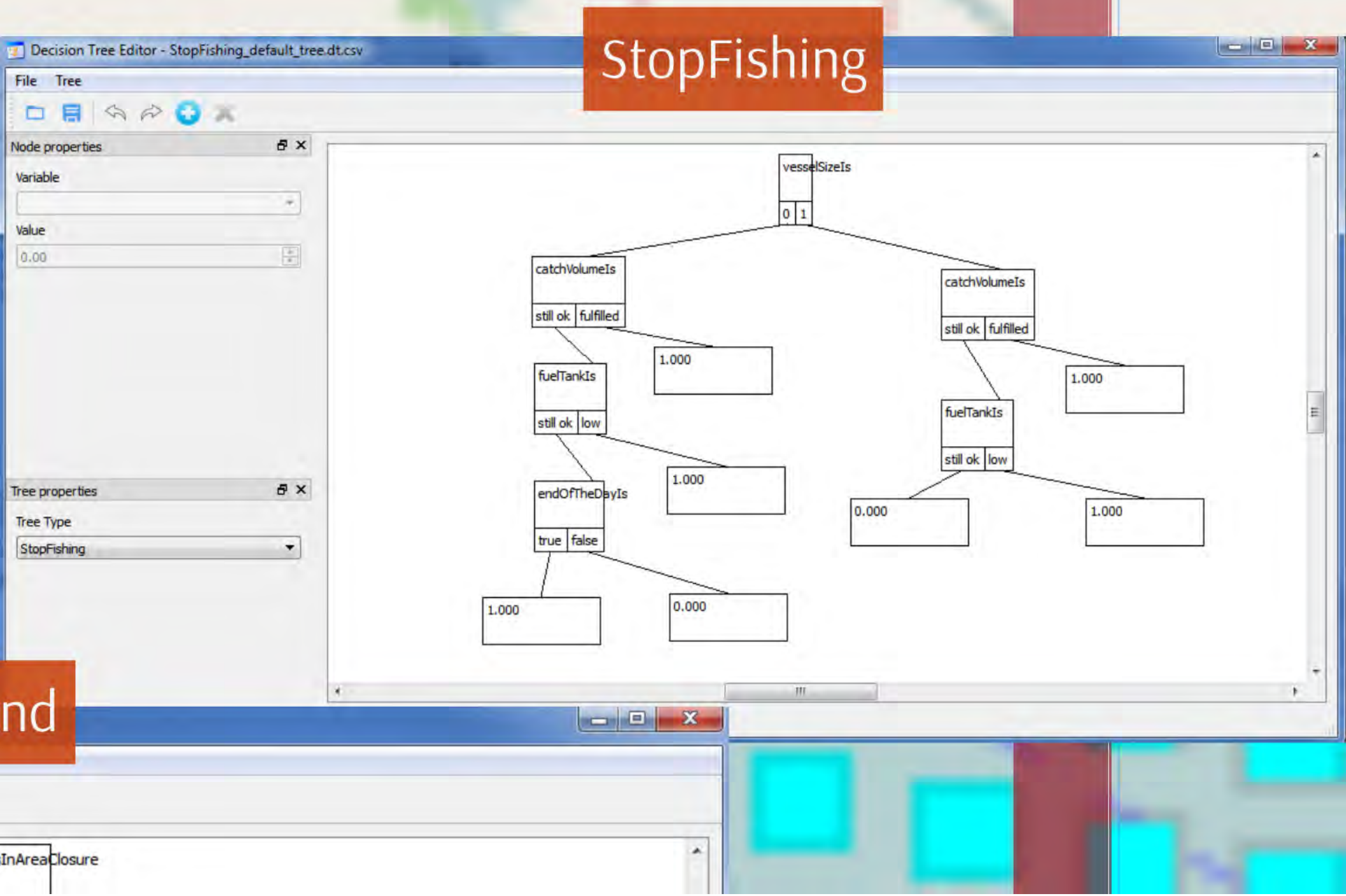
ChooseGround

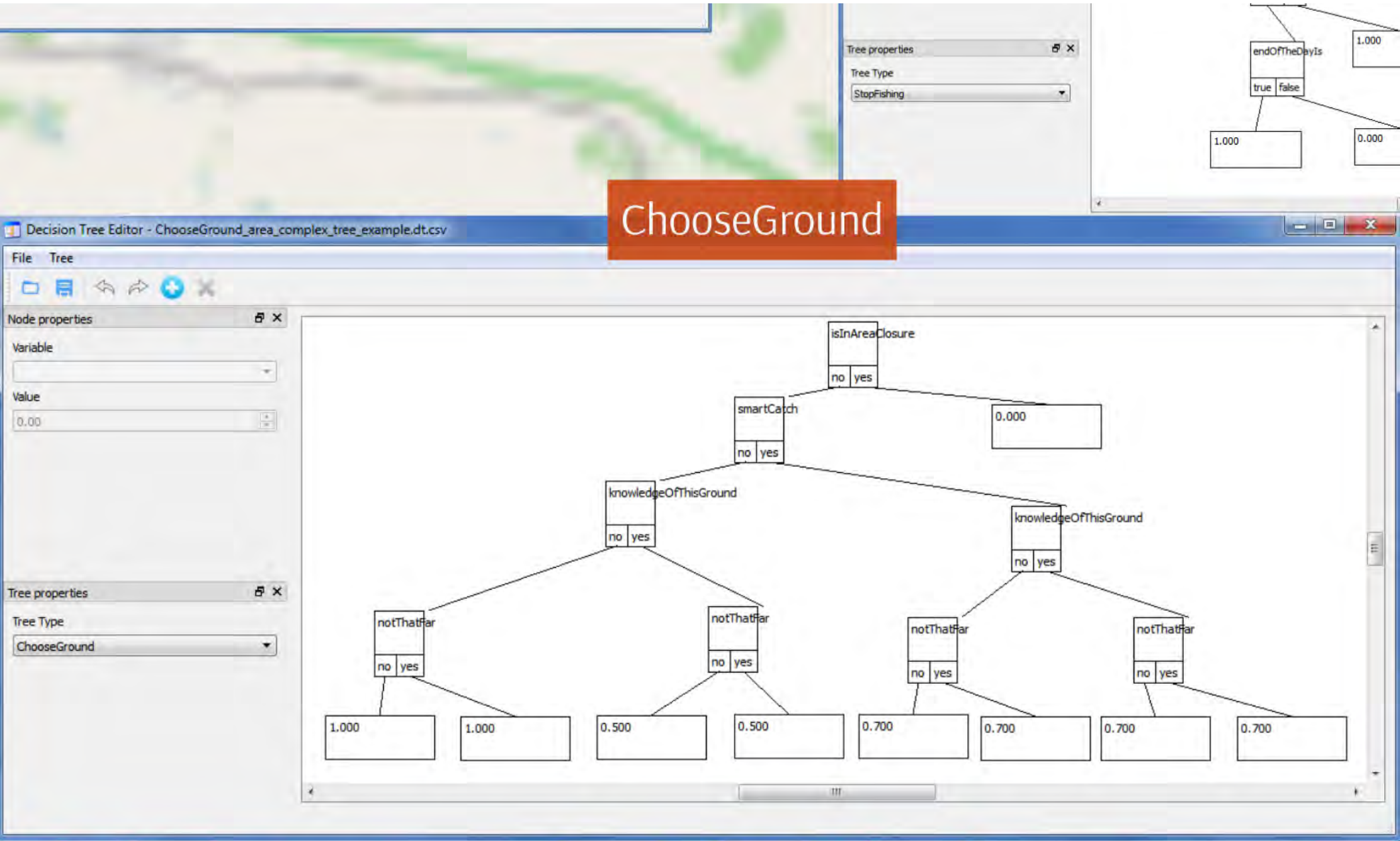


Individual decision-making through different patterns of actions/re-actions (avoid the "average" vessel approach)

GoFishing


Decision Tree Editor - GoFishing_fishPrice_lastTripProfit.dt.csv
File
Tree
Node properties
Variable
Value
0.00
Tree properties
Tree Type
GoFishing
fishPriceTargetStockIs
low
medium
high
lastTripProfitIs
below av.
above av.
lastTripProfitIs
below av.
above av.
