



# Can we use catch declarations data to map fish spatial distribution?

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de la source à l'océan



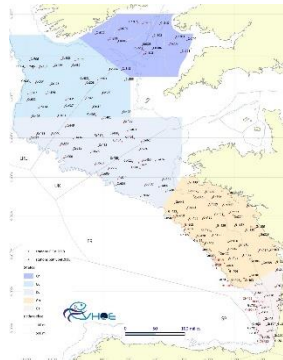
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# Spatial data in ecology

	Survey data	Citizen science data	Declaration data
+	<b>Standardized sampling plan</b>  <b>High quality data</b>	<b>Inexpensive data</b>  <b>Exact locations available</b>	<b>Mandatory data</b>  <b>Massive data</b>
-	<b>Small sample size</b>  <b>Partial temporal coverage</b>  <b>Expensive data</b>	<b>Opportunistic (or even preferential) sampling</b>	<b>Same as citizen science data</b>  <b>Aggregated at the scale of rough administrative units</b>

## Examples

**EVHOE data, Bay of Biscay**  
(marine ecology)



**Ebird application**  
(Ornithology)



**Harvest data, Wisconsin**  
(hunting)

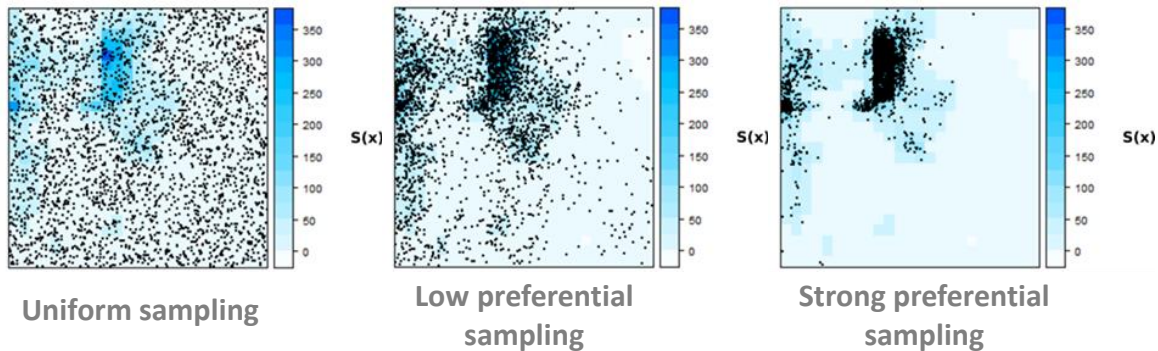


# How to integrate all these datasources?

2 main issues:

## Preferential sampling (PS)

When sampling agents preferentially target areas of higher species density

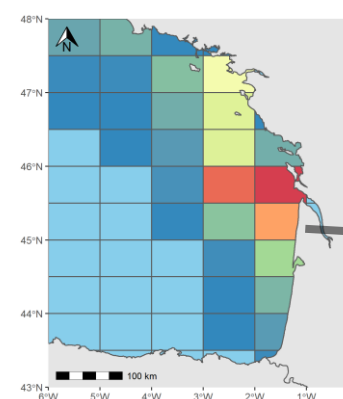


⇒ Account for preferential sampling in inference to avoid bias in species distribution

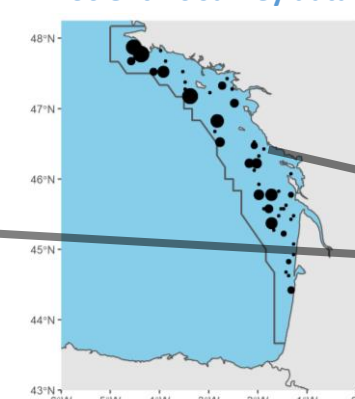
## Change of support (COS)

When predicting species distribution at a specific scale while data sources are defined at different scales (either fine or rough scale)

