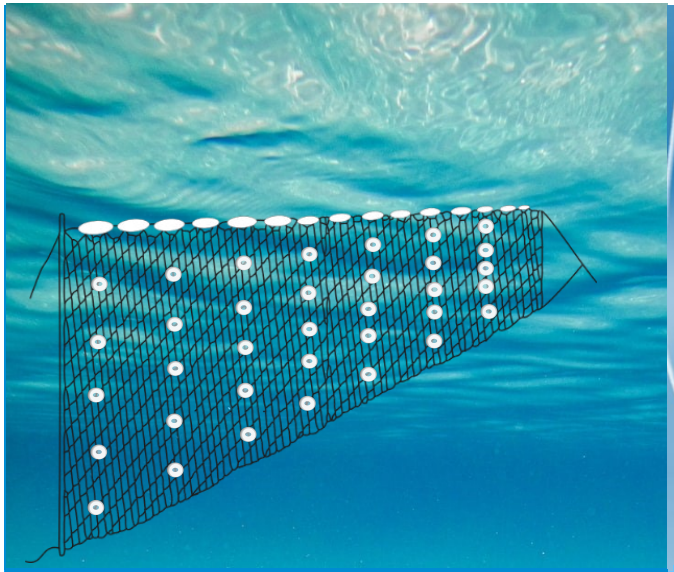
The PearlNet:

Application of acoustic reflectors in set nets to reduce bycatch of harbour porpoises and other odontocetes while keeping fish catches high

Thomas Noack, Andrea Milanelli, Sara Berzosa, Hannah Schartmann, Uwe Lichtenstein, Isabella Kratzer, Daniel Stepputtis
Thünen Institute of Baltic Sea Fisheries, Rostock, Germany

funded by Bundesamt für Naturschutz



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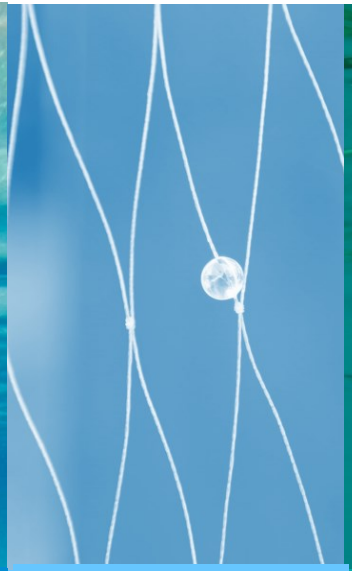
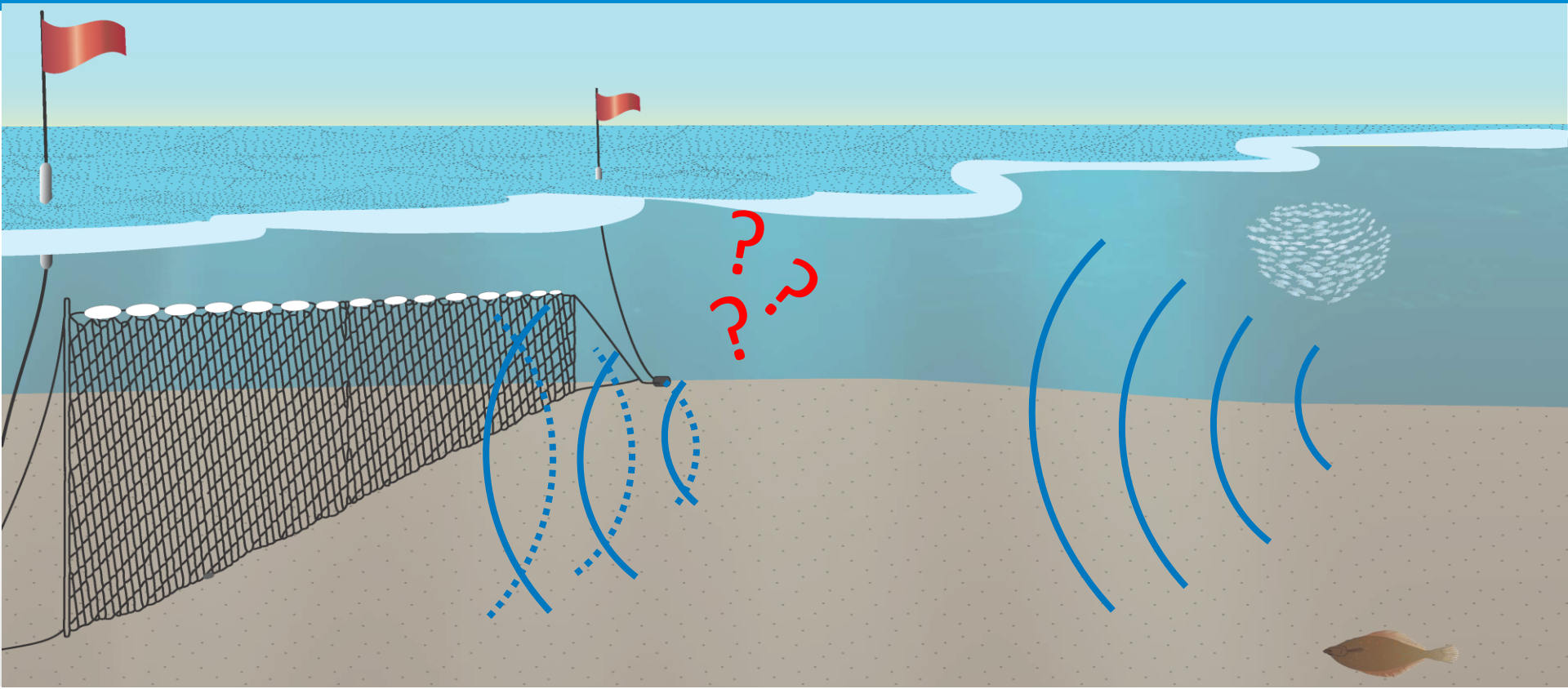