lastTripProfitIs
below av.
above av.
0.000
0.100
0.200
0.400
0.600
0.800

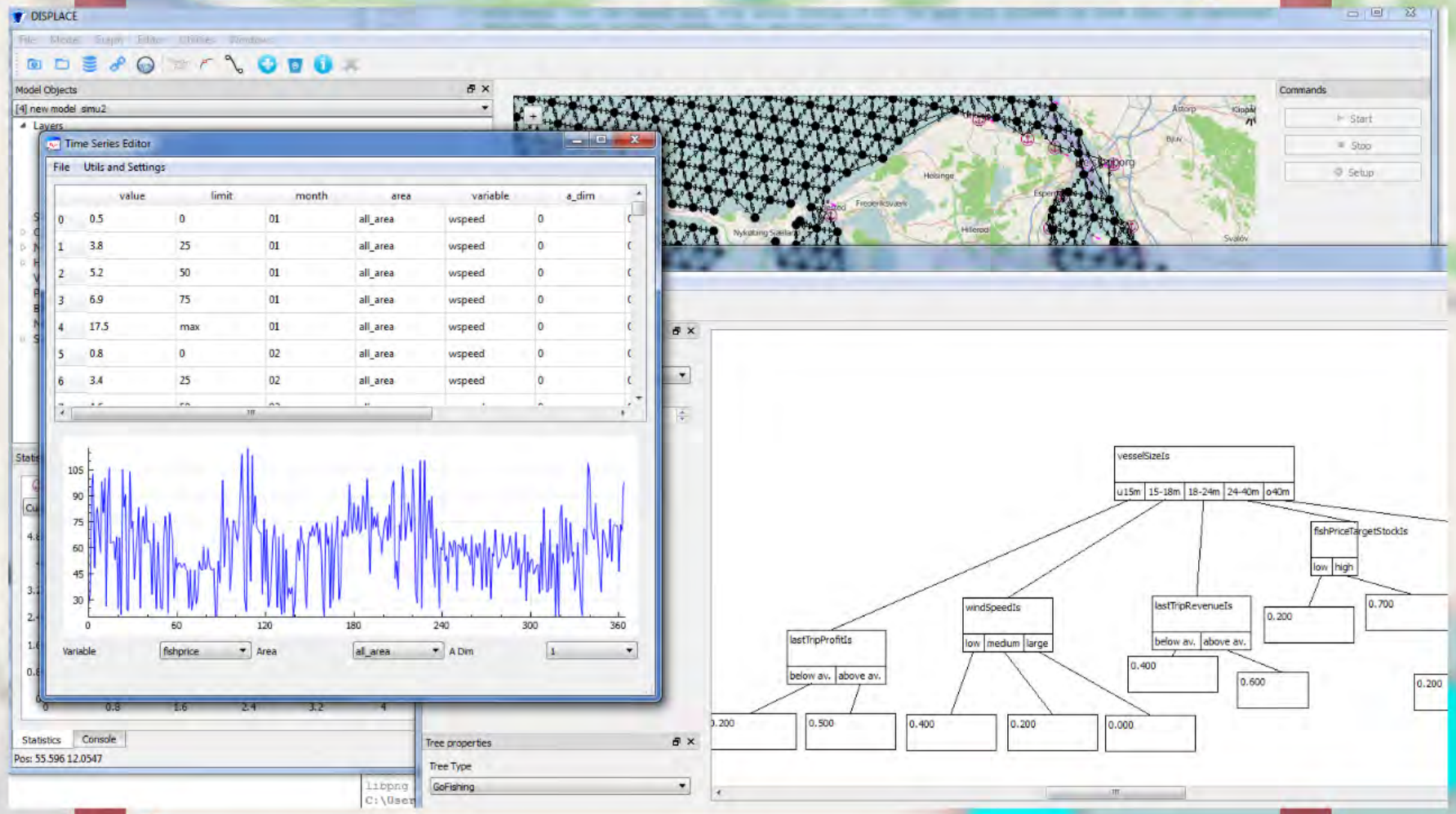

StopFishing
Decision Tree Editor - StopFishing_default_tree.dt.csv
File
Tree
Node properties
Variable
Value
0.00
Tree properties
Tree Type
StopFishing
vesselSizeIs
0
1
catchVolumeIs
still ok
fulfilled
1.000
fuelTankIs
still ok
low
1.000
endOfTheDayIs
true
false
1.000
0.000
catchVolumeIs
still ok
fulfilled
1.000
fuelTankIs
still ok
low
0.000
1.000
nd
InAreaClosure