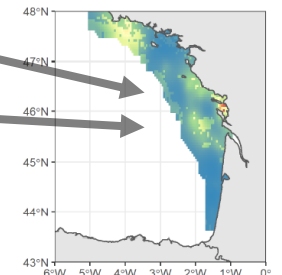
Fishermen declaration data



Scientific survey data

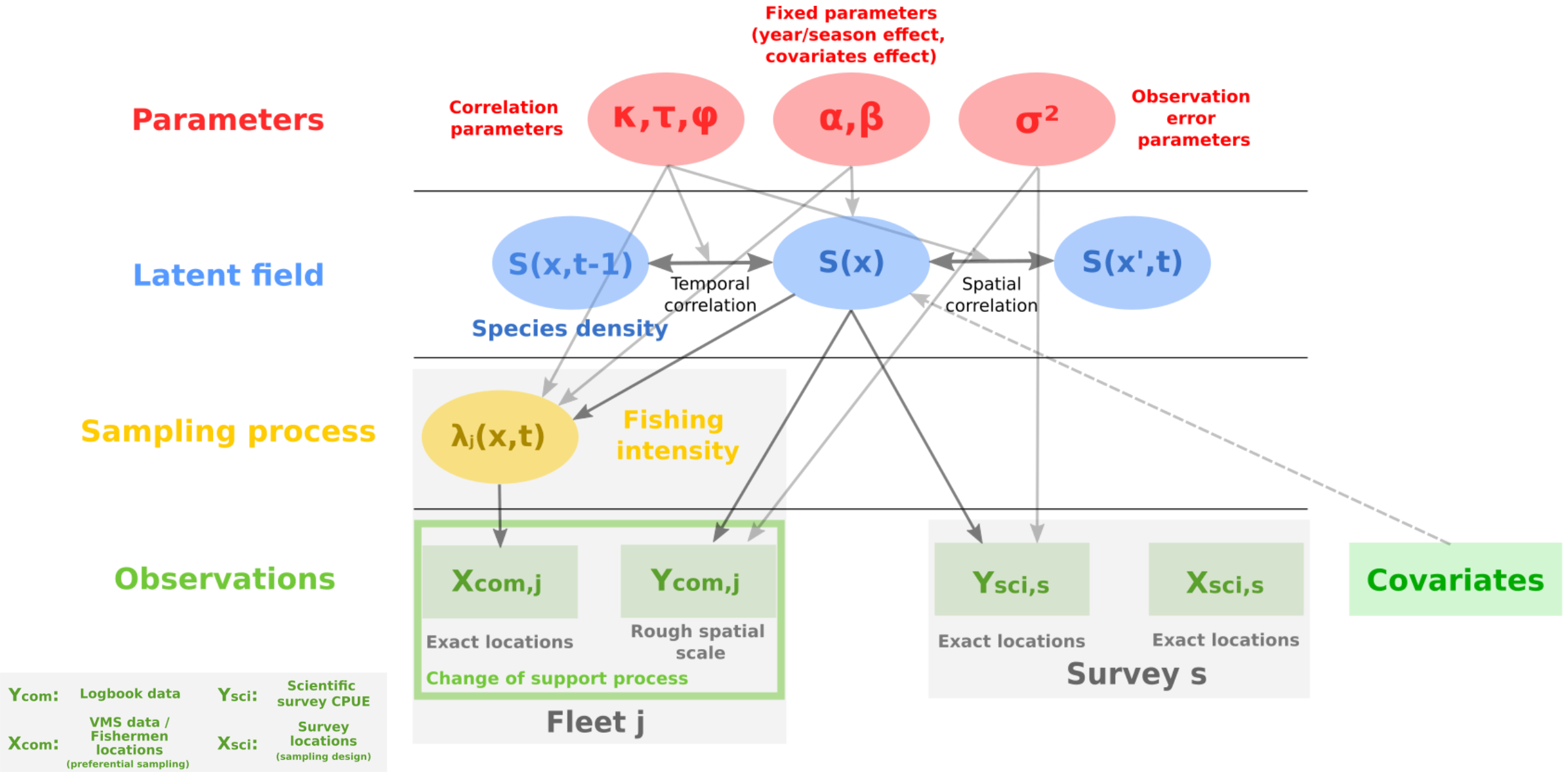


⇒ Reconcile the spatial scales of the data to make fine-scale predictions