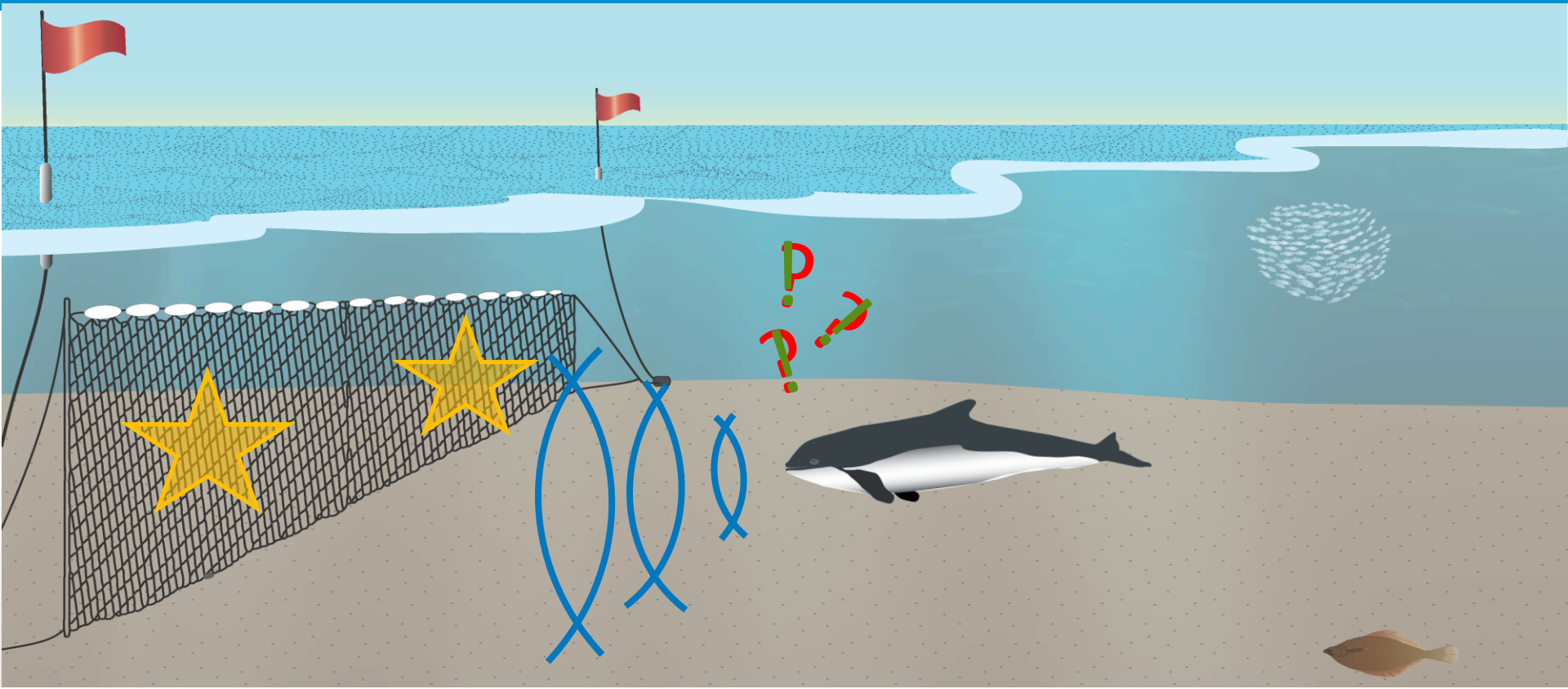
Zandvoort

13/03/2024

The Problem



The Problem



Development of the *PearlNet*

Identification of optimal acoustic reflector

- strong echo
- omnidirectional
- small
- neutrally buoyant

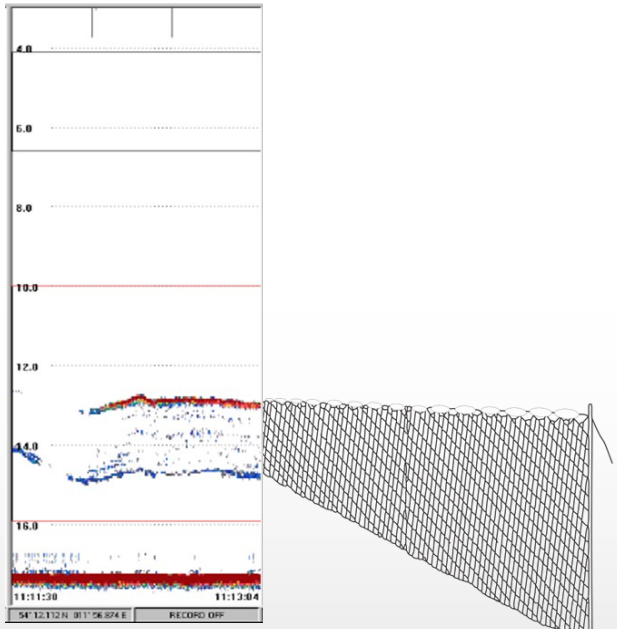
PMMA, ⌀ 8 mm

Design guide

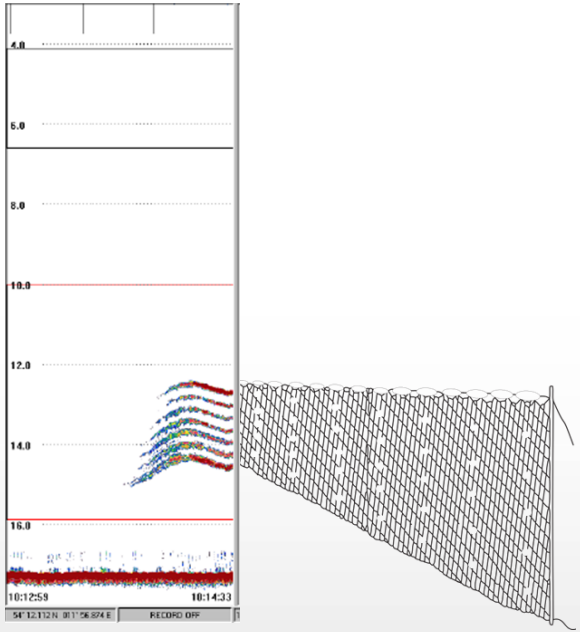
Species	Centroid frequency [kHz]	Sphere size [mm] ≤ 10 mm (TS [dB])
Lissodelphis borealis	18.2	**10 (–75.65)**
Delphinus delphis	112	9.9 (– 37.43)
Phocoena phocoena	130	8.5 (– 38.78)
Lagenorhynchus obliquidens	94.6	8.1 (– 37.78)
Phocoenoides dalli	133	8.3 (– 38.97)
Neophocaena phocaenoides	125	8.9 (– 38.47)
Stenella coeruleoalba	40	**10 (–67.60)**
Pontoporia blainvillei	130	8.5 (– 38.78)
Tursiops truncatus ponticus	80	9.6 (– 36.28)
Lagenorhynchus obscurus	73.8	10 (– 38.04)
Phocoena sinus	132	8.4 (– 38.86)
Phocoena phocoena relicta	presumably 130	8.5 (– 38.78)
Platanista gangetica	64.4	**10 (–53.14)**
Orcaella brevirostris	94.6	8.1 (– 37.78)
Inia geoffrensis geoffrensis	101.2	7.5 (– 38.38)
Cephalorhynchus hectori	124	8.9 (– 38.41)