Individual decision-making through

different patterns of actions/re-acti

link up time series and decision trees



reaction to external drivers...

....fish prices (target stocks)

....fuel prices

....wind speed

Scenario testing

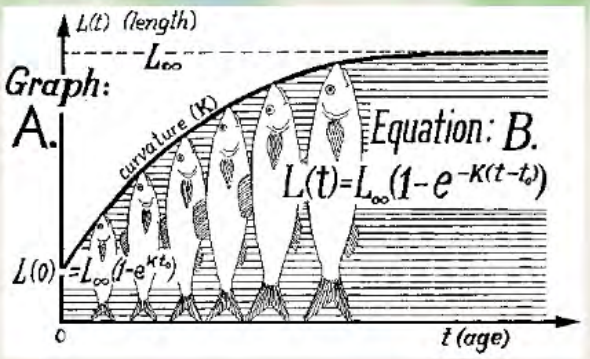
Stock parameterization from ICES WG and benchmark - initial population 2012 and biology - migration fluxes per size group from otolith and genetic analyses
Spatial distribution from surveys - next slide

Fleet parameterisation from coupling VMS to logbooks data - obtaining spatial catch rate on stocks per vessel (also depending on encountered abundances)

A vessel shows various activities with different gear selectivities in different time and space

Baseline stock conditioning vs. range of parameter values and/or combinations

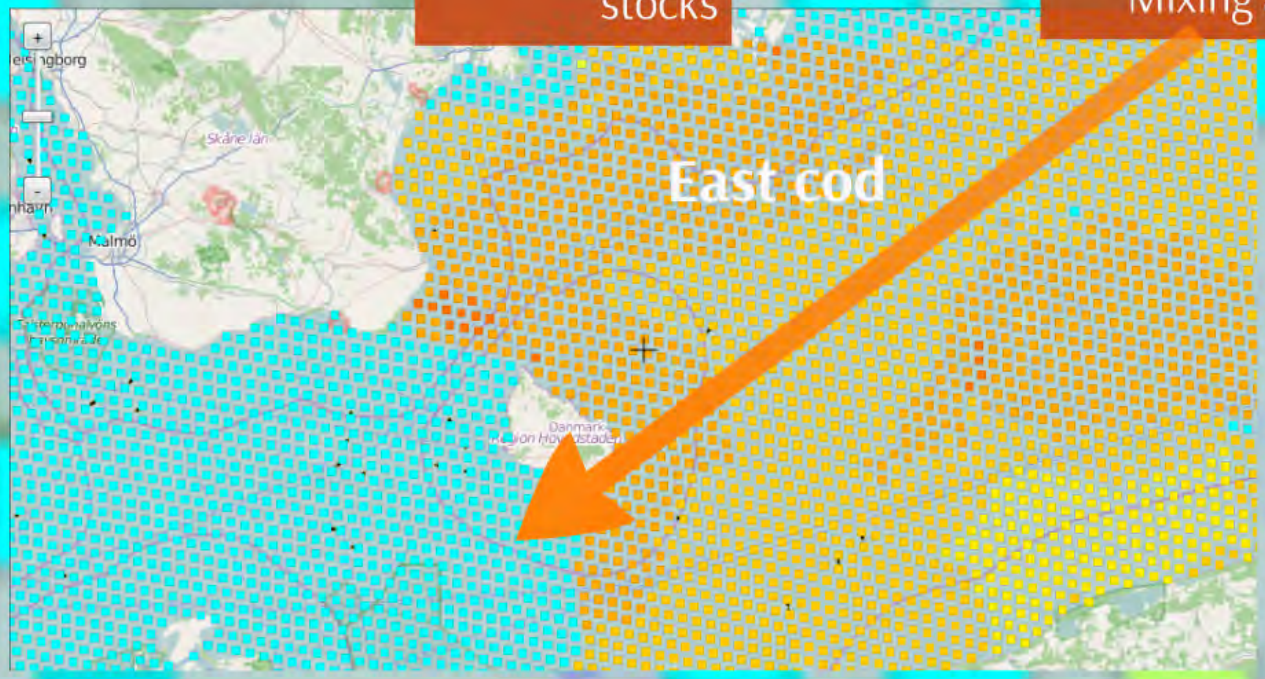
Baseline individual effort allocation vs. dynamic alternatives (from decision trees)