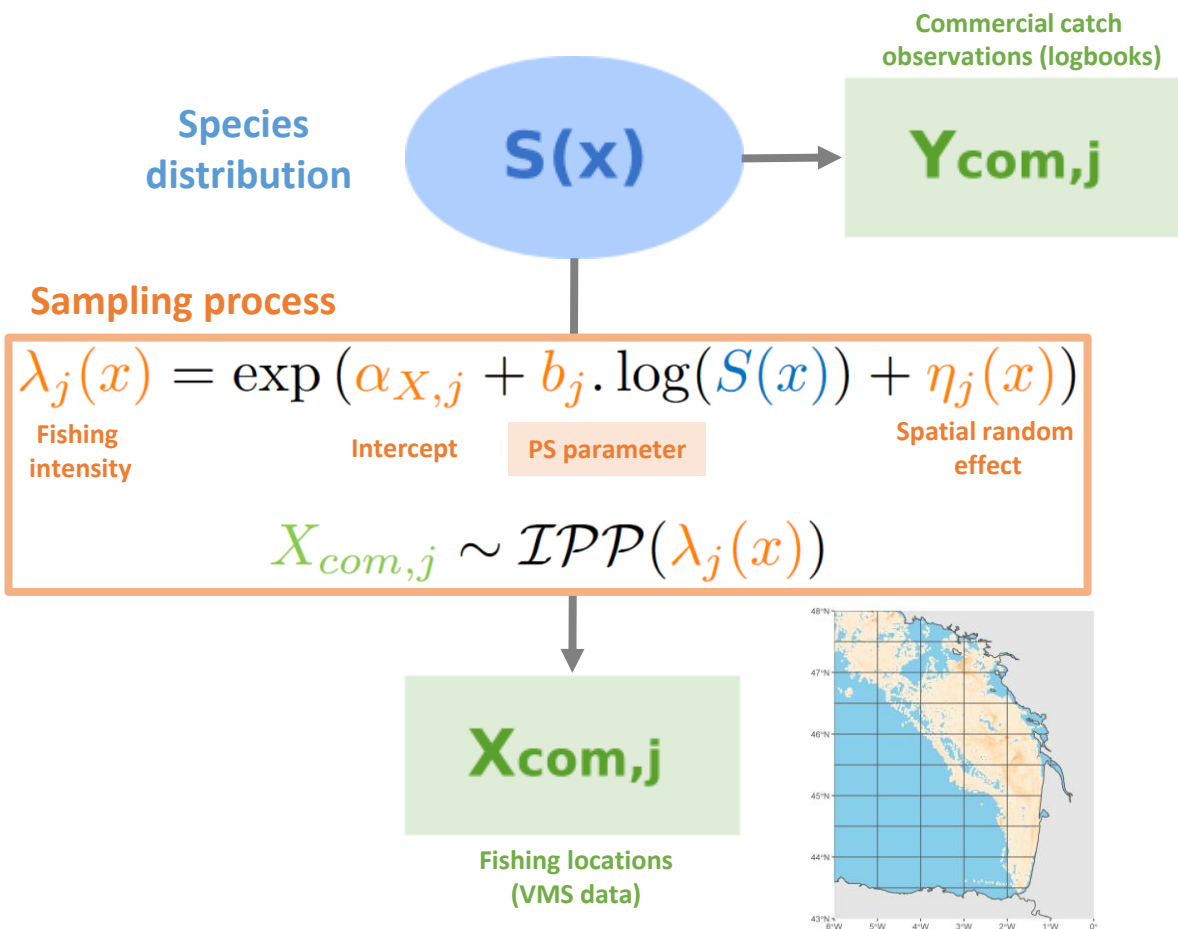


# Conceptual framework

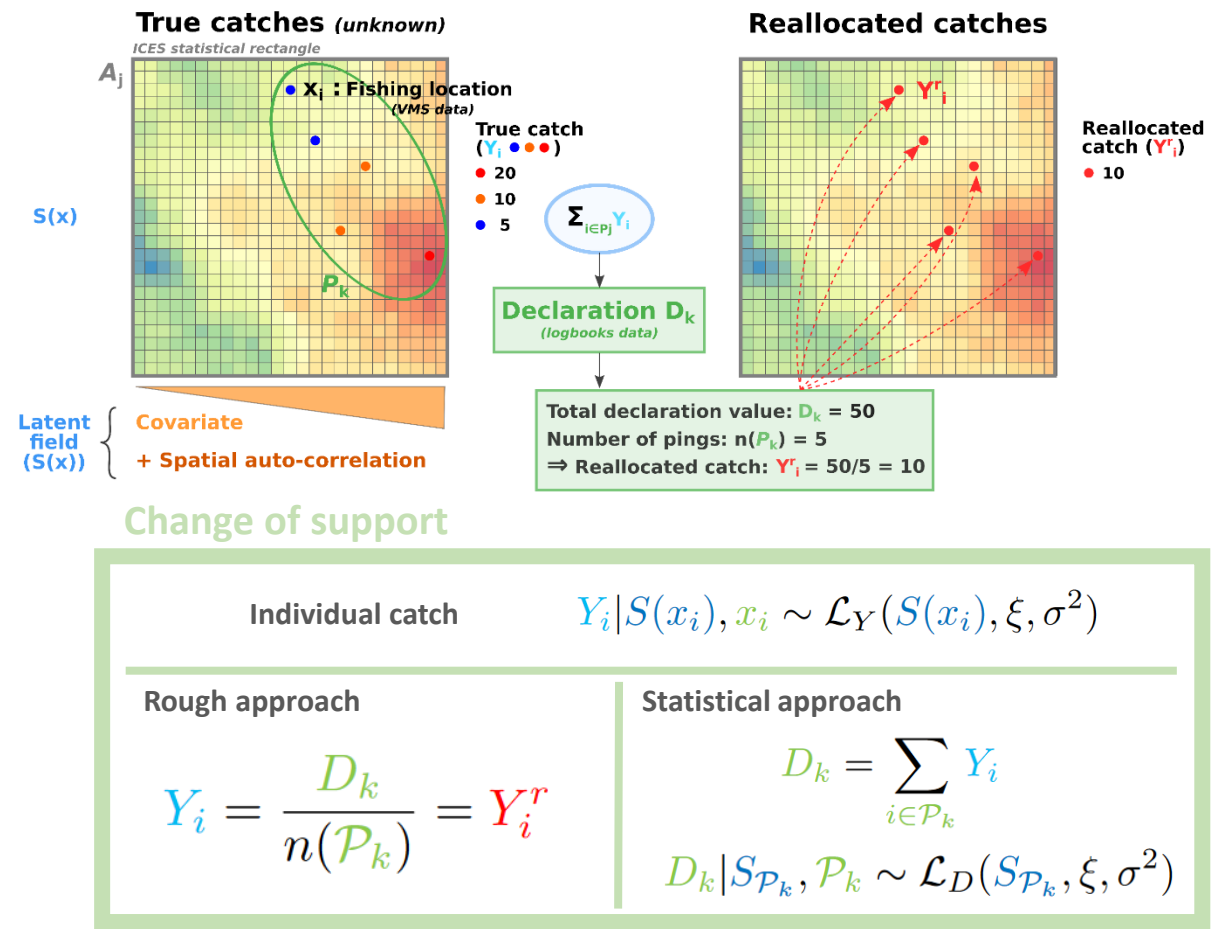


# Modeling PS and COS in a spatial context

## Preferential sampling

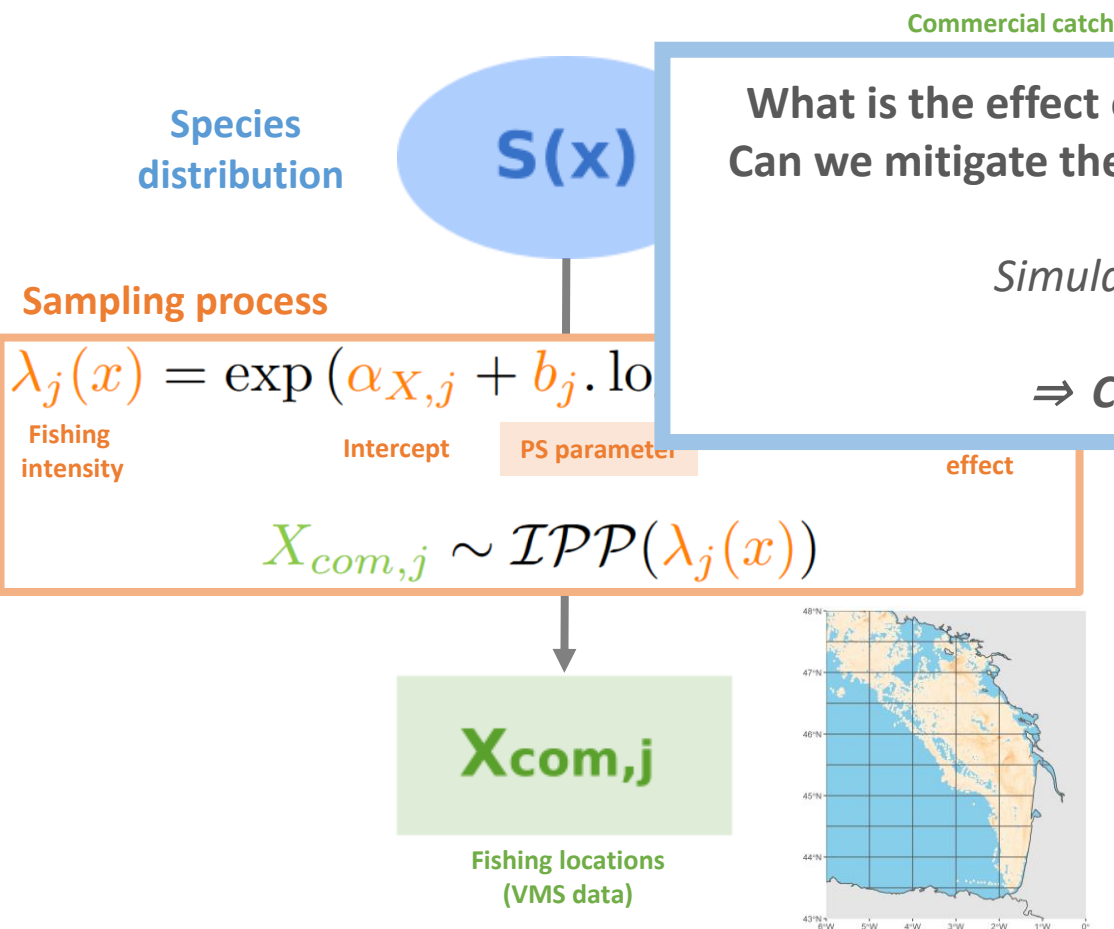


