Fishing effort for netters, and key drivers of common dolphin bycatch in the Bay of Biscay

DELMOGES project

6th Meeting of the Steering Group for the ASCOBANS Species Action Plan for the North-East Atlantic Common Dolphin

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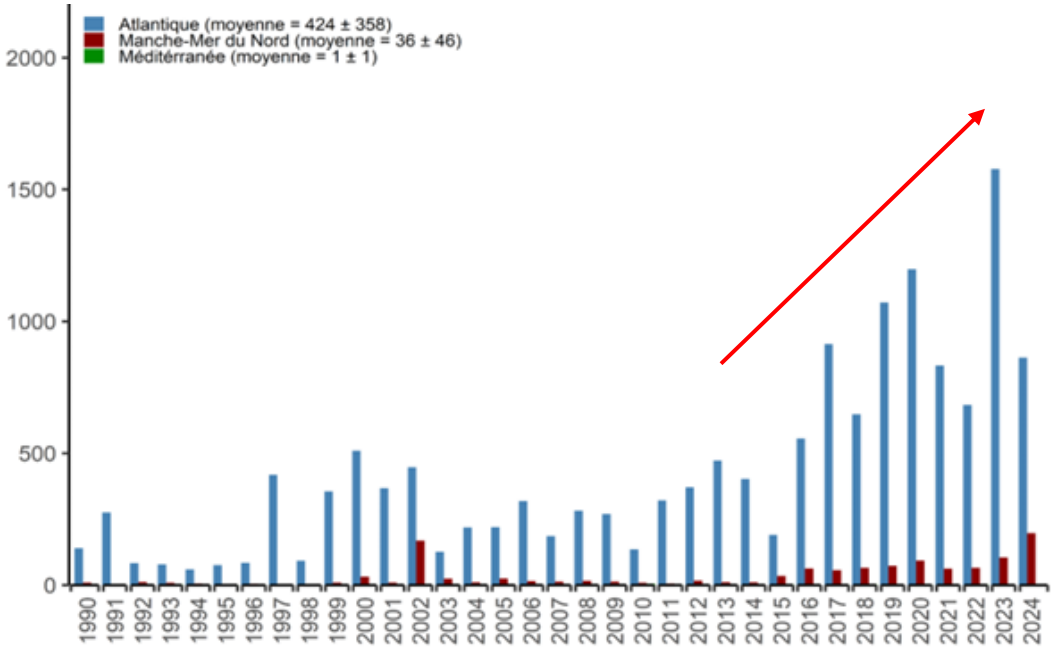
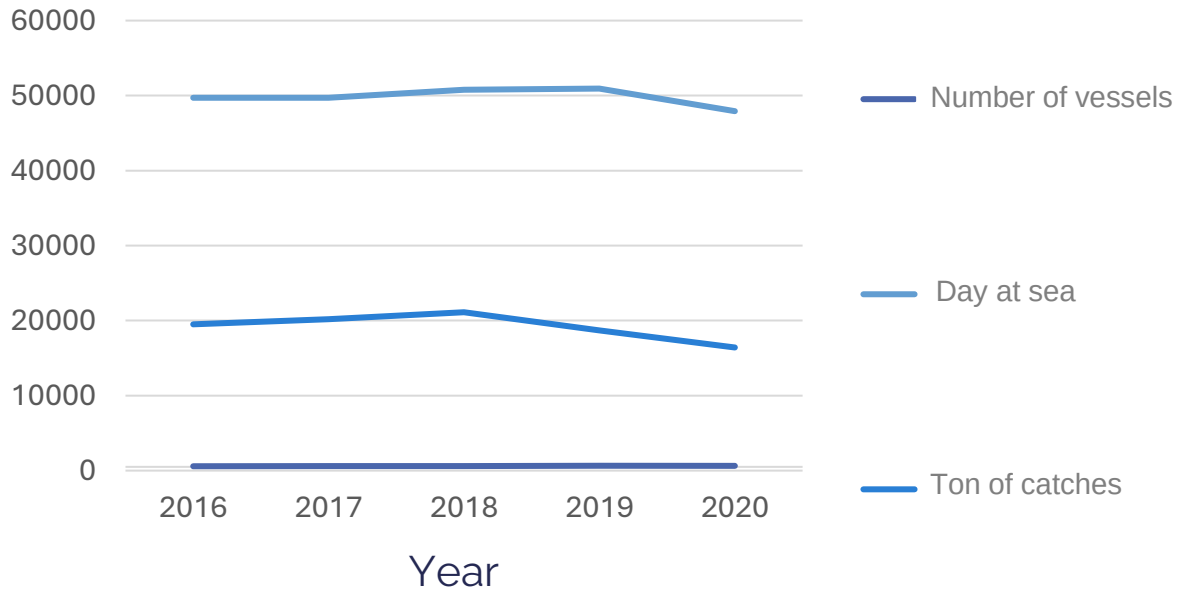
The Hop-o'-My-Thumb white pebbles: how AIS data allow gillnet and trammel net fishing effort to be tracked in the forest of fisheries data

(2026) Deslias C., Dubroca L., Ridoux V. , Bidenbach E. & Peltier H. in review, *Fisheries Research*