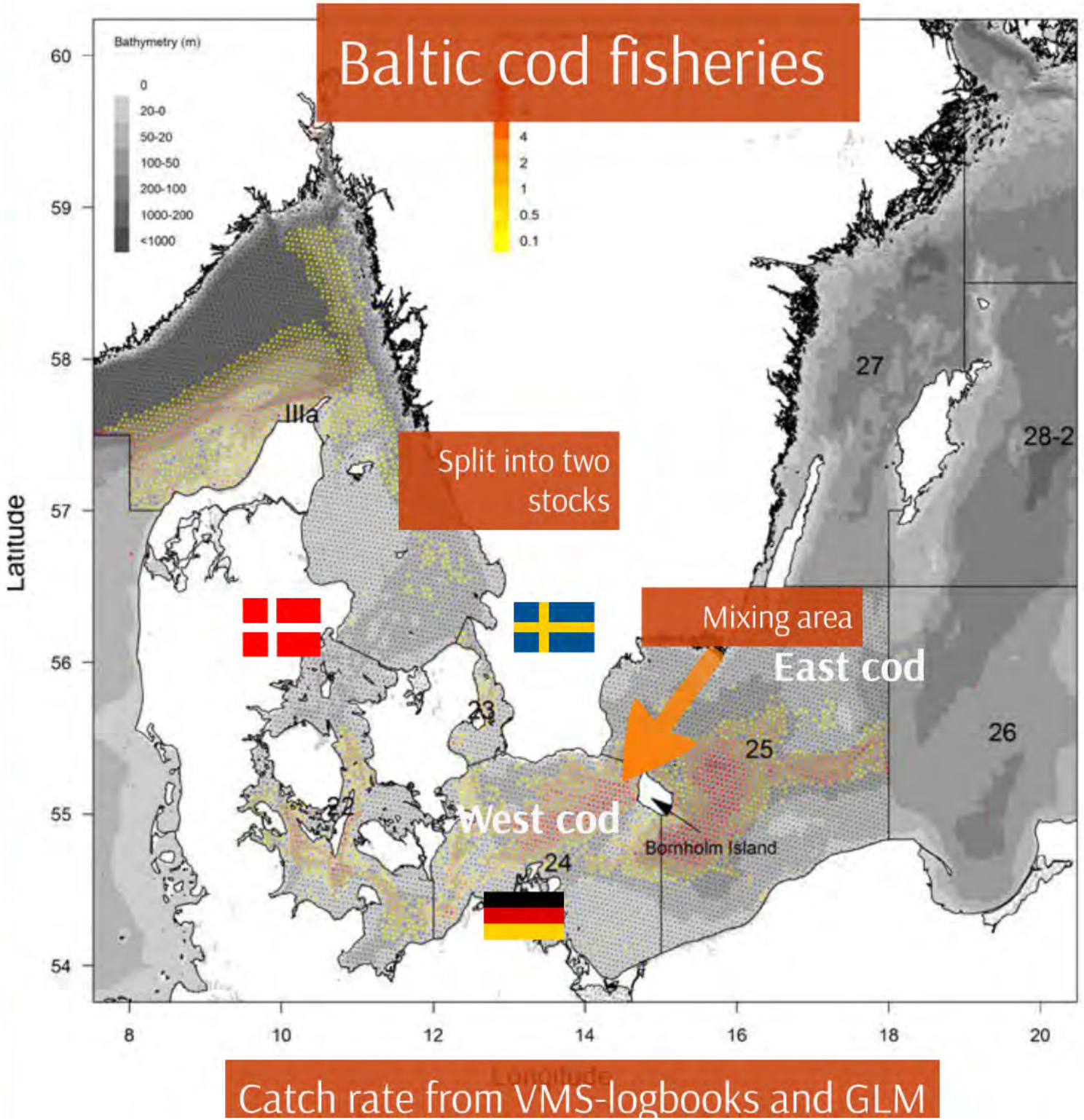
Baltic cod fisheries

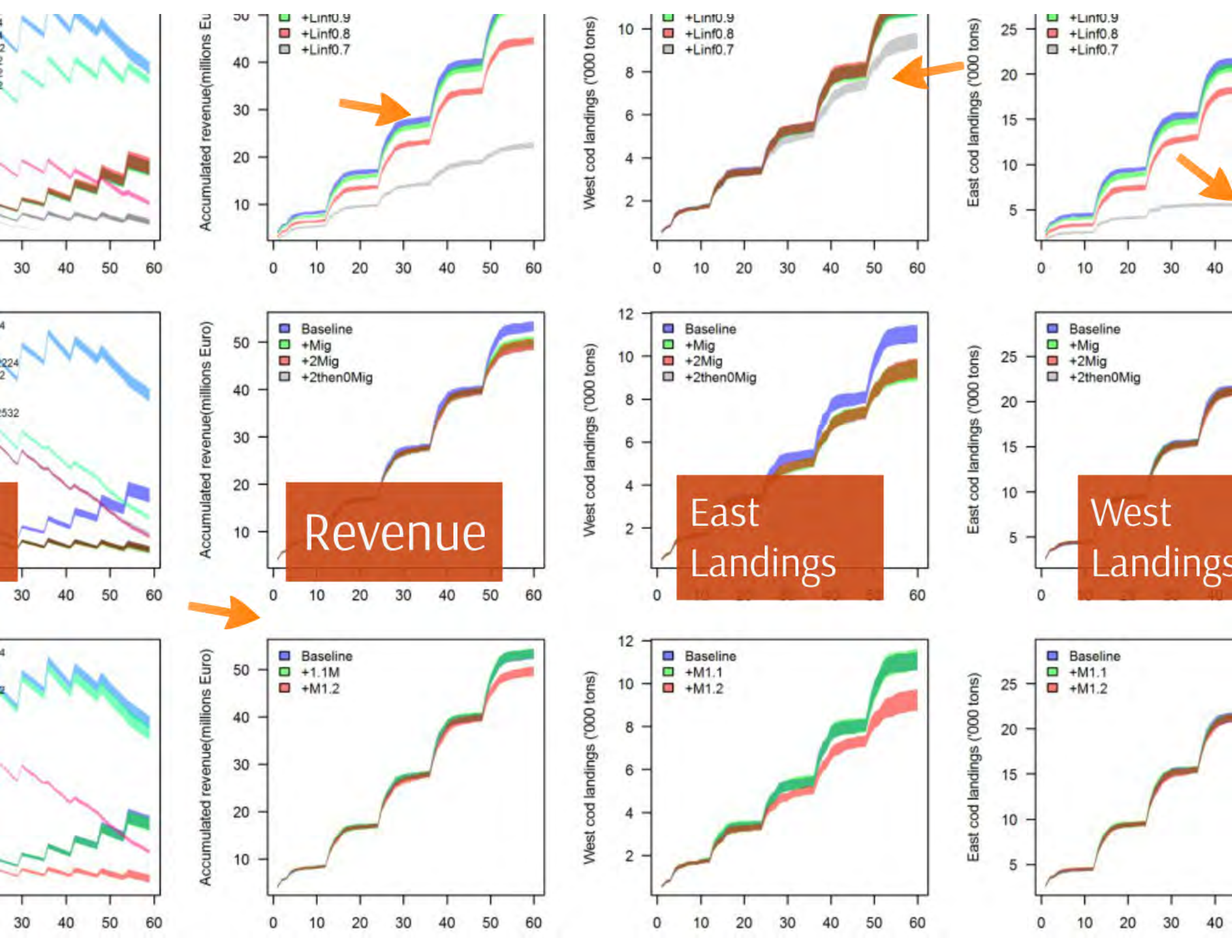
Split into two stocks

Mixing area

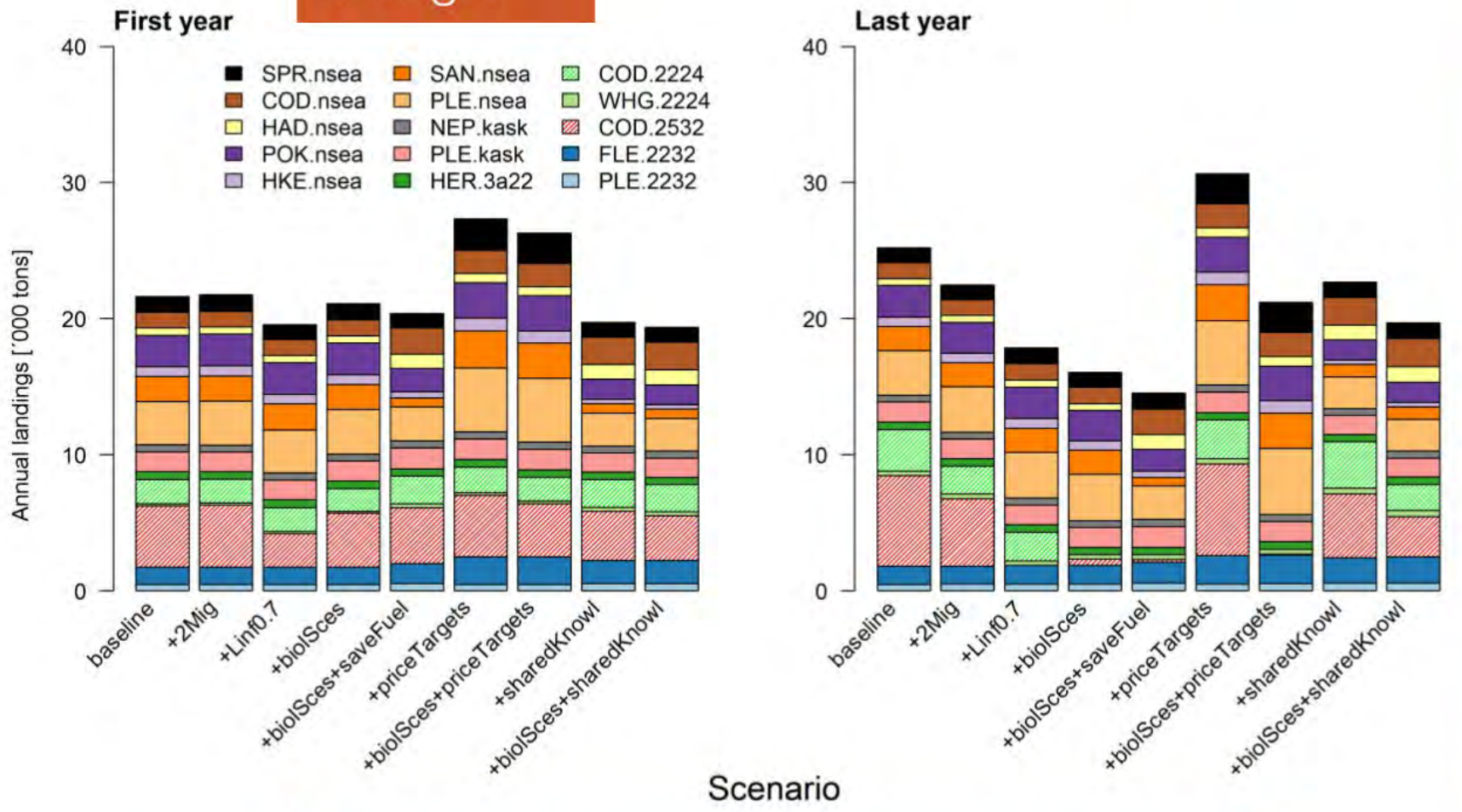


Resource spatial distribution from scientific surveys


Baltic cod fisheries
Bathymetry (m)
0
20-0
50-20
100-50
200-100
1000-200
<1000
4
2
1
0.5
0.1
IIIa
27
28-2
Split into two stocks
Mixing area
East cod
23
25
26
West cod
24
Bornholm Island
Latitude
Longitude
60
59
58
57
56
55
54
8
10
12
14
16
18
20
Catch rate from VMS-logbooks and GLM