## Change of support

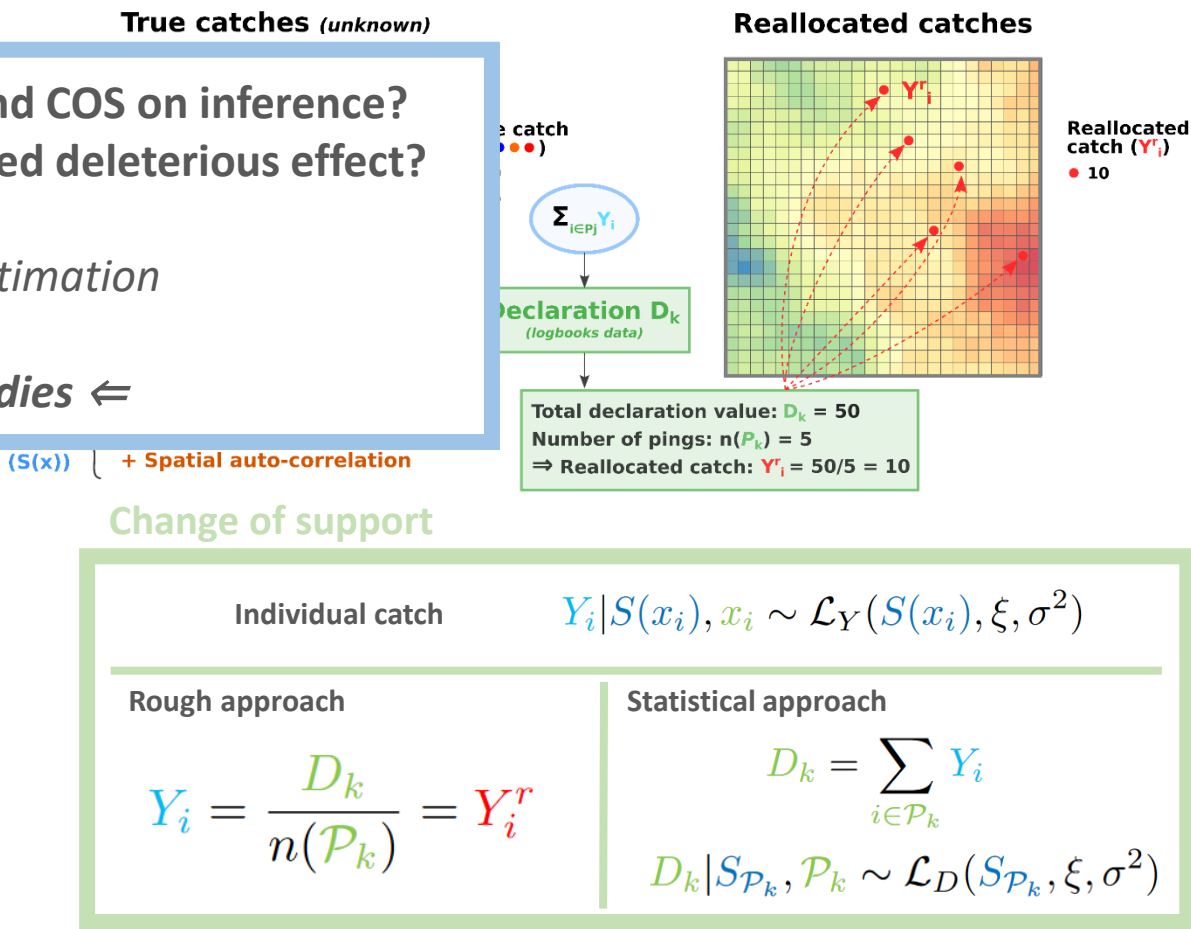


# Modeling PS and COS in a spatial context

## Preferential sampling



## Change of support



# Applications