Stranding of common dolphin



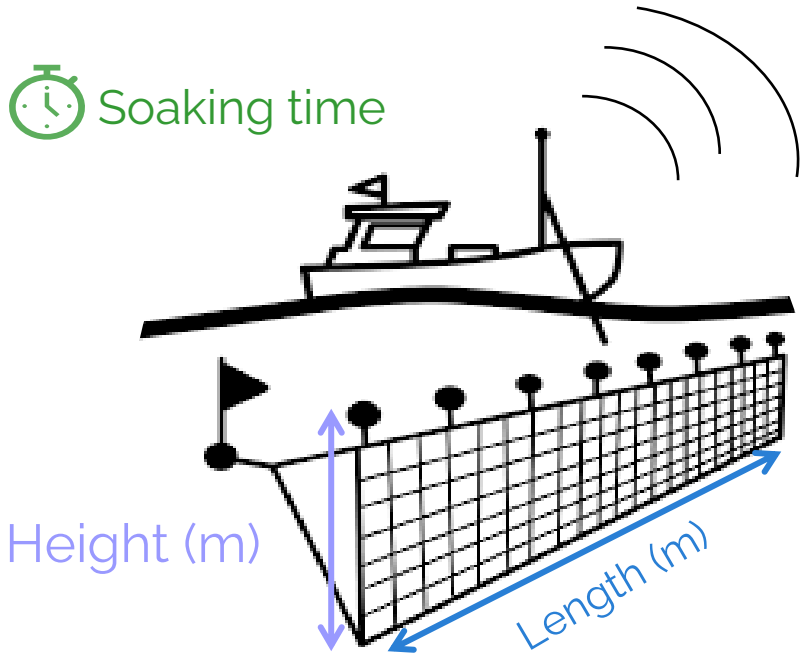
Fishing effort for netters



→ ICES has identified netters as a high-risk fishing gear for bycatch

This fishing effort use general characteristics. For the most accurate cases, fishing effort can be calculated using a speed threshold and a simple decision tree.

→ Don’t take key aspects into account for bycatch, such as soaking time, net height, and net length.



Vessel equipped with a geolocation device: allows the vessel's position to be determined at defined intervals

OBJECTIVE

Calculate fishing effort more accurately using high-resolution geolocation data to identify fishing operations and associated net metrics

Data

From 2016 to 2023

Geolocation data

Cerema CLIMAT & TERRITOIRES DE DEMAIN

All

AIS - Automatic Identification System

> 15 m

Few minutes

Fishing data

Ifremer

SACROIS UN ALGORITHME DE CROISEMENT DE DONNÉES

SACROIS

Typology

On board observers

Mean heigt of the net

Targeted species

- Sea bass
- Hake
- Sole

Material & methods

1. Using vessel ID and logbook, we identify the main gear and the main target species. Based on onboard observer data, we can then estimate the net height.

Vessel ID 10

- Gear : trammel net
- Distance : coastal
- Targeted specie: soles
- **Heigth : 1m**

Material & methods

lapesca package

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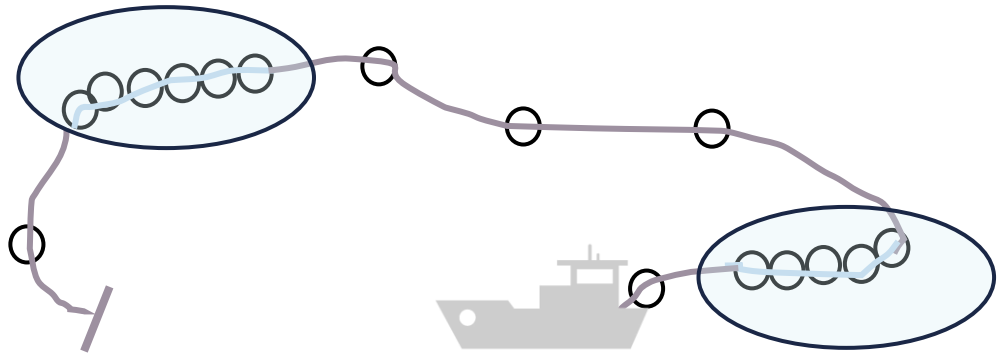


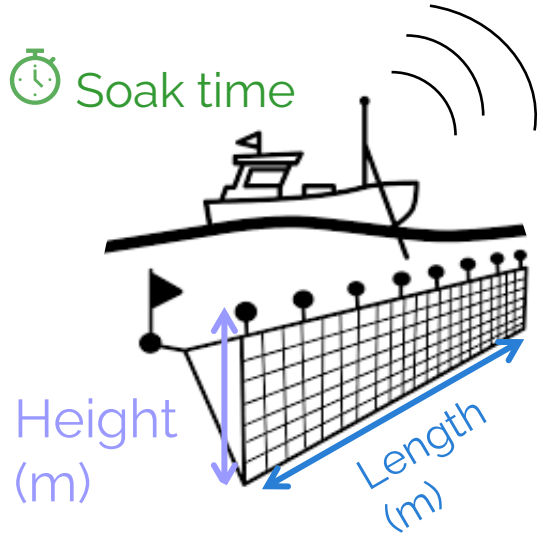
2. With vessel trajectories, we can identify fishing operations and estimate net length

Length 

3. We detect the start and end of the fishing operation when the vessel comes back to the net, and we estimate the net soak time

Soaking time 

Material & methods

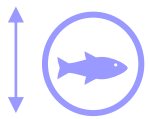


1. Using vessel ID and the logbook, we identify the main gear and the main target species. Based on observer data, we can then estimate the net height.

2. With the vessel trajectories, we can identify the fishing operation and estimate a length of the net

3. We detect the start and end of the fishing operation when the vessel comes back to retrieve the net, and we estimate the net soak time.