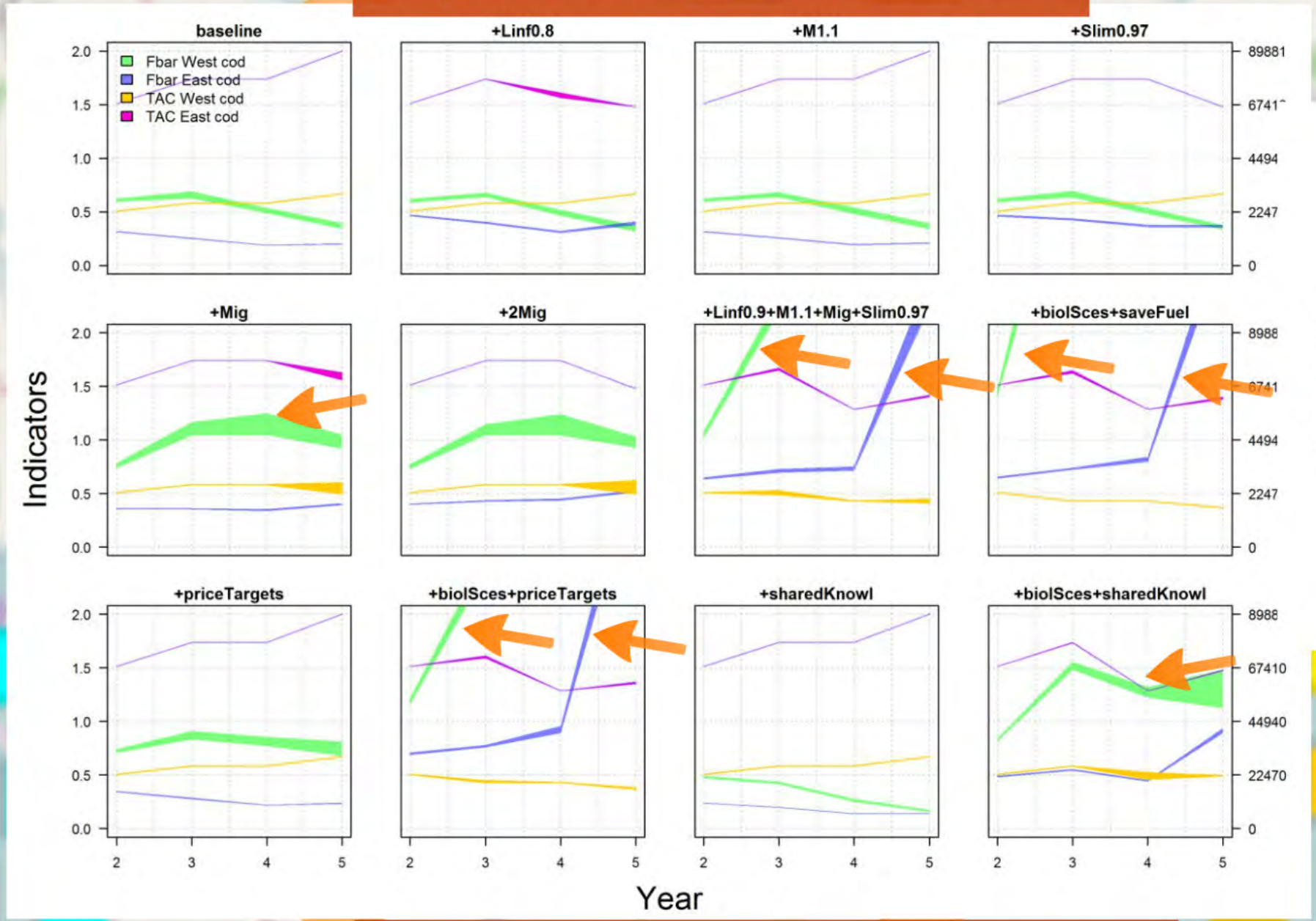

Accumulated revenue(millions Euro)
West cod landings ('000 tons)
East cod landings ('000 tons)
+Linf0.9
+Linf0.8
+Linf0.7
Baseline
+Mig
+2Mig
+2then0Mig
+1.1M
+M1.2
+M1.1
Revenue
East Landings
West Landings

Landing composition changes



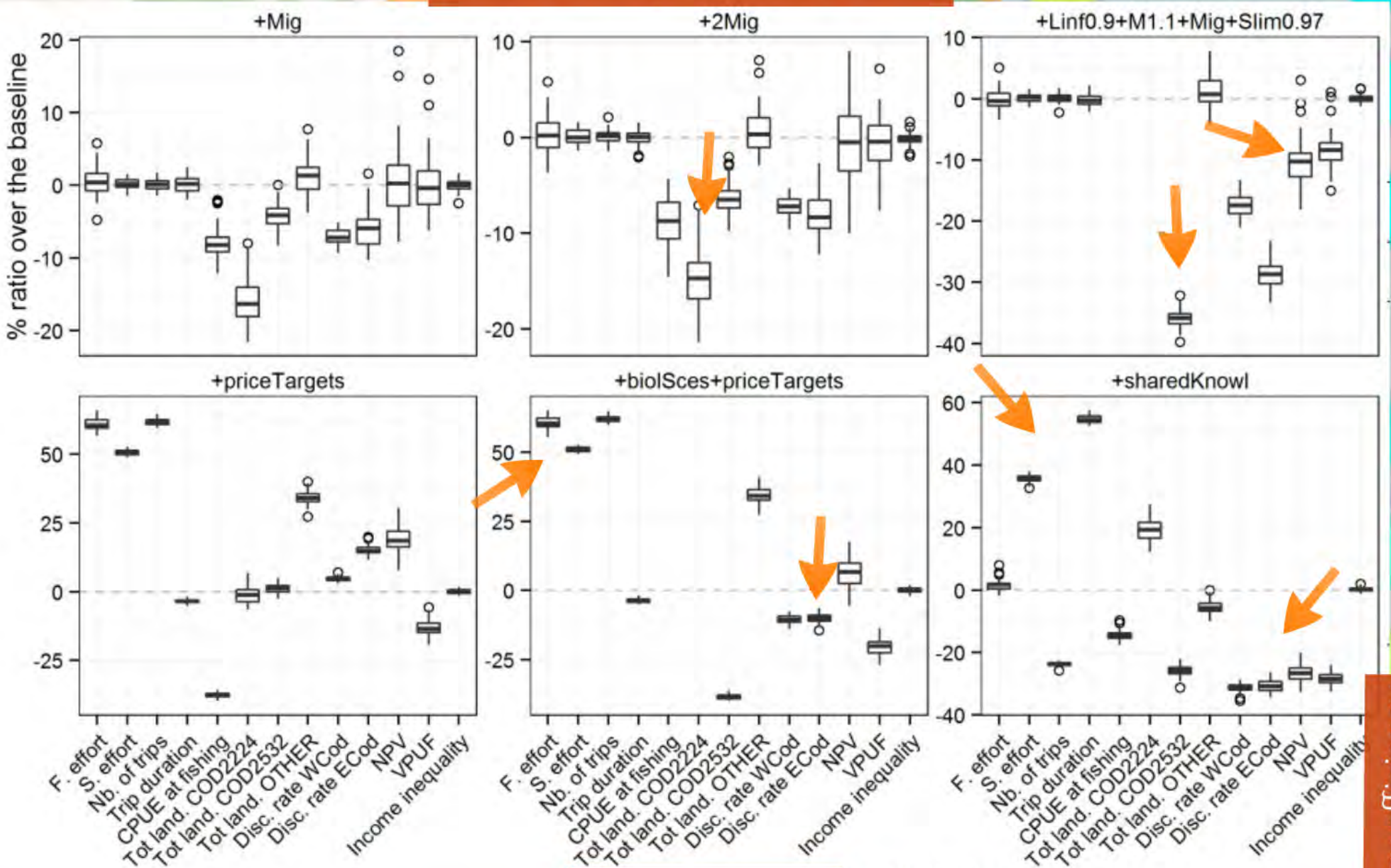
Is stability in provision of sea food, etc. still be meet?

