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International Institute of Fisheries Economics & Trade (IIFET)

Coupling commercial fisheries and survey data: a practical solution to boost the amount of information in data-poor context

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DTU Aqua
National Institute of Aquatic Resources

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  - Do not follow most of the assumptions of the existing quantitative stock assessment models

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  - **Fishery-dependent data (**Commercial fisheries)

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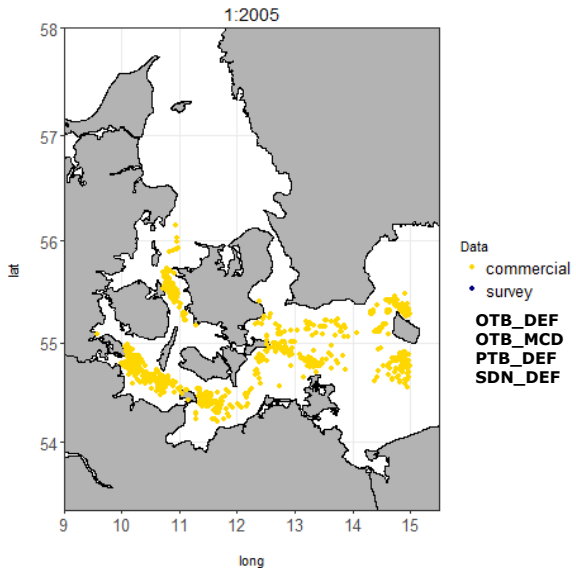
Main objective

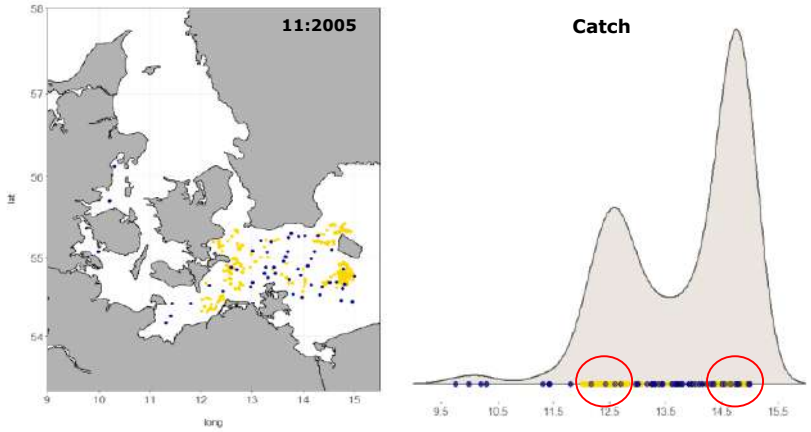
Develop a flexible and robust statistical model to estimate and predict species abundance in space and time

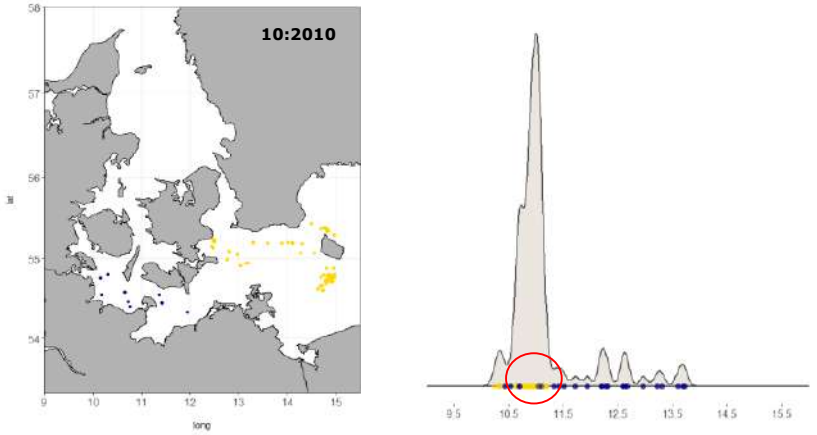
Spatial & temporal sampling coverage

Fishery dependent data:
Long time & short spatial coverage;

Fishery-independent data:
Short time & long spatial coverage;