## Preferential sampling

PS vs. no PS:

Map of predictions' relative difference

Biomass indices ( $B$ )

$b = 1$

Hake

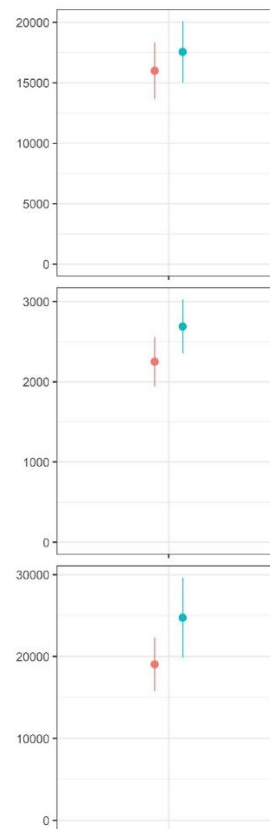
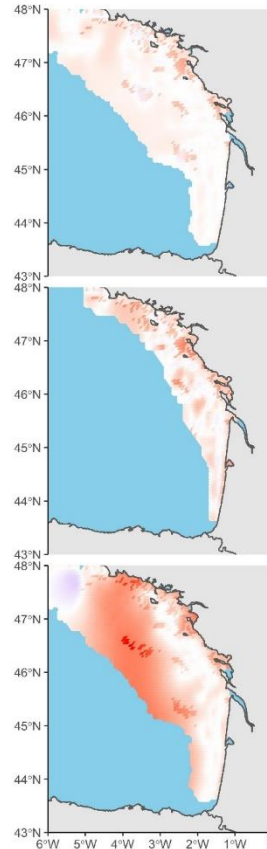
$b = 2$