Heigth



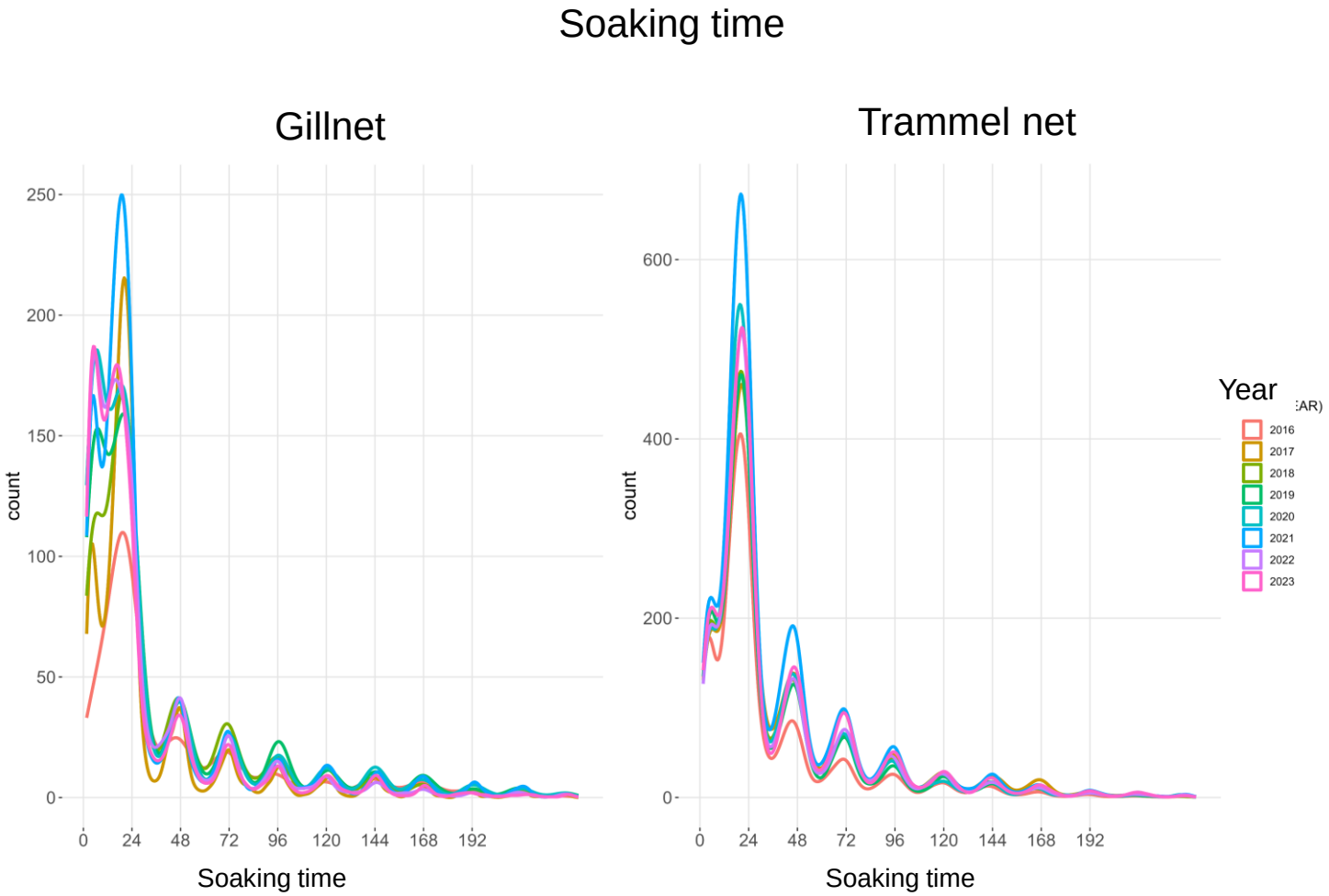
Length

Soak time

Fishing effort = soaking time x height x length → $km^2.h$

Results

- Consistency of practices over time
- Most fishing operations last between 0 and 24 hours