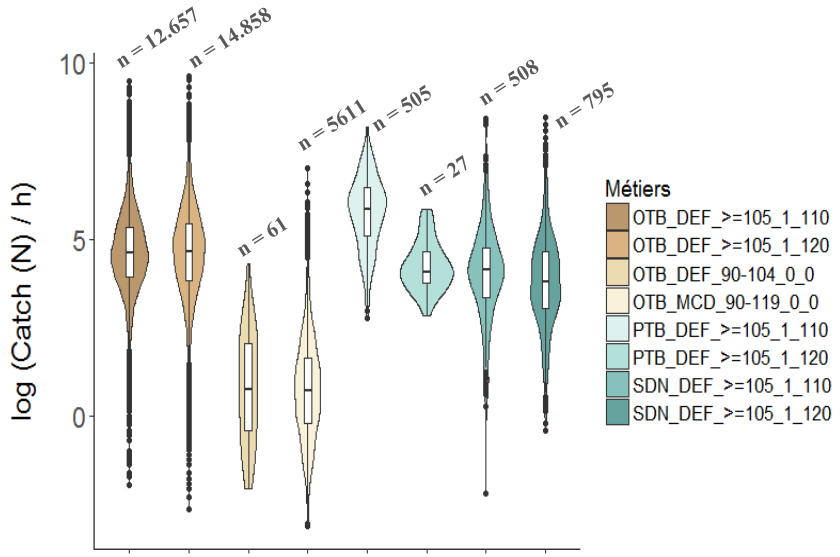






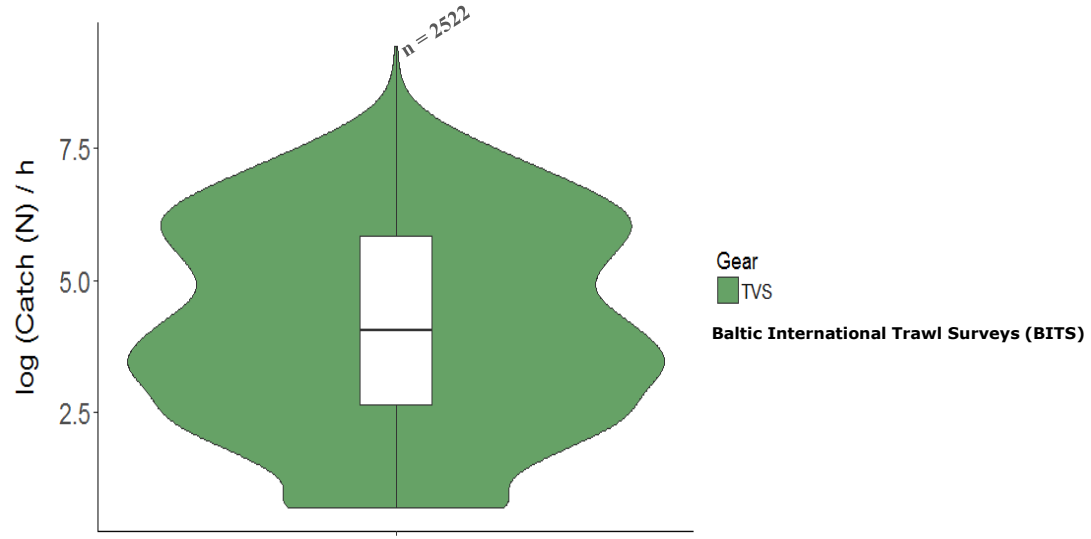
Fishing catchability

Fishery-dependent data



↑ Variability

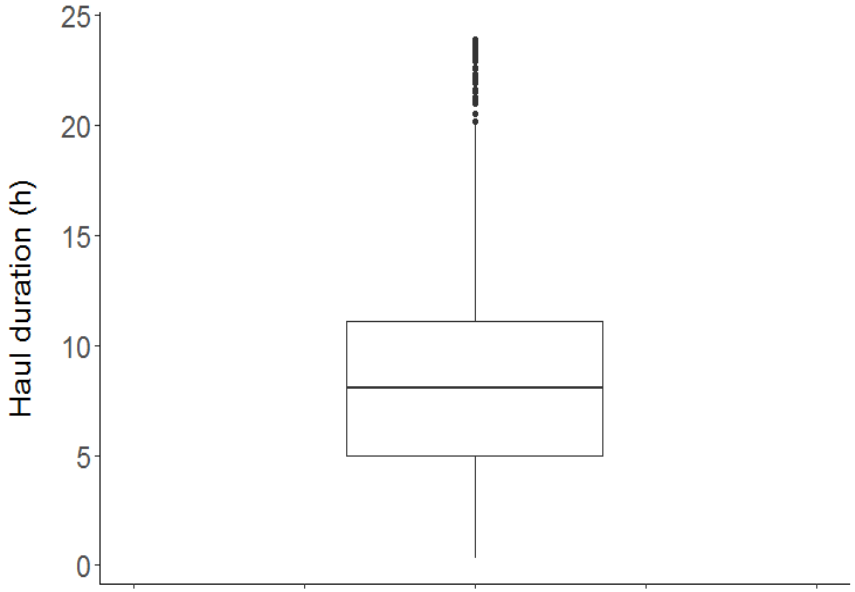
Fishery-independent data



↓ Variability

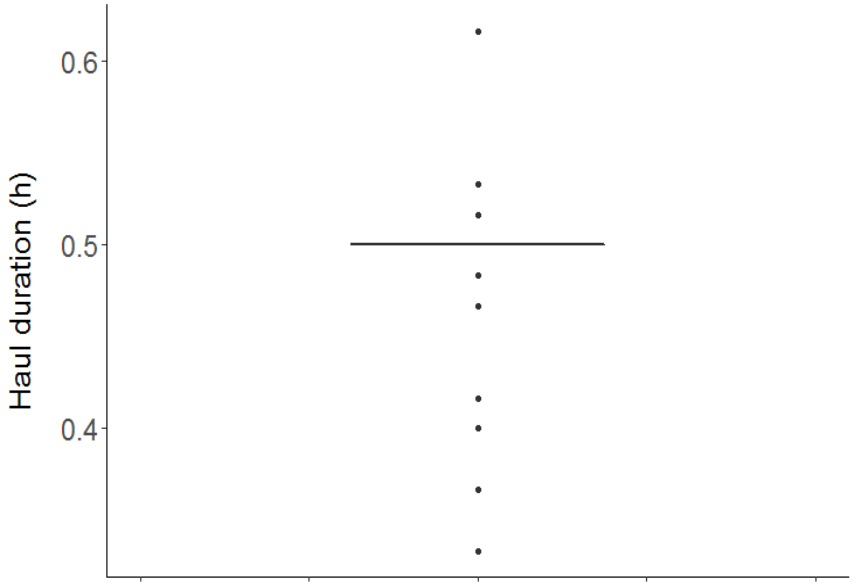
Fishing effort

Fishery-dependent data



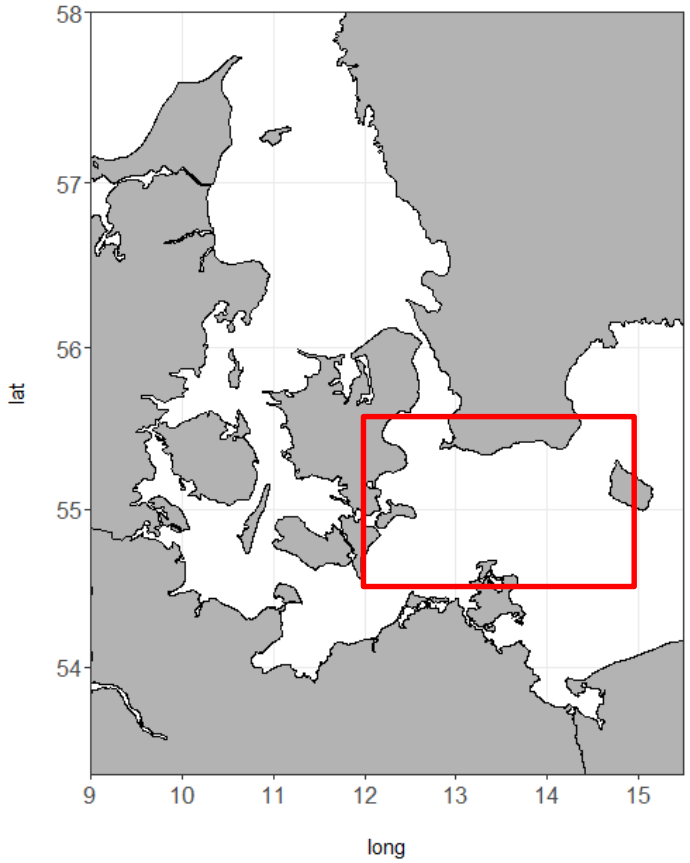
↑ Variability

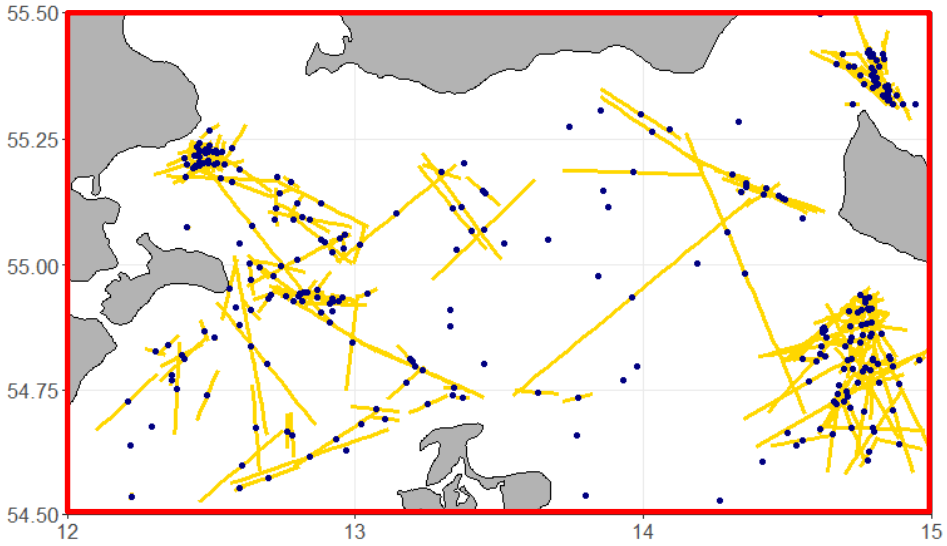
Fishery-independent data



↓ Variability

Trawled distance





Spatio-temporal model

$$d(s,t) \sim NB(\lambda(s,t), \phi)$$

$$\exp(\lambda(s,t)) = \beta_0 + \gamma + \sum_{k=1}^{n_k} \beta_k x_k(s,t) + \sum_{l=1}^{n_l} f_l(\upsilon_l) + \xi(s,t)$$