Sole

$b = 3$

Squids

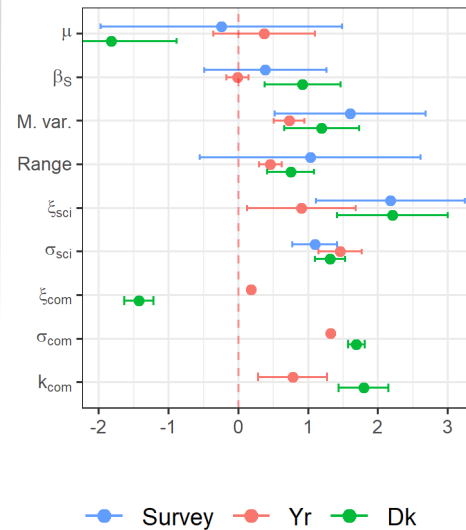
PS no PS



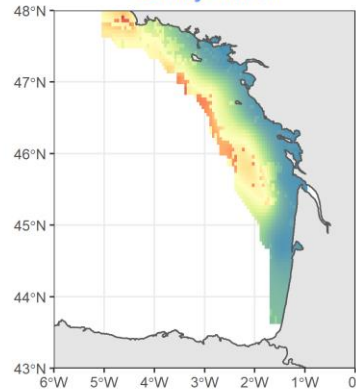
## Change of support



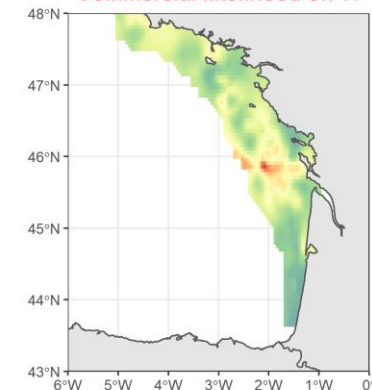
Parameters estimates



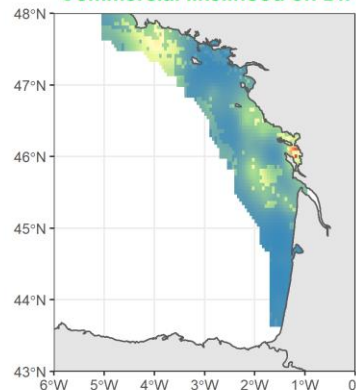
Survey model



Commercial likelihood on Yr



Commercial likelihood on Dk



# Applications

## Preferential sampling

PS vs. no PS:

Map of predictions' relative difference

Biomass indices (B)

$b = 1$

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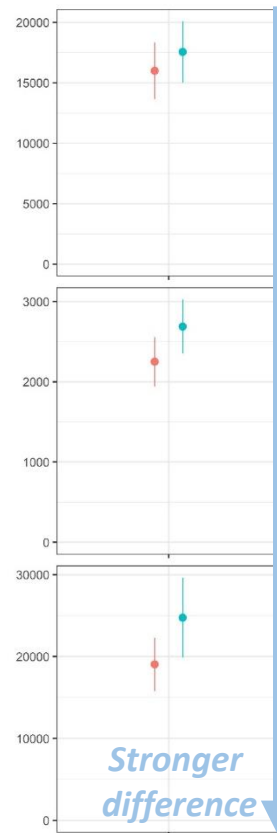
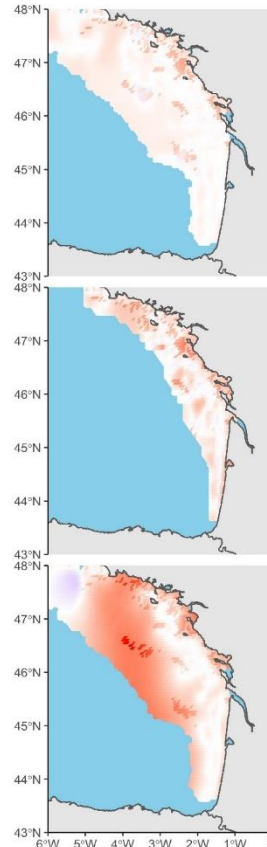
$b = 2$