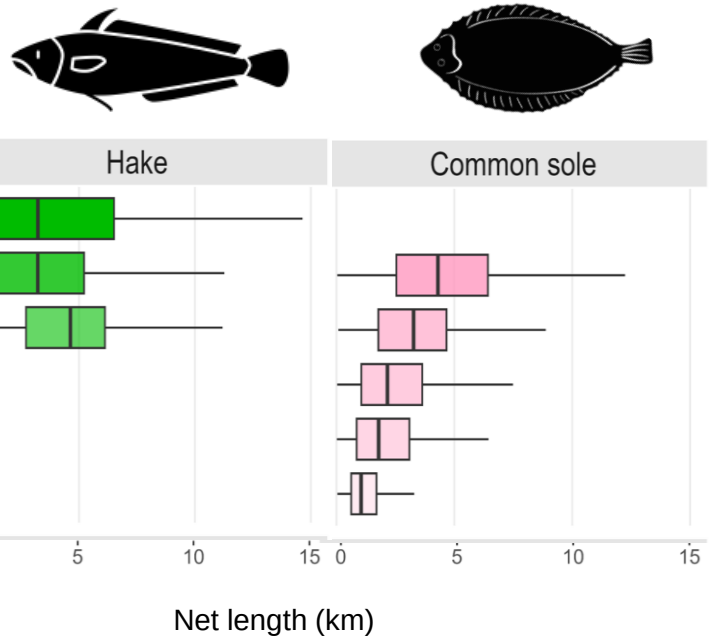


Results

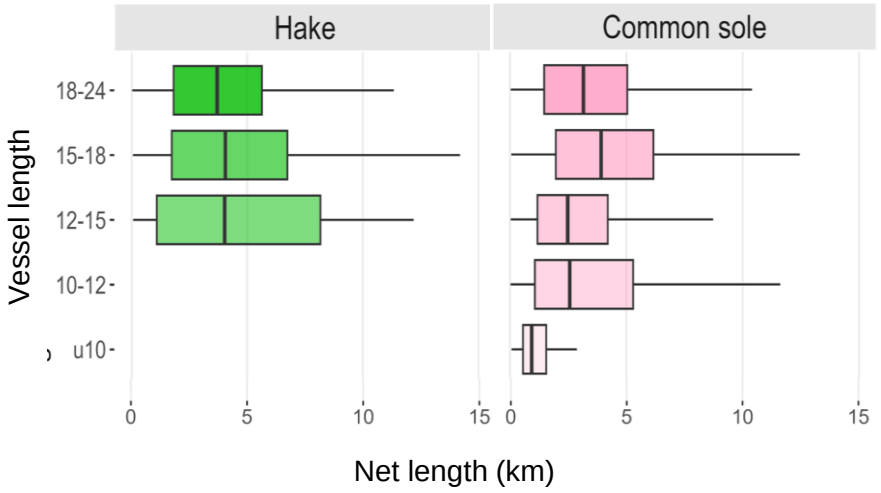
- The larger the vessel, the longer the nets — but not always.

- Net length ranges widely, from 0 to 15 km

Gillnet



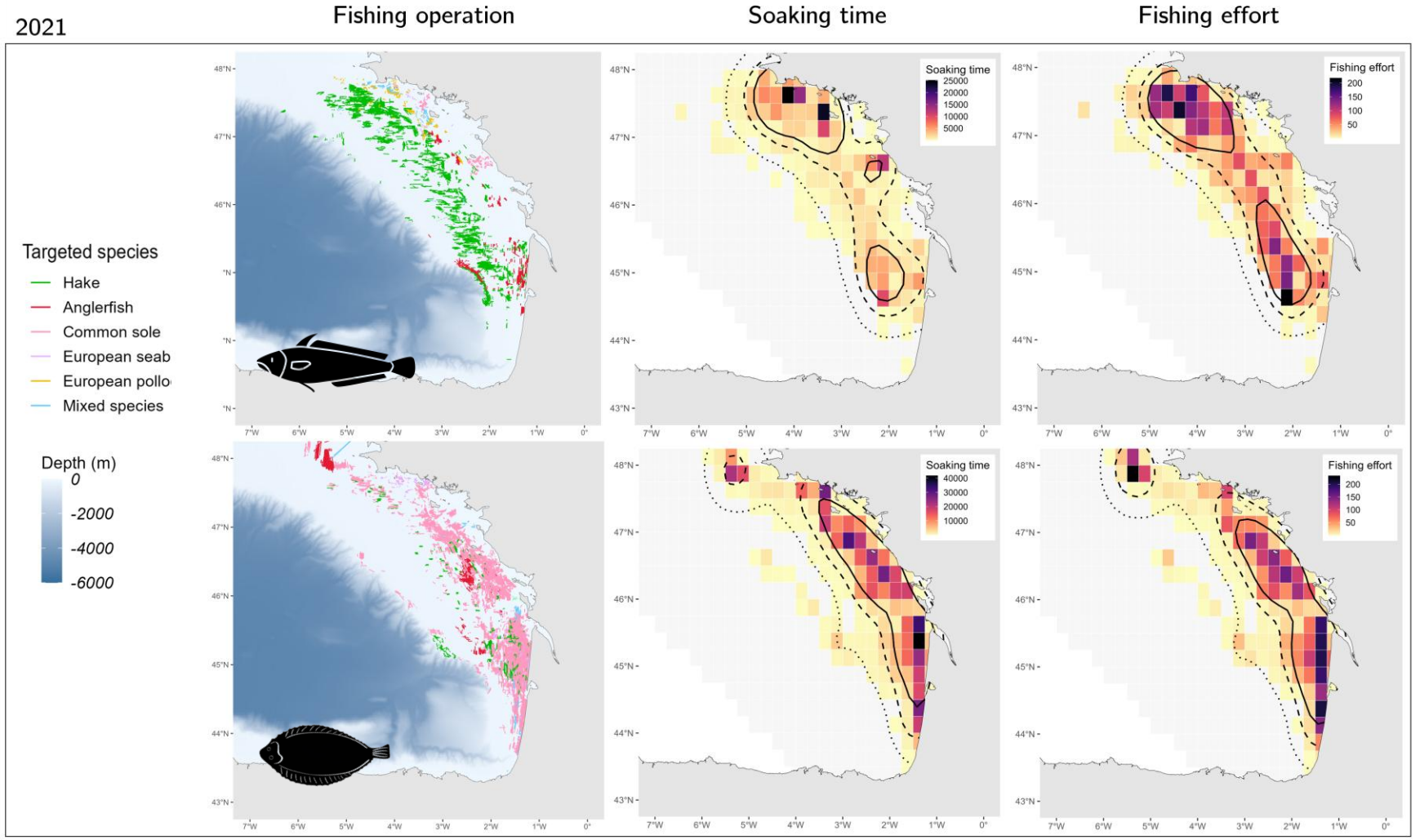
Trammel net



Results

- Hake– gillnet
- Sole – trammel net

- Immersion time: allows identification of high-pressure areas but is not sufficient to represent the intensity of fishing effort.