Development of the *PearlNet*

Identification of optimal acoustic reflector



Standard gillnet



PearlNet

Catch efficiency of the *PearlNet*

Trials by DTU Aqua

- **Logbook**
- **EM**

Hauls: 17

Total catch: Standard (221 nets): 655 kg

PearlNet (85 nets): 260 kg

Species: Cod, Flatfish

Bycatch: 0

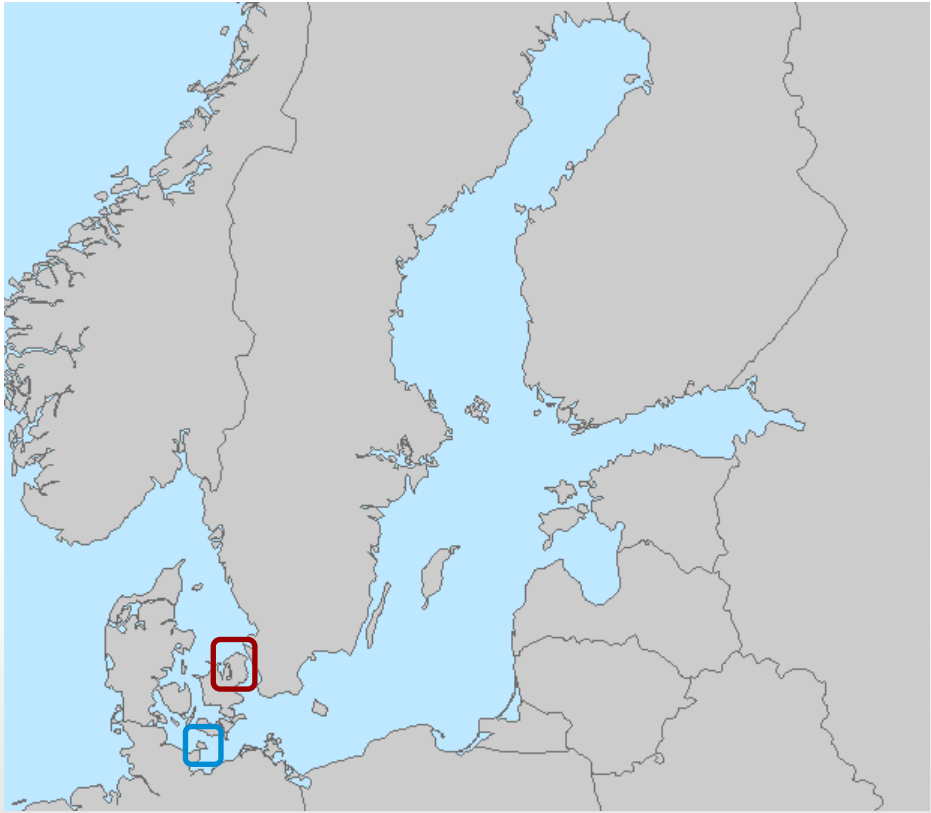
Catch efficiency of the *PearlNet*

Trials by DTU Aqua

- **Logbook**
- **EM**

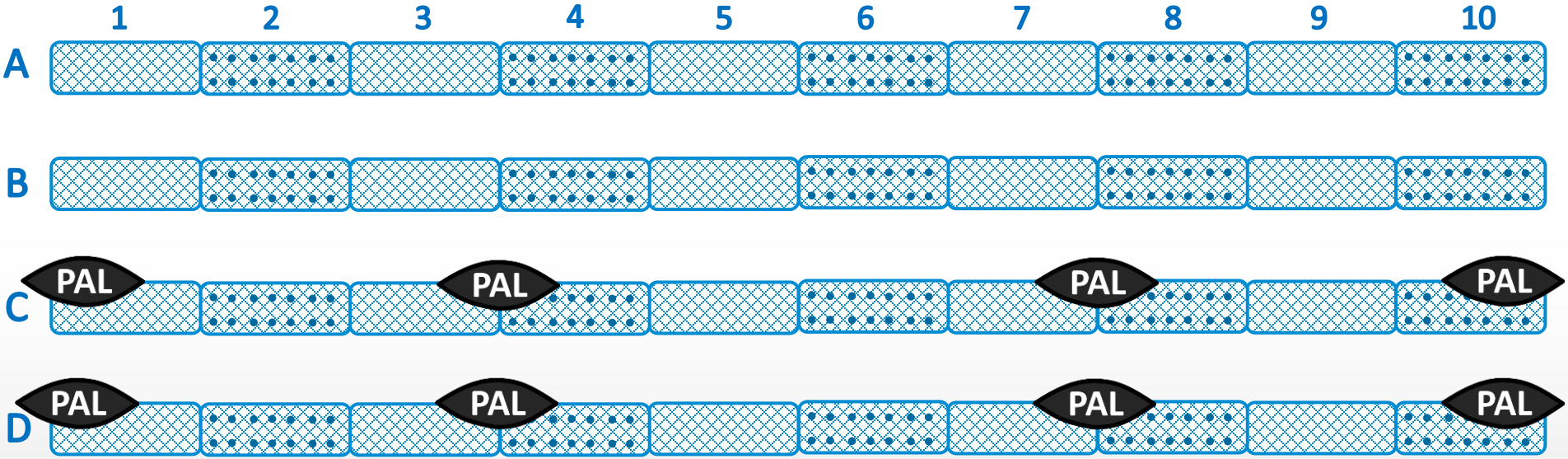
Trials by Thünen

- **Observer**



Catch efficiency of the *PearlNet*

Setup



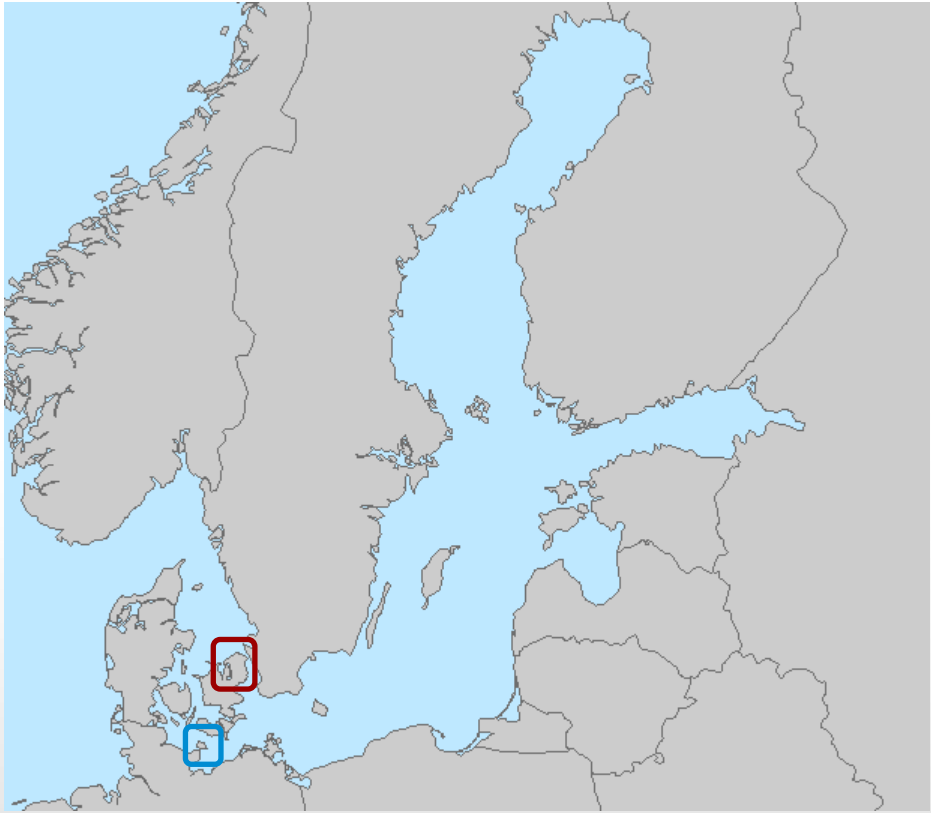
target: flatfish type: trammel net height: ~2 m mesh opening: 150 mm

Catch efficiency of the *PearlNet*

Trials by DTU Aqua
- **Logbook**
- **EM**

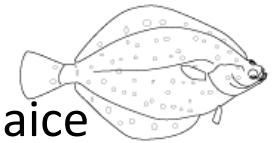
Trials by Thünen
- **Observer**

Hauls: 20
Total catch: standard: 2533 kg
PearlNet: 2585 kg
Species: Plaice, Flounder, Dab, Sole
Whiting, Cod, Turbot,…



Catch efficiency of the *PearlNet*

Results



Plaice

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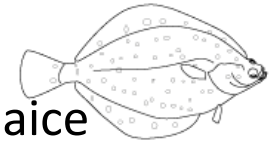
Similar for other species

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	-2.209483	0.816852	-2.705	0.00683**
Pearl	0.039146	0.035034	1.117	0.26385
PAL	-0.204846	0.143895	-1.424	0.15457
Depth	0.004563	0.046337	0.098	0.92155
Location				
1	2.882378	0.693929	4.154	0.0000327***
2	0.441147	0.592442	0.745	0.4565
3	0.054973	0.672623	0.082	0.93486
4	-0.214826	0.604154	-0.356	0.72215
5	0.777498	0.672048	1.157	0.24731
6	-0.087606	0.704834	-0.124	0.90108
7	1.044717	0.634292	1.647	0.09955.
8	0.271288	0.674982	0.402	0.68774
9	0.645082	0.823241	0.784	0.43328

Length effect?