Sole

$b = 3$

Squids

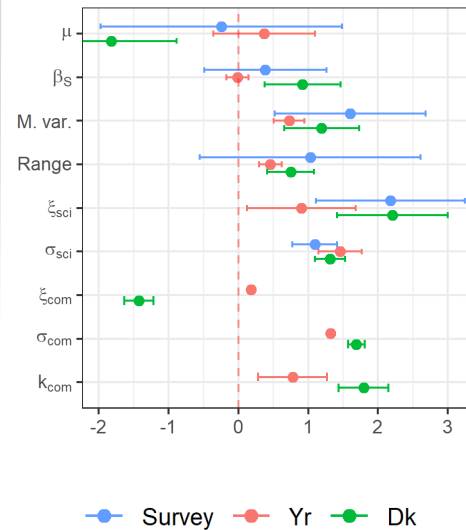
PS no PS



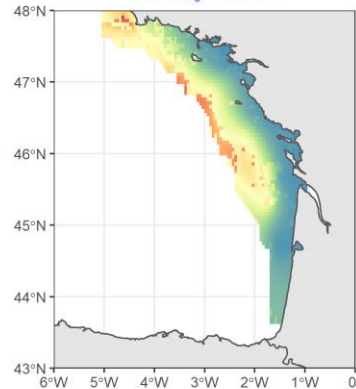
## Change of support



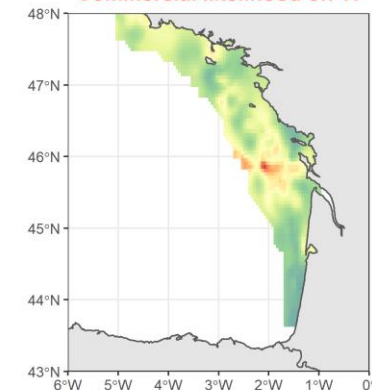
Parameters estimates



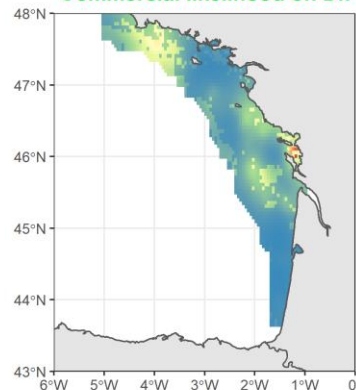
Survey model



Commercial likelihood on Yr



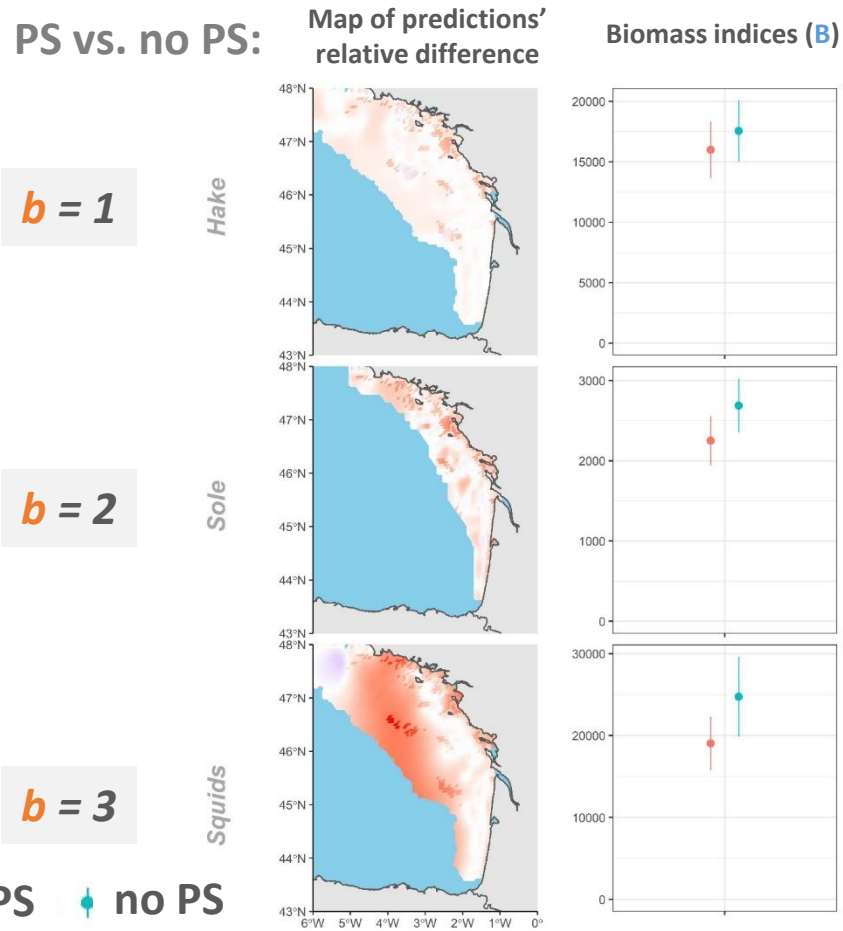
Commercial likelihood on Dk



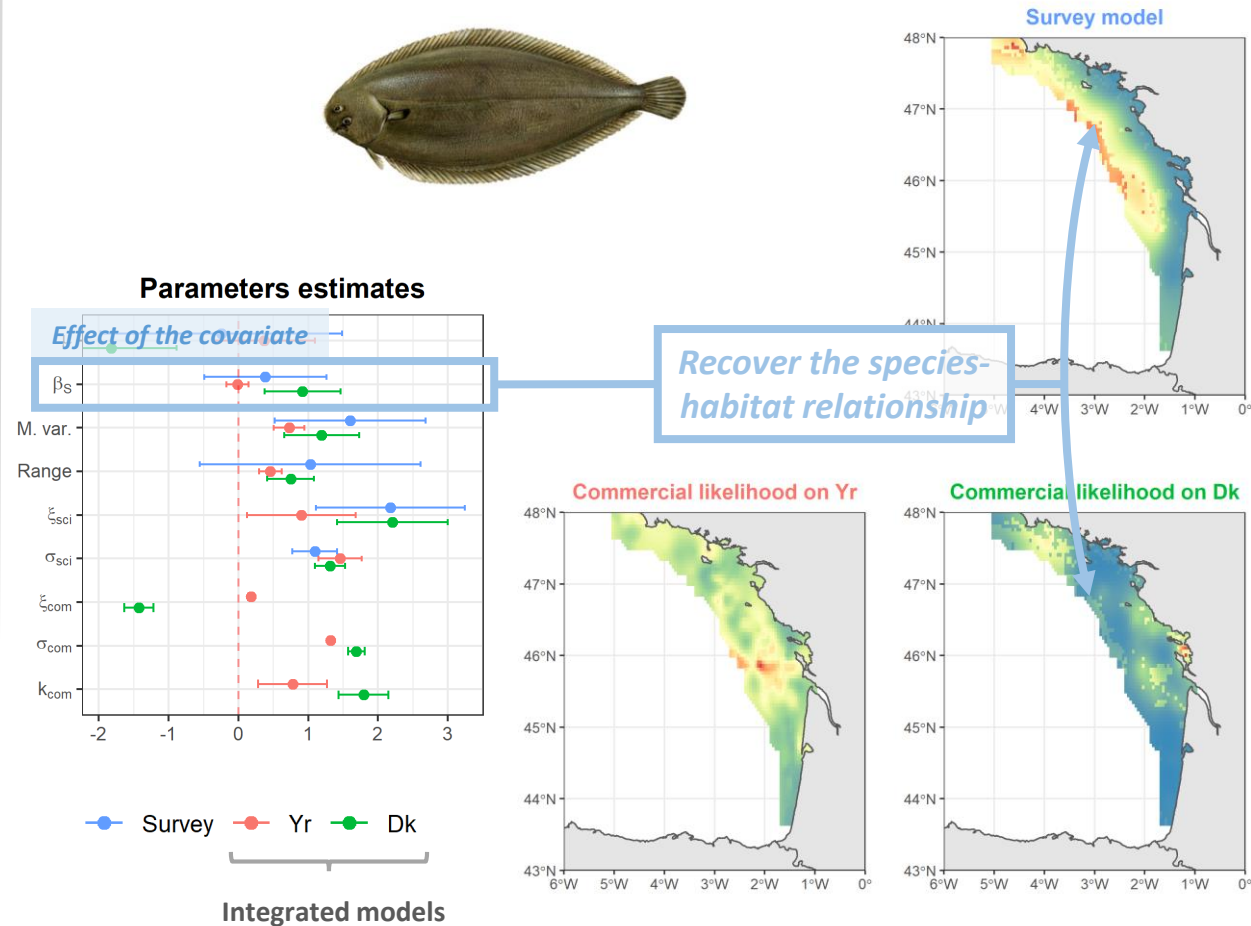


# Applications

## Preferential sampling



## Change of support



# Discussion

- **Not accounting for:**

**Preferential sampling**

⇒ *Positively biased predictions*

**Change of support**

⇒ *Loss of the species-habitat relationship,  
smoothed maps*

- **We provide a framework that potentially deals with both issues (at least separately)**

⇒ *How do they interact?*

- **For more details:**

Alglave, B., Rivot, E., Etienne, M. P., Woillez, M., Thorson, J. T., & Vermard, Y. (2022). Combining scientific survey and commercial catch data to map fish distribution. *ICES Journal of Marine Science*, 79(4), 1133-1149.

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Alglave, B., Vermard, Y., Kristensen, K., Rivot, E., Woillez, M., & Etienne, M. P. (*In prep*). Inferring fine-scale wild species distribution from spatially aggregated data.

Soon available on arxiv