Impact under cod LTMP



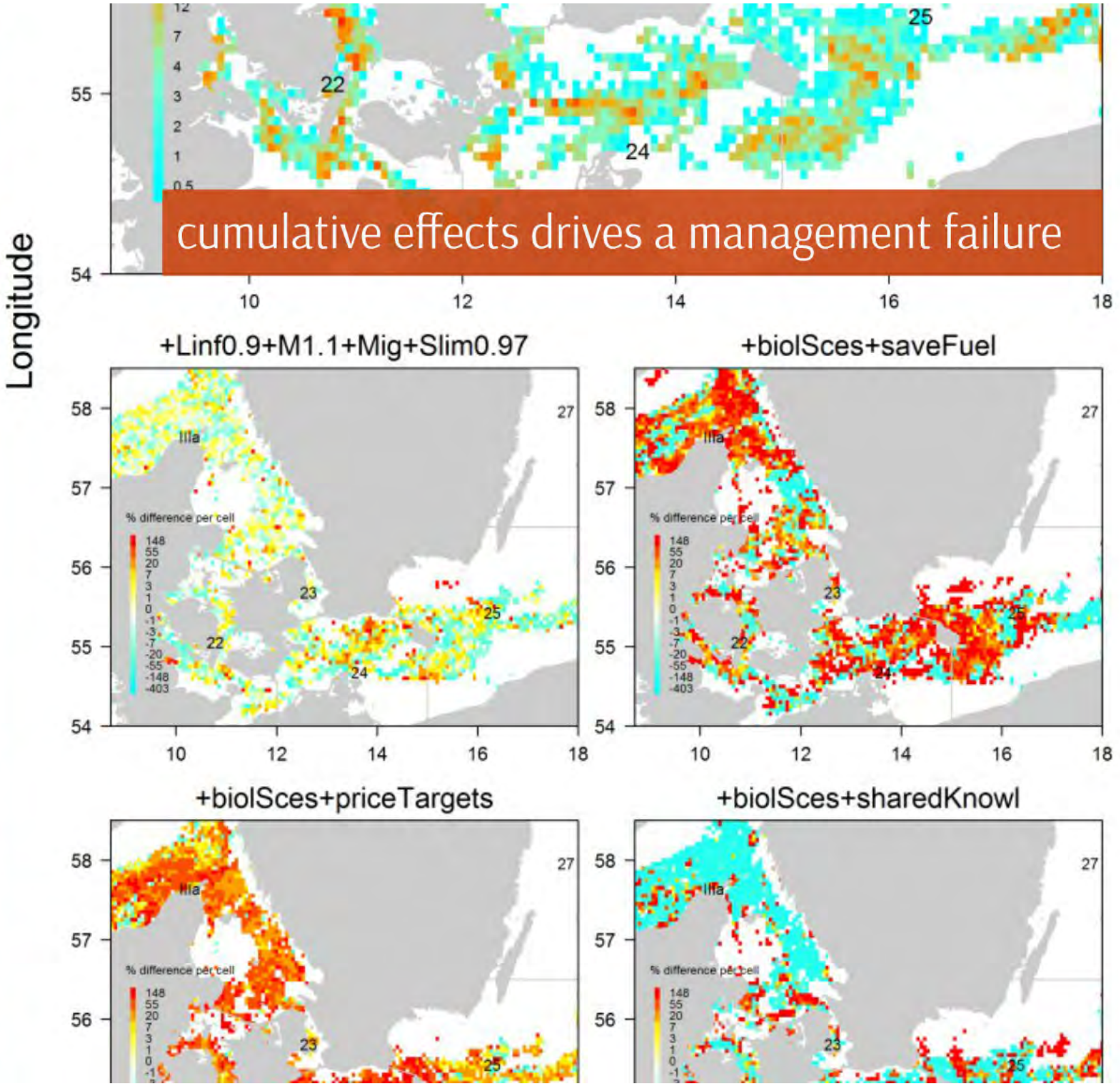
Is cod LTMP can catch up?