Catch efficiency of the *PearlNet*

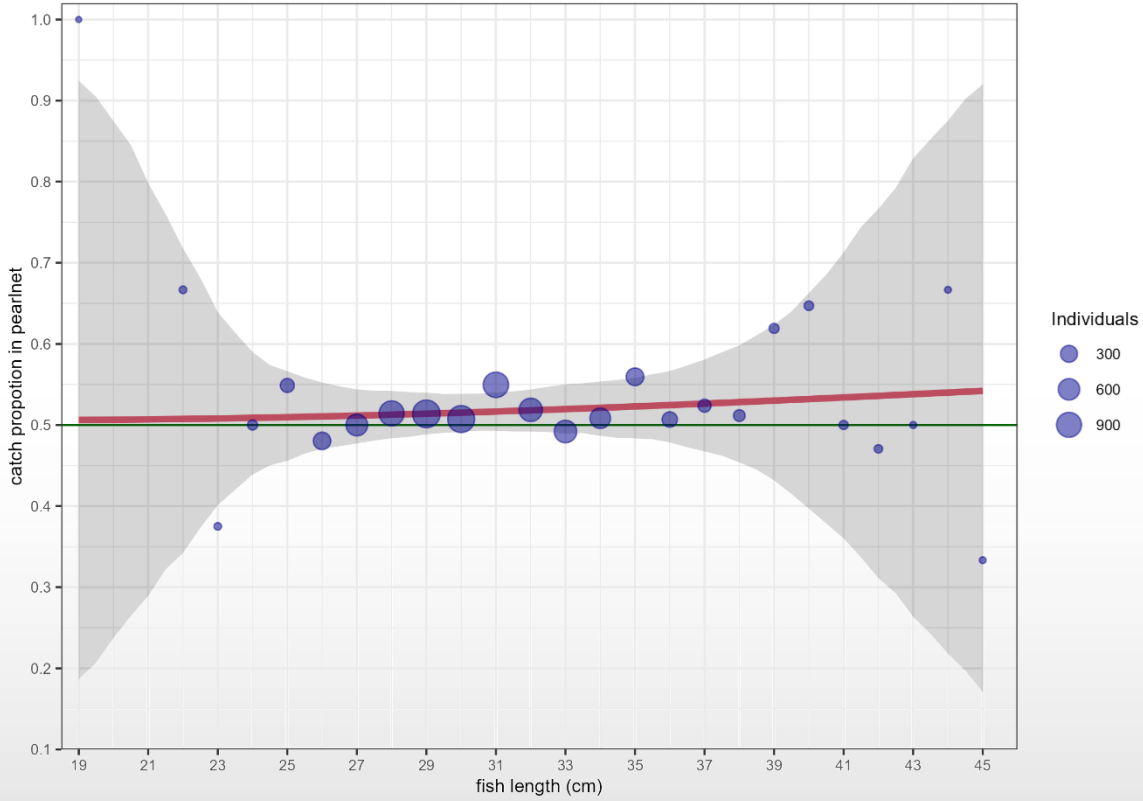
Results



Plaice

Similar for other species

Few mesh-pearl entanglements during cleaning



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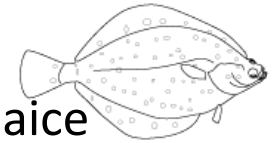
Catch efficiency of the *PearlNet*