Discussion

AIS

mandatory > 15 m

- Vessel representativeness:
  - ✓ Good :]12-15]
  - ✗ Poor : < 12 m

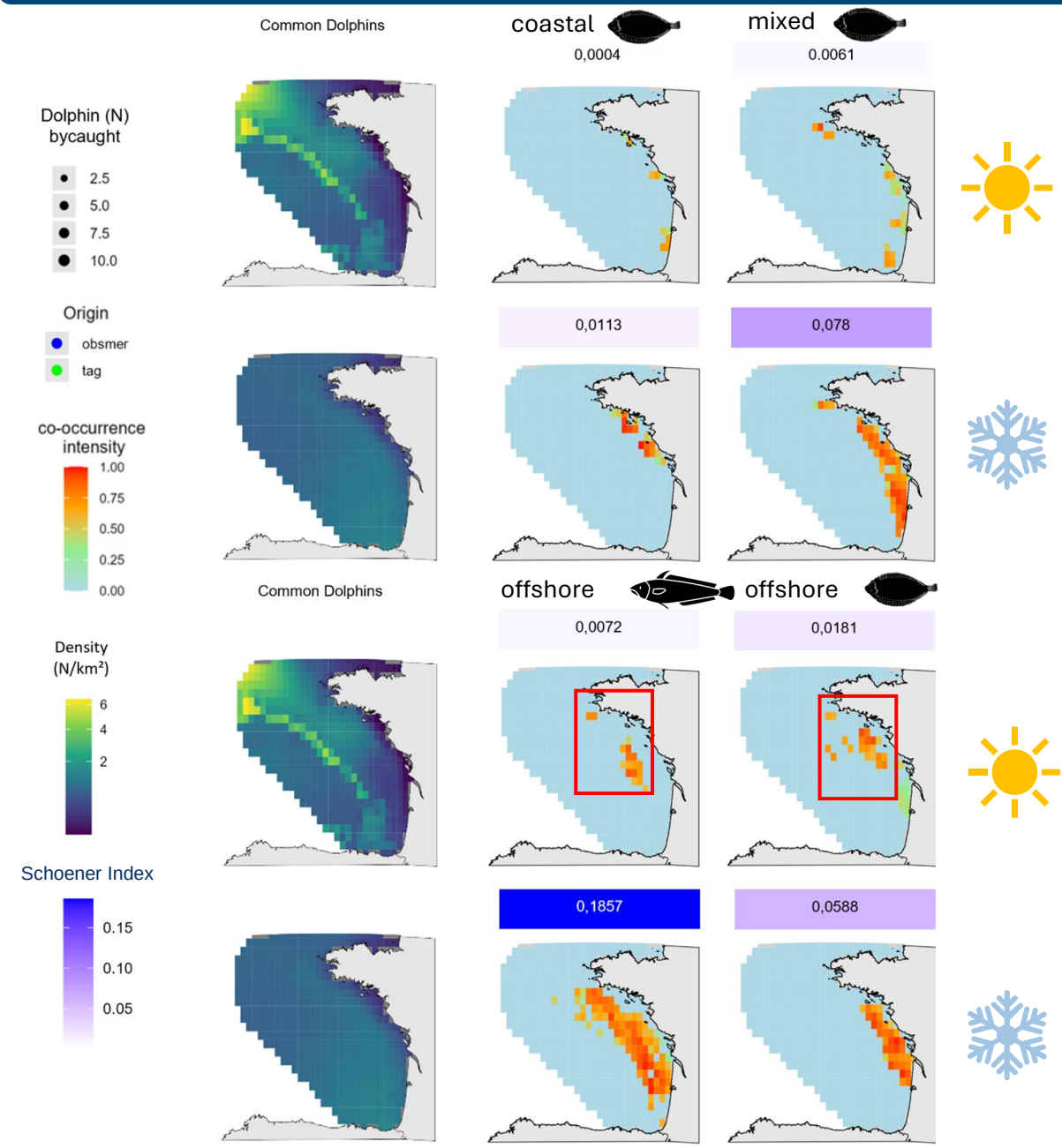
Vessels length	% of vessels
> 15 m	82
]12m-15m]	85
]7m-12m]	14
All vessel	23

- Precision vs. generality: Fishing effort is more precise but less generalizable

  → Importance of high-frequency VMS data

- This method can be applied wherever high-resolution geolocation data are available and is not restricted to bycatch-related issues.

→ **Additional factors to be considered in subsequent analyses**



2016 SCANS-III

2021 SAMM-II

Co-occurrence - Risk assesment

Most at risk typology :

Offshore

Mixed

Some areas offshore of the Loire-Atlantique and in the south of Brittany, which could be linked to the stranding pattern we observe.