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Intercept

Spatio-temporal model

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Offset (fishing effort)

Spatio-temporal model

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Covariates (Depth, Sediment type and time of the year)

Spatio-temporal model

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Random effect (Fishing catchability)

Spatio-temporal model

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Spatio & temporal correlation

Spatio-temporal model

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Response variable (N / age)

(count data)

Spatio-temporal model

Option 1

Fishery-dependent data

- OBO (On-board observer)
- DFAD (Danish fisheries analysis database)
- VMS (Vessel monitoring system)
- Vessel logbook

Option 2

Fishery-independent data

- BITS (Baltic International Trawl Surveys)
- IBTS (International Bottom Trawl Surveys)

Option 3

Fishery-dependent + independent data

Spatio-temporal model

Cod

Gadus morhua

(SD 21
SD 22-24)

Sprat

(SD 22-24)

Herring

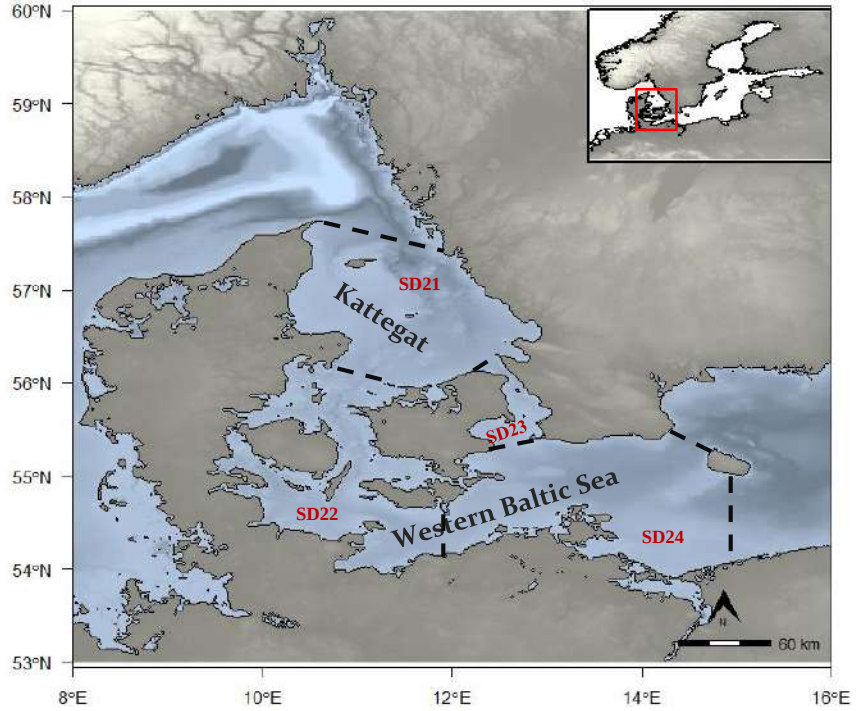
Clupea harengus

(SD 21-24)

Plaice

Pleuronectes platessa

(SD 21-23
SD 24-32)