Results

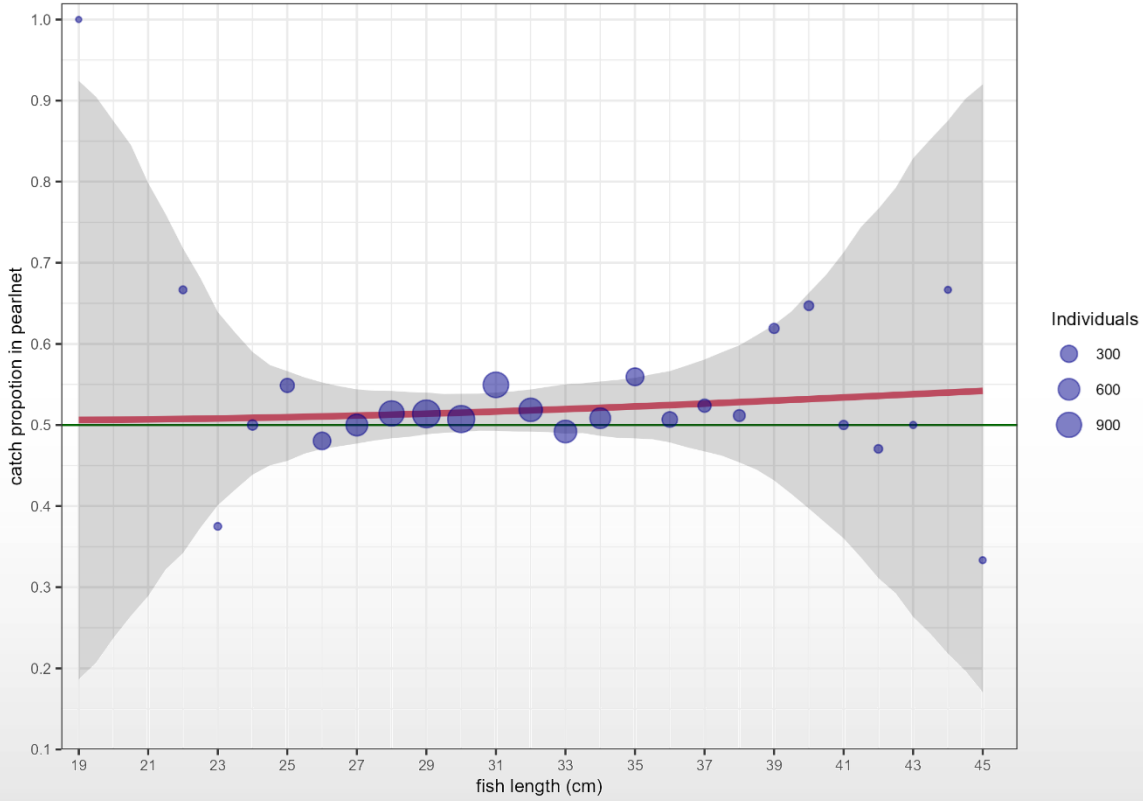


Plaice

Similar for other species

Few mesh-pearl entanglements during cleaning

Fisher uses PearlNets now

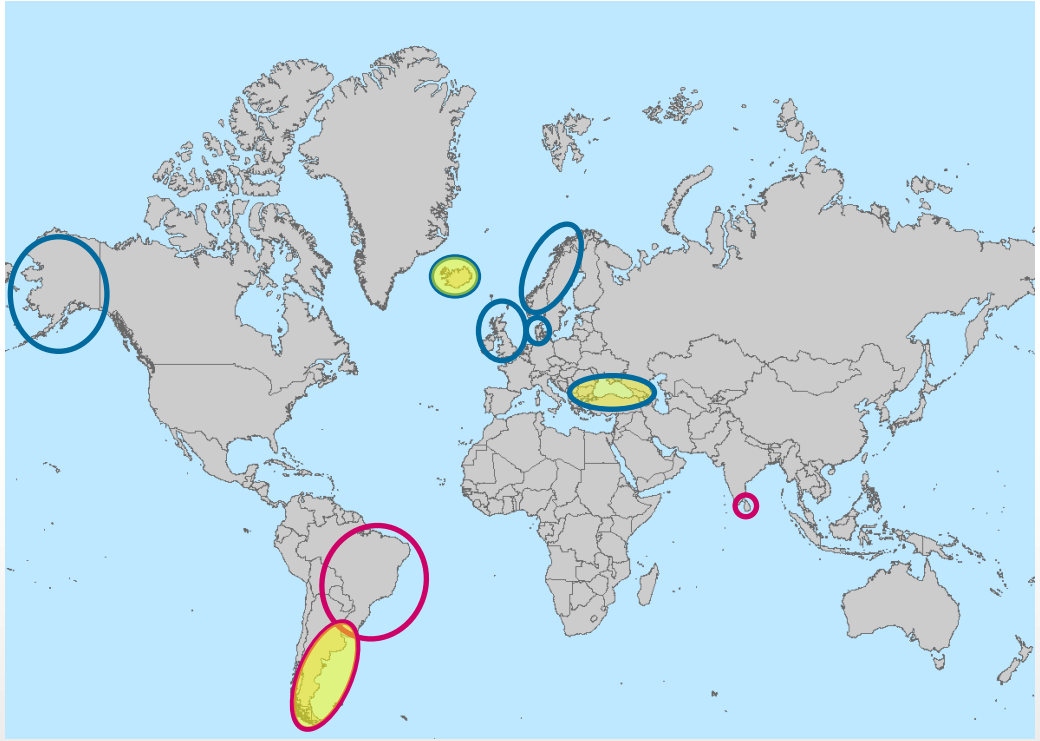


Cetacaen bycatch reduction of the *PearlNet*

- High and increasing interest

Species of interest

- Harbour porpoise
- other cetacaens



→Bycatch trials

- Brazil: in the moment
- Iceland: mid April
- Turkey: in 2019

Production of the *PearlNet*

PearlNet is available for purchase

„Click pearl“

Automatisation

Alternative materials

The PearlNet:

Application of acoustic reflectors in set nets to reduce bycatch of harbour porpoises and other odontocetes while keeping fish catches high

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STELLA2

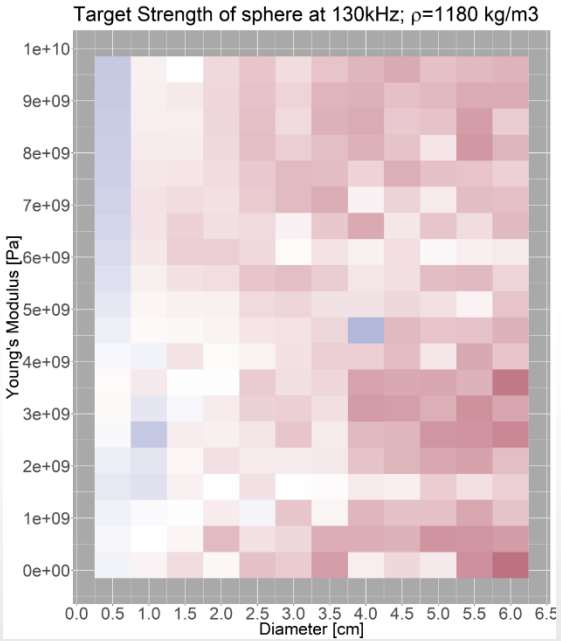
ASCOBANS - NSG12/JG20 | Zandvoort | 13/03/2024