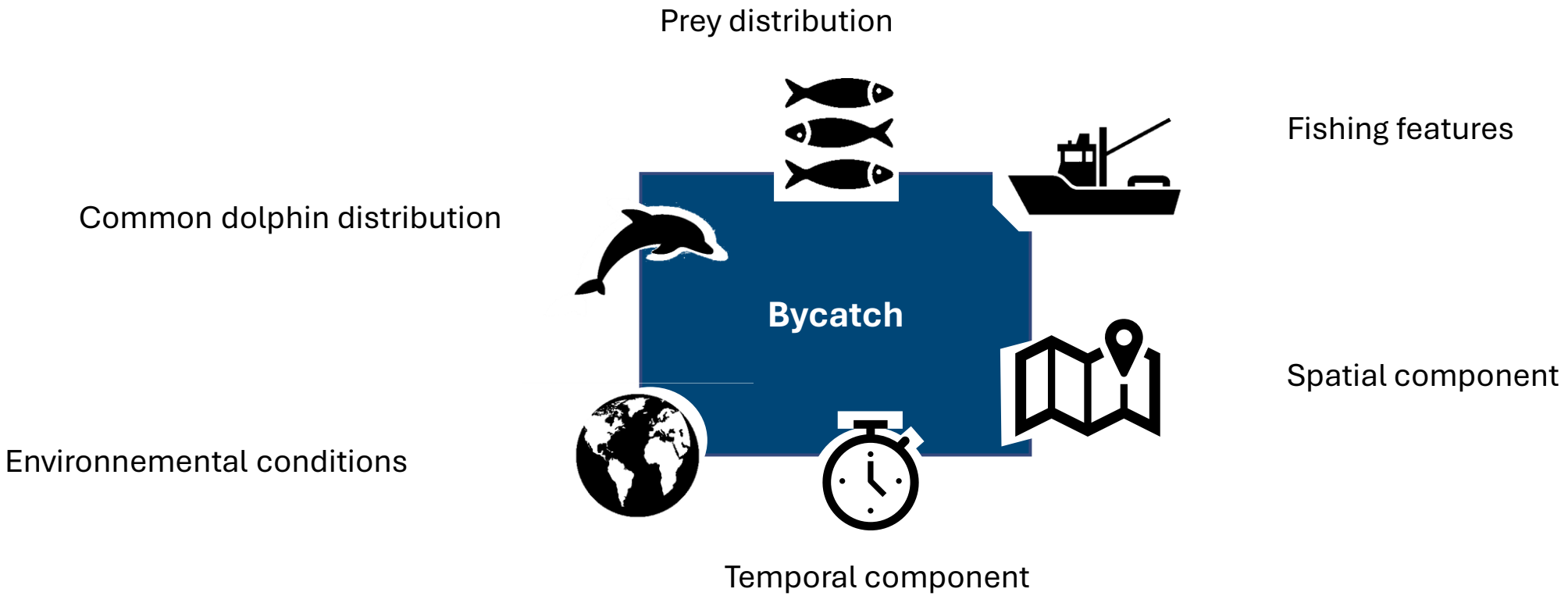
Identifying **key drivers** of common dolphin *Delphinus delphis* bycatch in the Bay of Biscay using supervised Machine Learning

Deslias C., Dubroca L., Ridoux V., Tachoires S., & Peltier H. in prep

Introduction

Numerous technical solutions have been tested to mitigate bycatch.

→ **Limited understanding of the factors affecting bycatch**



Introduction

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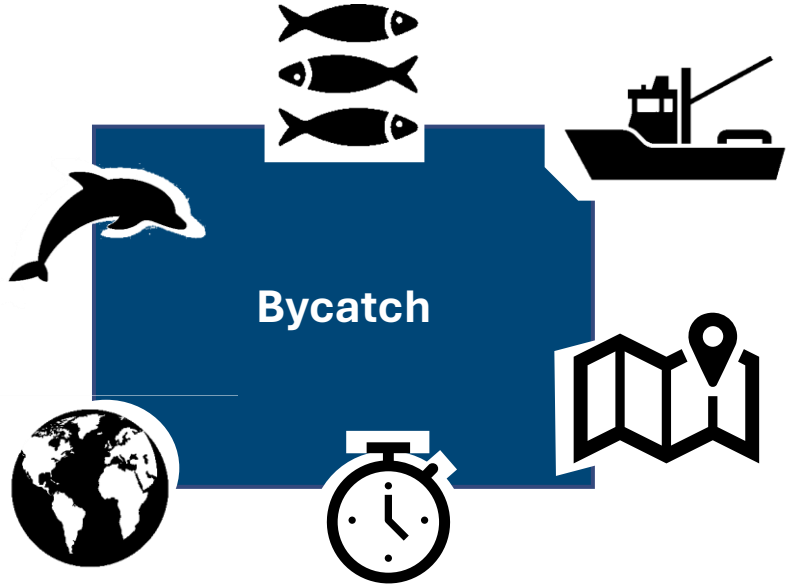
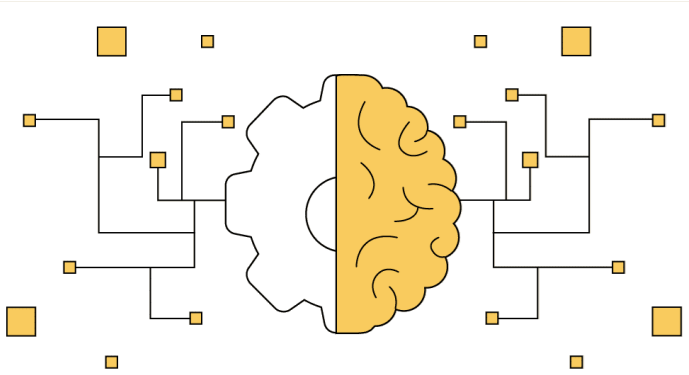


Various sources of highly heterogeneous and correlated data



Non-convergent parametric models

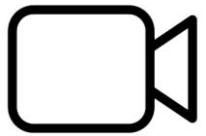
→ Use of machine learning: Random Forest

- Similar method used to explore and predict bycatch (Mannocci et al., 2021; Inoue et al., 2017)
- Allows assessing the relative importance of each variable