*SD = ICES subdivision

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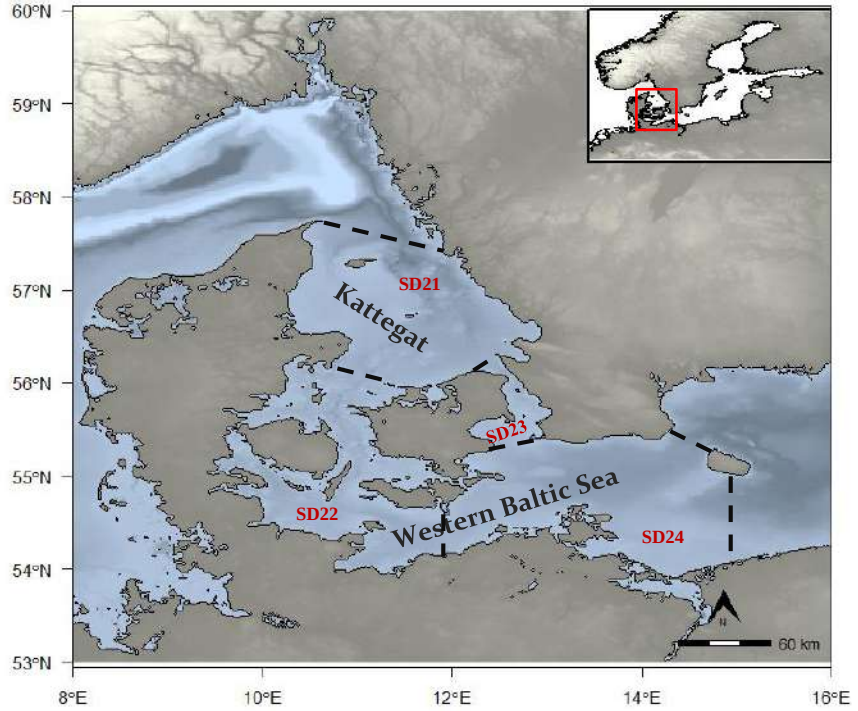


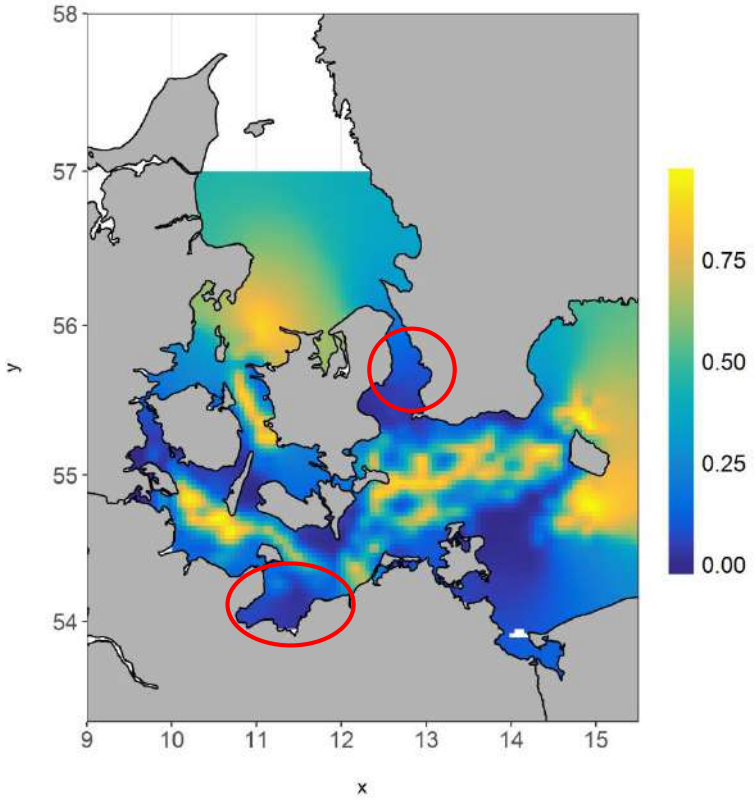
*SD = ICES subdivision

Model		AIC		
		Commercial	Survey	Both
m1	Time	392280.9	5240.1	397808.8
m2	Time + Depth	392174.4	5009.1	397634.4
m3	Time + Depth^2	392140.9	5019.1	397588.3
m4	Time + Sediment	392295.0	5264.0	397822.0
m5	Time + Depth + Sediment	392148.3	5035.0	397592.8
m6	Time + Depth^2 + Sediment	392089.4	5044.9	397515.7
m7	Time + Depth:Sediment	392170.1	5060.9	397604.4