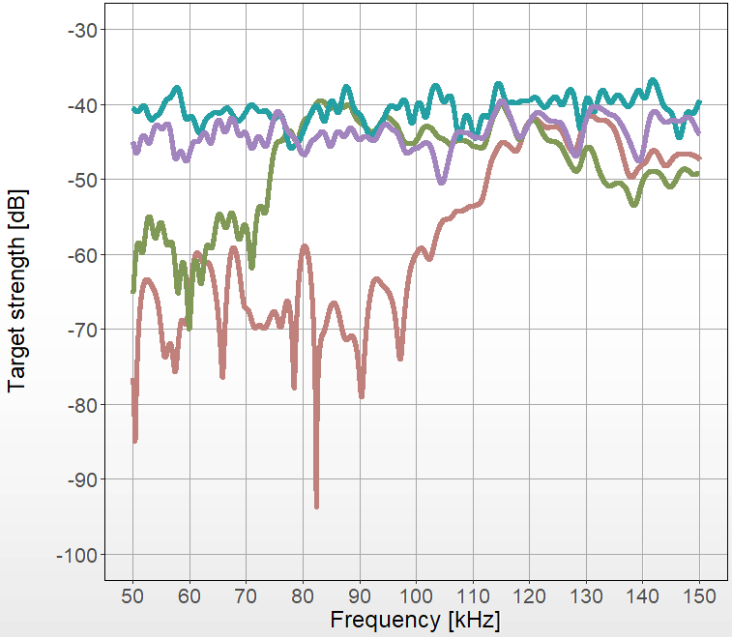
Current prices of German netmaker

Calculation (pearl production: 0.09 €; pearl attachment: 0.28 €)			
	normal net	**PearlNet**	**PearlNet-70% EMFAF**
price	142 €	327 €	98.10 €
difference to standard net (absolute)		185 €	-43.90 €
difference to standard net (%)		130%	-31%
relative to standard net (%)		230%	69%

extra

Identification of optimal acoustic reflector





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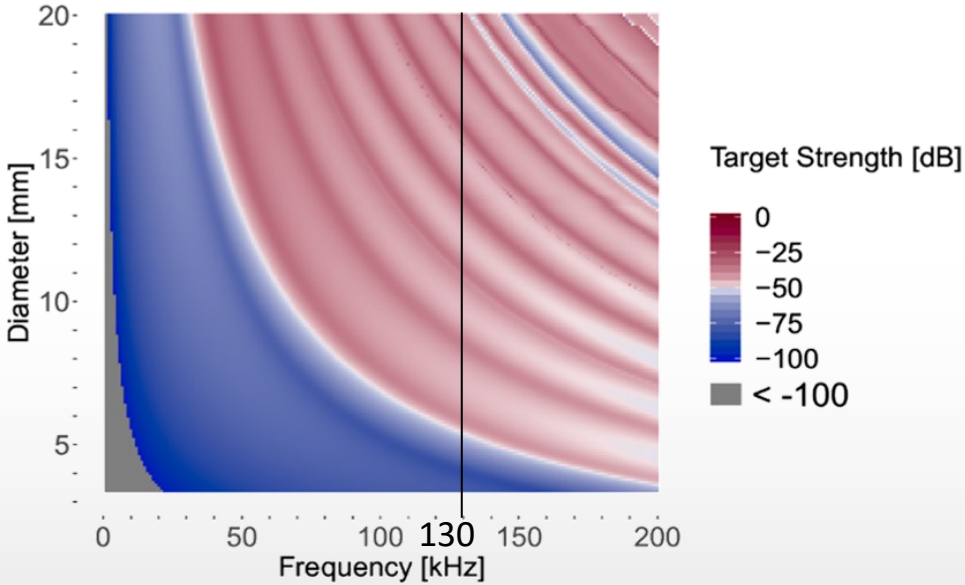

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Inia geoffrensis geoffrensis	101.2	17.2 (− 31.85)
Cephalorhynchus hectori	124	19.4 (− 31.61)

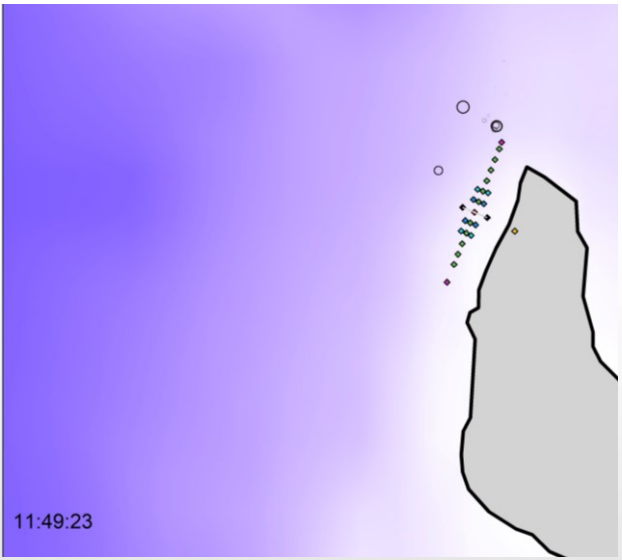
Behavior of harbor porpoises towards the different nets

extra

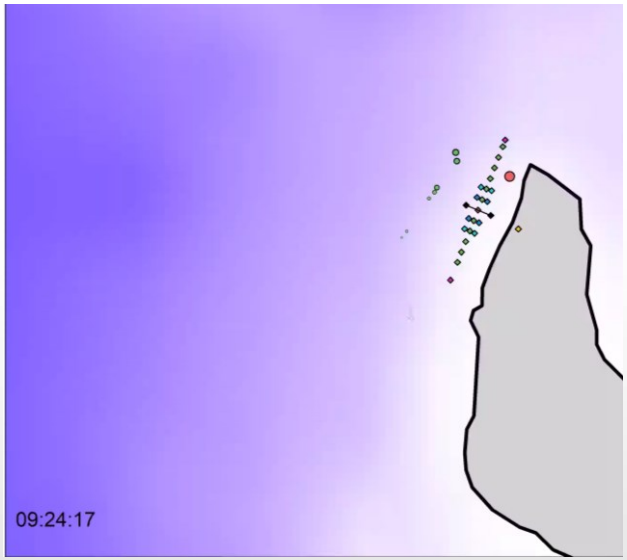
Behavior of harbor porpoises towards the different nets