Material & Methods

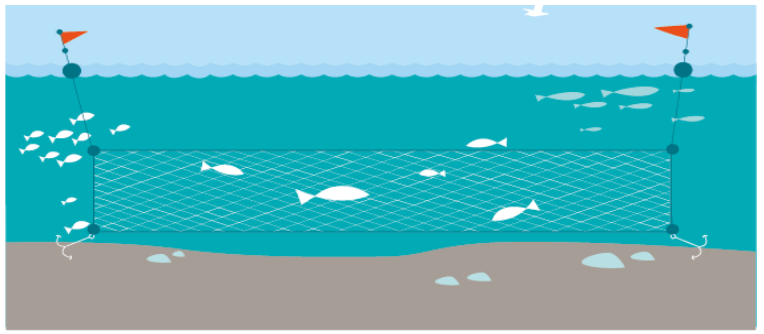
data

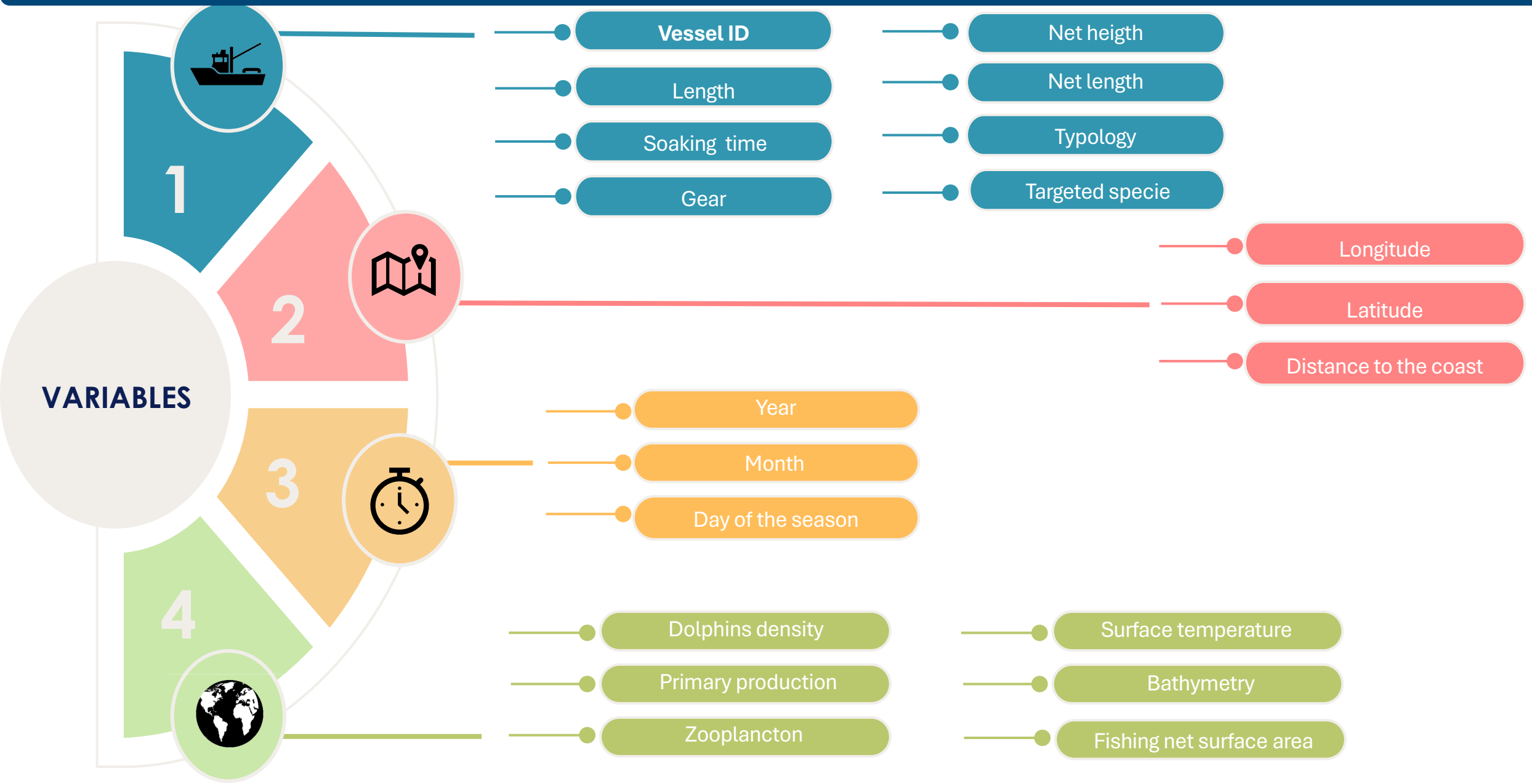
On board observer
2016 – 2023 from december to march



On board electronic device
2022 – 2023 from december to march

~7 000 fishing operations




VARIABLES
1
Vessel ID
Length
Soaking time
Gear
Net heigth
Net length
Typology
Targeted specie
2
Longitude
Latitude
Distance to the coast
3
Year
Month
Day of the season
4
Dolphins density
Primary production
Zooplancton
Surface temperature
Bathymetry
Fishing net surface area

Random Forest

- Forest of decision tree
- It randomly selects rows and variable to create subsamples and build decision tree grom them
- It repeat this process many times to cover all the datasets