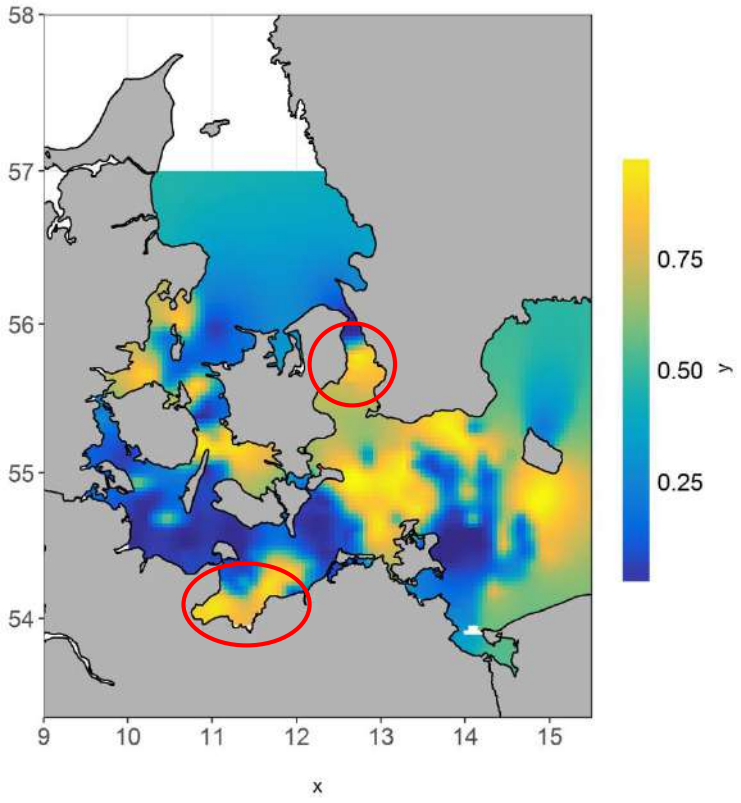
- Different results according to the input data ;
- Combined model is driven by the dataset containing the highest amount of data;

Cod (SD22-24)

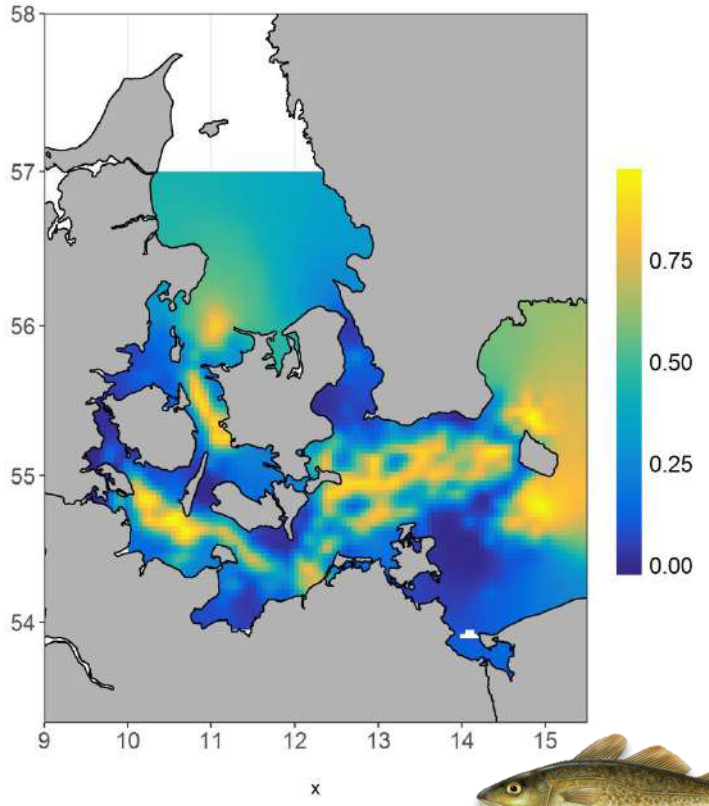
Commercial (option 1)



Survey (option 2)