# Discussion

## Applications and perspectives

Marine ecology

Providing fine-scale information for marine spatial planning



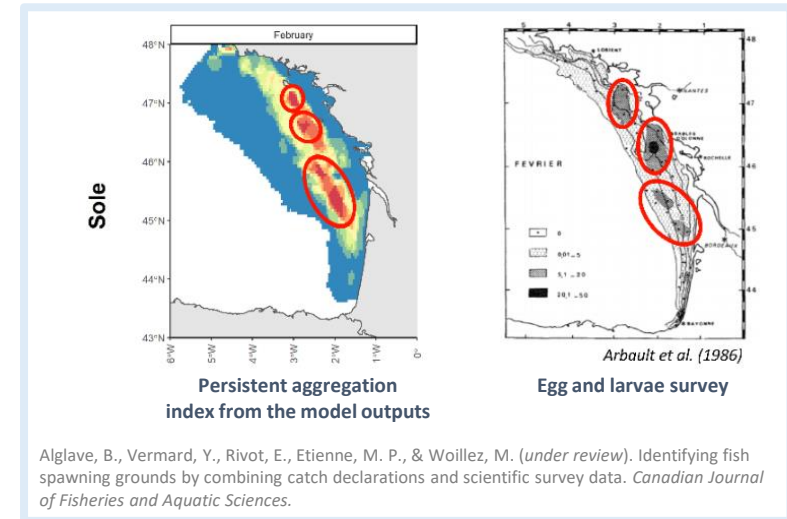
Movement ecology

Potential to extend the framework to include movement

Other potential fields of appli.

Many cases where (complex) data are aggregated over rough scale and/or face preferential sampling

Identifying essential habitats (e.g. spawning grounds)



Movement of fishermen

Sampling process

Movement of fish

Biomass field

Terrestrial ecology

Air pollution

Epidemiology

And possibly others...



A blue and yellow fishing boat is shown from a front-three-quarter view, moving through the ocean. The boat has a blue upper hull and a yellow lower section. It is equipped with various fishing gear, including buoys and a mast with antennas. Numerous seagulls are flying around the boat, some perched on the mast and others in the air. The water is a deep blue with white foam from the boat's wake. A semi-transparent white banner is overlaid across the middle of the image, containing the text "Thank you for your attention!".

# Thank you for your attention!

If any question/suggestion/proposition: [Baptiste.alglave@agrocampus-ouest.fr](mailto:Baptiste.alglave@agrocampus-ouest.fr)