→ Learn about data

Résultats

Variables importance

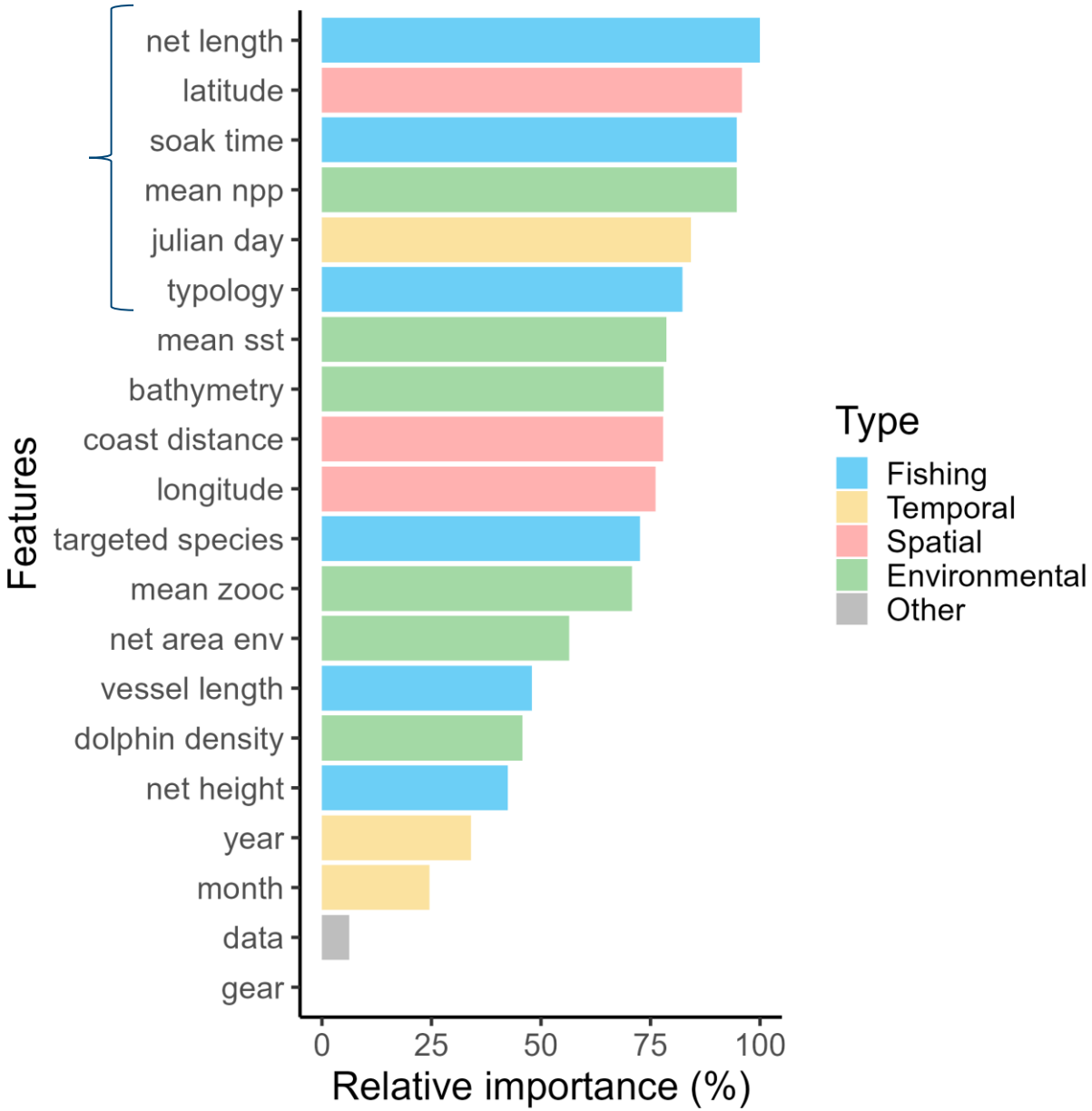
→ Effect of each variable on model improvement during splits

- The most important variable is the one with the highest improvement score.
- Relative importance (in %) is calculated compared to the most important predictor.

The six most important variables include all variable types.

Among these six variables:

- 3 fishing variables
- 1 temporal variable
- 1 spatial variable
- 1 environmental variable



Discussion

- Net length, immersion time and typology

  Impact on cetacean bycatch and other taxa (turtles, seabirds)(Northridge et al. 2017)

  Impact on Atlantic white-sided dolphin (drift gillnets – Canadian Atlantic waters), but no impact on harbour porpoise (gillnets – Danish waters)(Kindt-Larsen et al., 2023; Stenson et al., 2011))

  → Need to have access to their information

  Highlighting very coastal gillnetters: absent from AIS data?

  → Need for all fishing vessels to be equipped with a high-resolution geolocation system

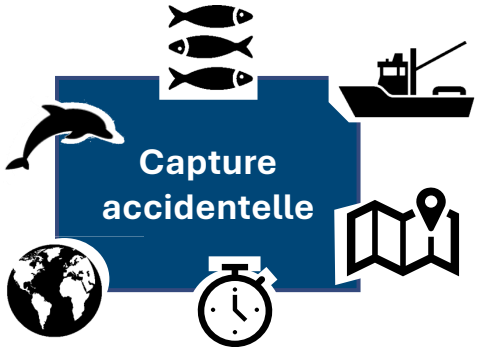
- Latitude

  Correlated with dolphin distribution along a north–south gradient.
  Higher sampling effort of onboard cameras in the south

- Day of the season

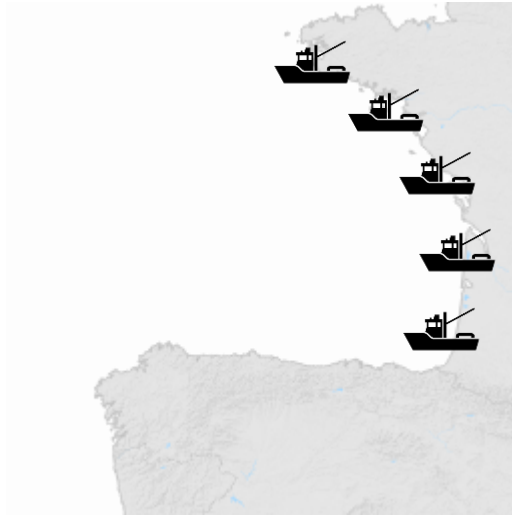
  Aligned with stranding peaks occurring in mid-January and mid-February.

Discussion



- Data on dolphin distribution is missing: both horizontally and vertically

- This method allows for the identification of **key factors** influencing bycatch and highlights the operational factors on which management measures can be implemented



- **A more extensive and representative sampling** of the fleet, across métiers and spatial distribution, is necessary

- This is an **innovative method**, yet a better understanding of its limitations is required

Thank you for your attention