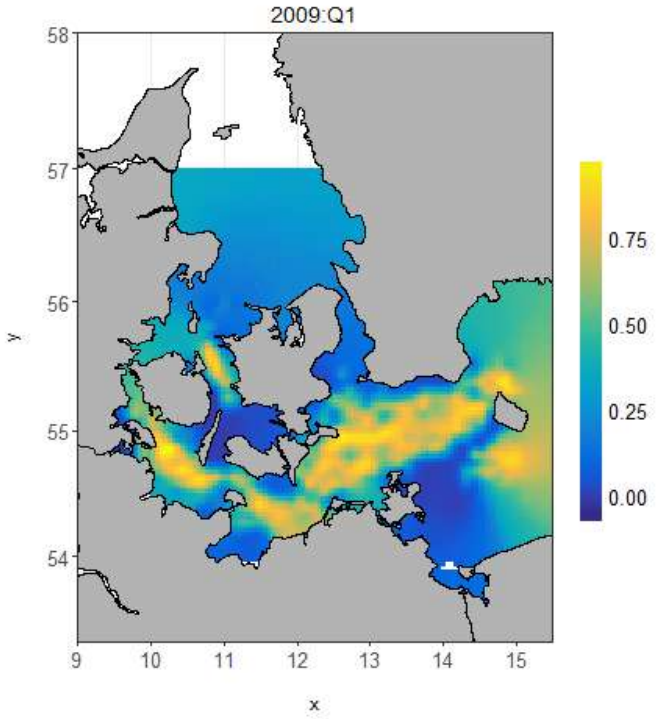


Combined (option 3)

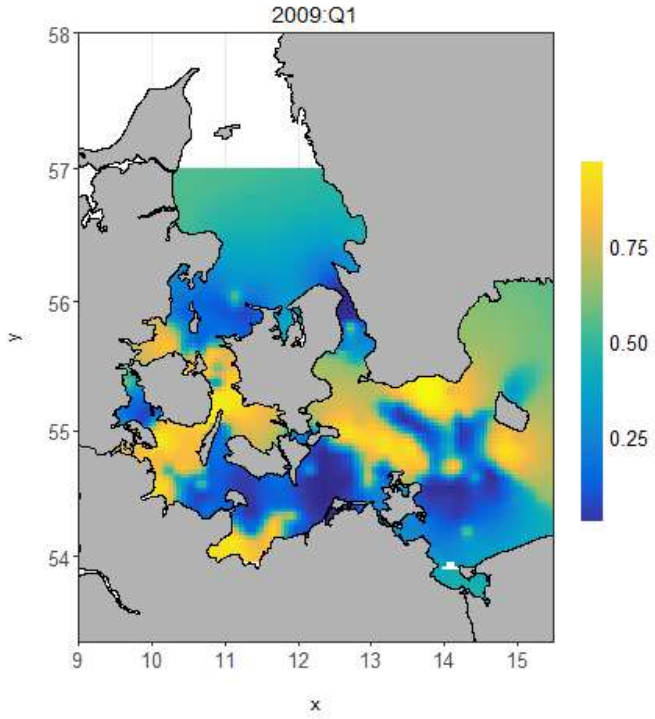


Cod (SD22-24)

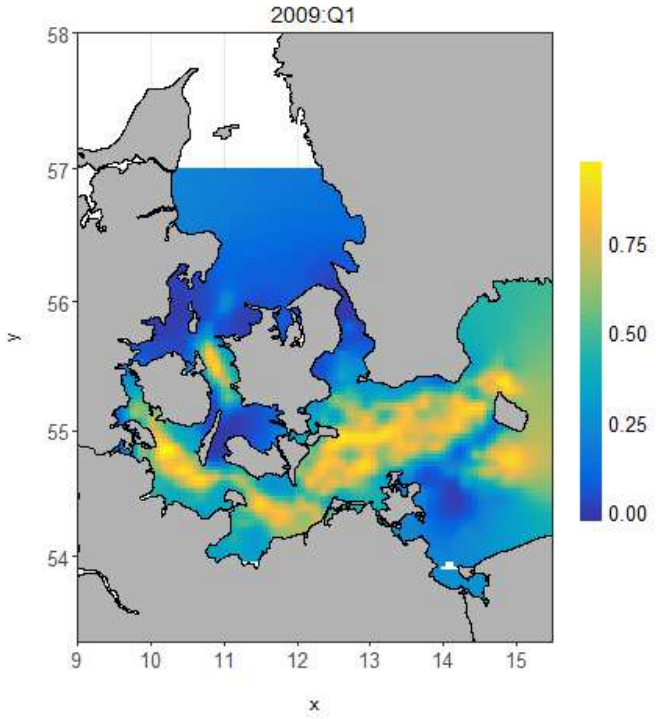
Commercial (option 1)