Overall fleet performance

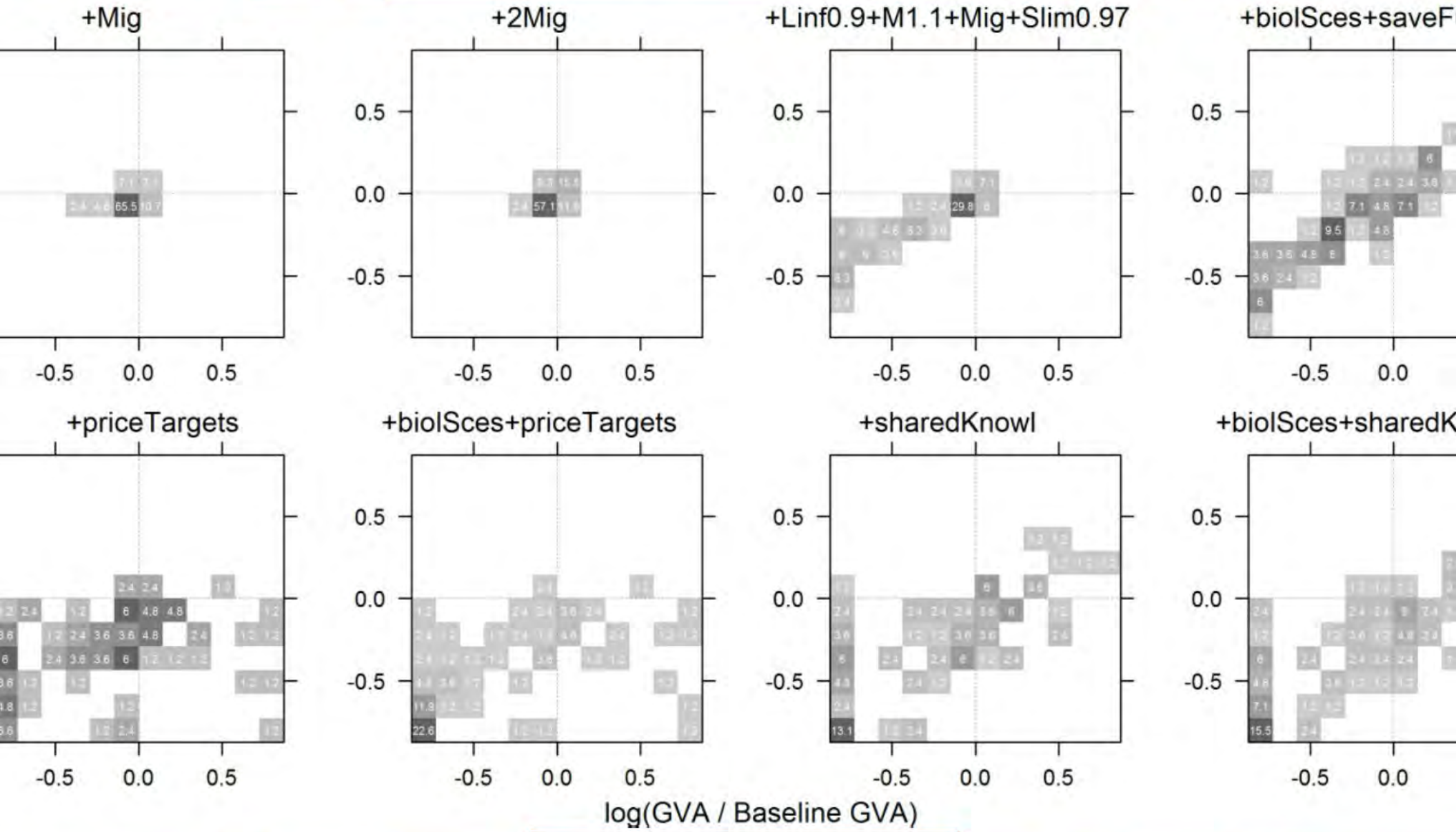


Indicators

Energy efficiency


cumulative effects drives a management failure
Longitude
+Linf0.9+M1.1+Mig+Slim0.97
+biolSces+saveFuel
+biolSces+priceTargets
+biolSces+sharedKnowl
% difference per cell
IIIa
22
23
24
25
27

More winners than losers?



individual profit

Lessons learned

Biological scenarios: Declining East cod stock when affecting sensitive biological features...(i.e. growth as a proxy for biological processes)
Impact on economy: Quantification of the profits decline when cod stocks decline, but (large) vessels still make money out of other stocks

Biological scenarios: stock mixing highly influential when ensuring the sustainability of both stocks... the long-term management procedure fails to perceive the West stock at risk if sustained by cod migrants of poor condition from East...
...in an attempt to minimize this effect, since 2015, rule in the assessment is to be stock-based by splitting SD24 cod into West cod and East cod.

Impact on the fisheries...overall vs. individual scale: who wins? Is there more winners than losers?

Spatial effort redirection (?) toward West or to remote grounds...
Testing ways for compensation, the present allocation seems already optimal...

Implications of this particular modeling approach....
Agent-based modeling to avoid "average" vessel, exploring the unknown with some potentials for capturing non-linear effects stocks <-> fleets

ng approach....
age" vessel, exploring the unknown with some potentials for
> fleets

Thank you!

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SOCIO ECONOMIC EFFECTS OF MANAGEMENT MEASURES OF THE FUTURE CFP

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Maximising yield of fisheries while balancing ecosystem, economic and social concerns

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Have your say on how spatial restrictions affect your fishing

May 19, 2014 displaced fishing effort fishermen decisions, stakeholder engagement Edit

In relation to present simulations performed under the Baltic case study of the SOCIOEC project, the stakeholder feed-back is expected to provide information on (and contribute to) what the stakeholders consider to be the most important risk factors in such spatial management. Furthermore, they are expected to contribute with information on how they plan to react to the spatial management measures in their short-term decision making (on a

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Portugal bans deep-sea trawling http://t.co/L2l3CMPNnC & http://t.co/cRKl0fGFOB @Oceana @osparcomm

@navigate4sea June 3, 2014

Ports & blue economy - Stakeholders meeting in Cherbourg, FR, 18th of June 14 http://t.co/QIycf5189s

@navigate4sea June 2, 2014

Effects of fishing on benthic fauna, habitat and ecosystem function http://t.co/Cgyq7TJXB1 Tromsø, Norway from 16-19th June 2014 @ICES_ASC