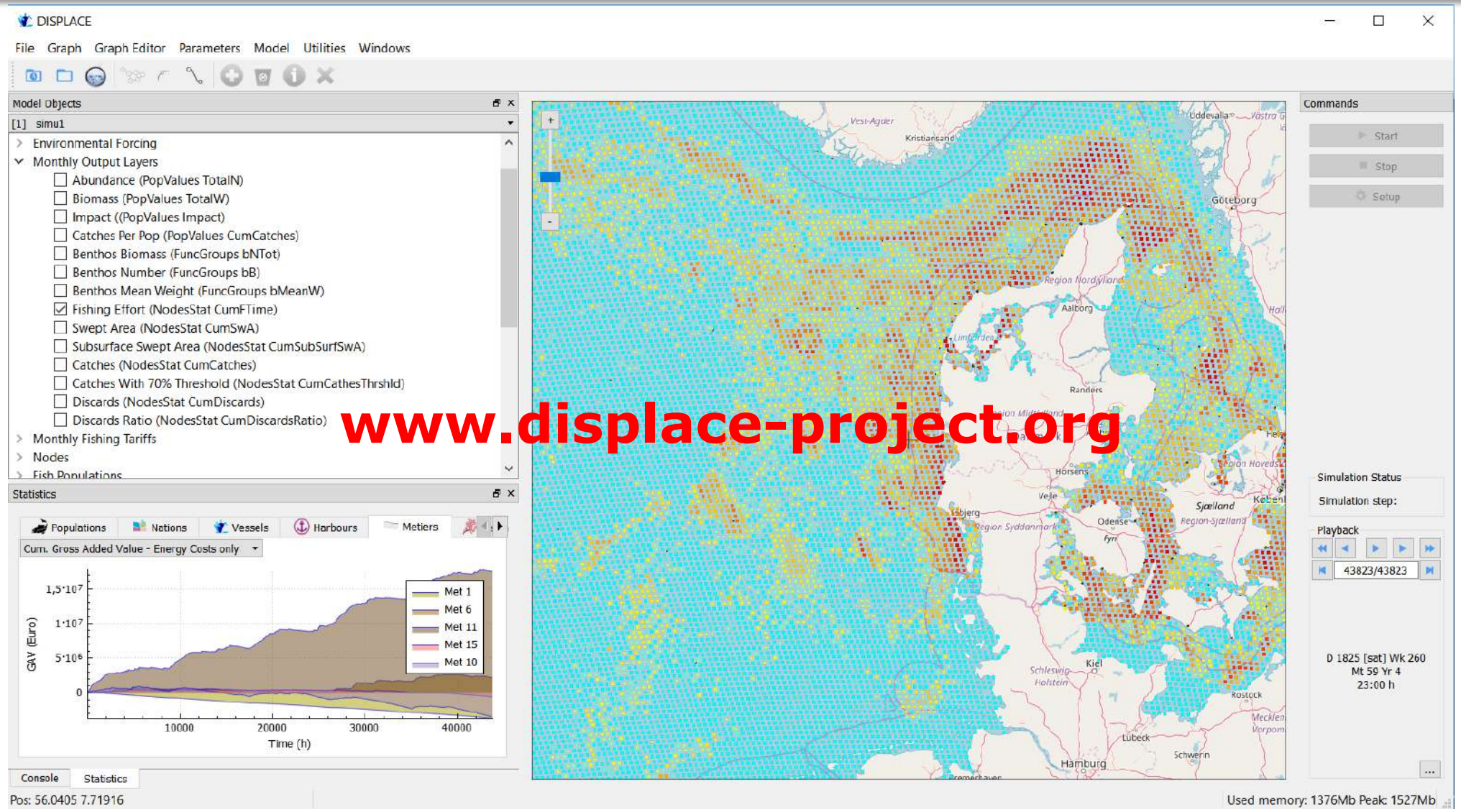
Survey (option 2)



Combined (option 3)



Cod (SD22-24)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Monthly Output Layers
Abundance (PopValues TotalN)
Biomass (PopValues TotalW)
Impact ((PopValues Impact)
Catches Per Pop (PopValues CumCatches)
Benthos Biomass (FuncGroups bNTot)
Benthos Number (FuncGroups bB)
Benthos Mean Weight (FuncGroups bMeanW)
Fishing Effort (NodesStat CumFTime)
Swept Area (NodesStat CumSwA)
Subsurface Swept Area (NodesStat CumSubSurfSwA)
Catches (NodesStat CumCatches)
Catches With 70% Threshold (NodesStat CumCathesThrshld)
Discards (NodesStat CumDiscards)
Discards Ratio (NodesStat CumDiscardsRatio)
Monthly Fishing Tariffs
Nodes
Fish Populations
www.displace-project.org
Statistics
Populations Nations Vessels Harbours Metiers
Cum. Gross Added Value - Energy Costs only
GAV (Euro)
Time (h)
Met 1
Met 6
Met 11
Met 15
Met 10
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Stop
Setup
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Thank you!