Behavior of harbor porpoises towards the different nets

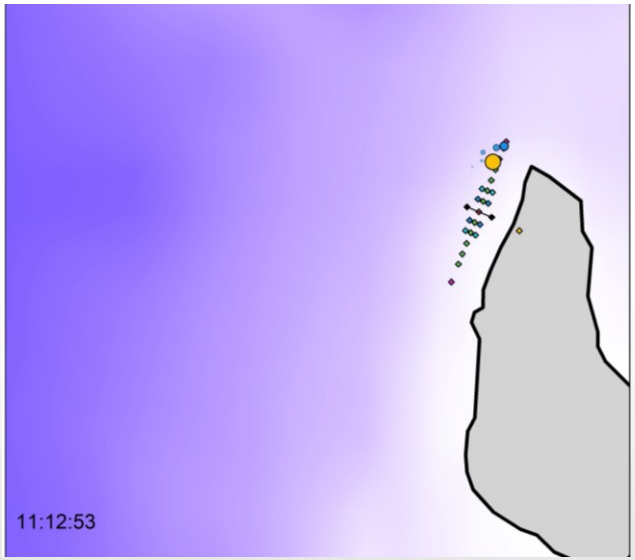
No net



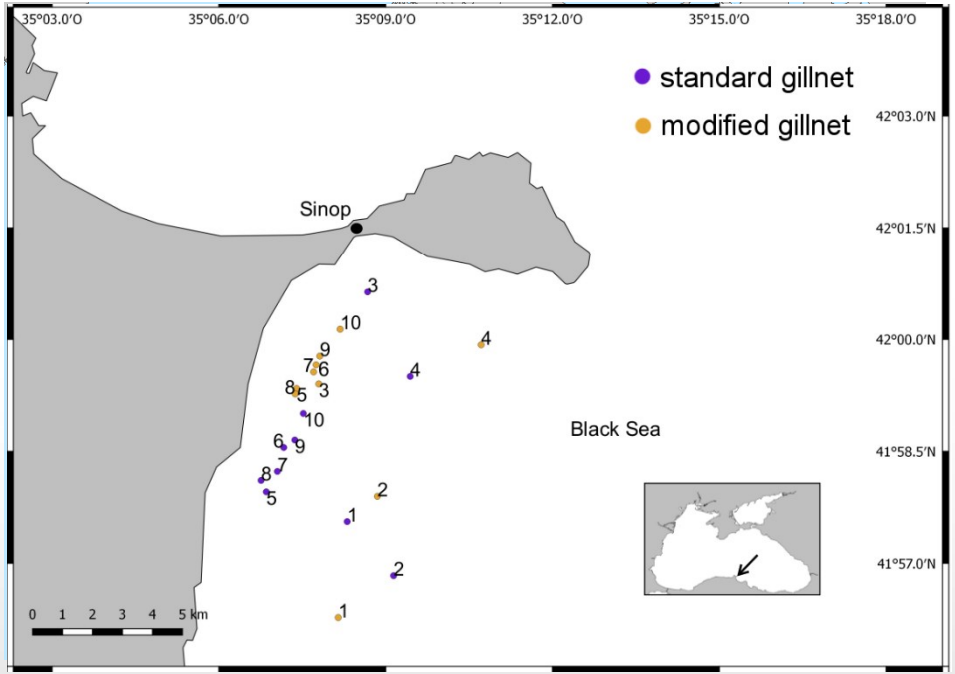
Standard net



PearlNet



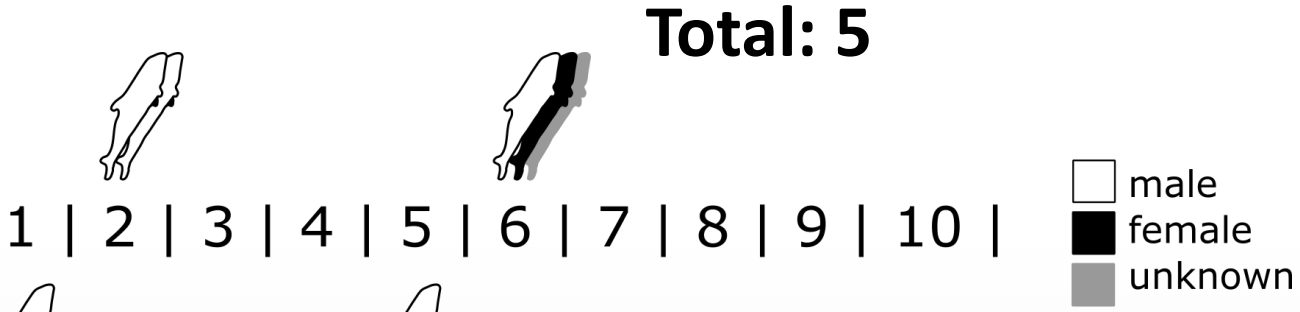
Commercial trial



extra

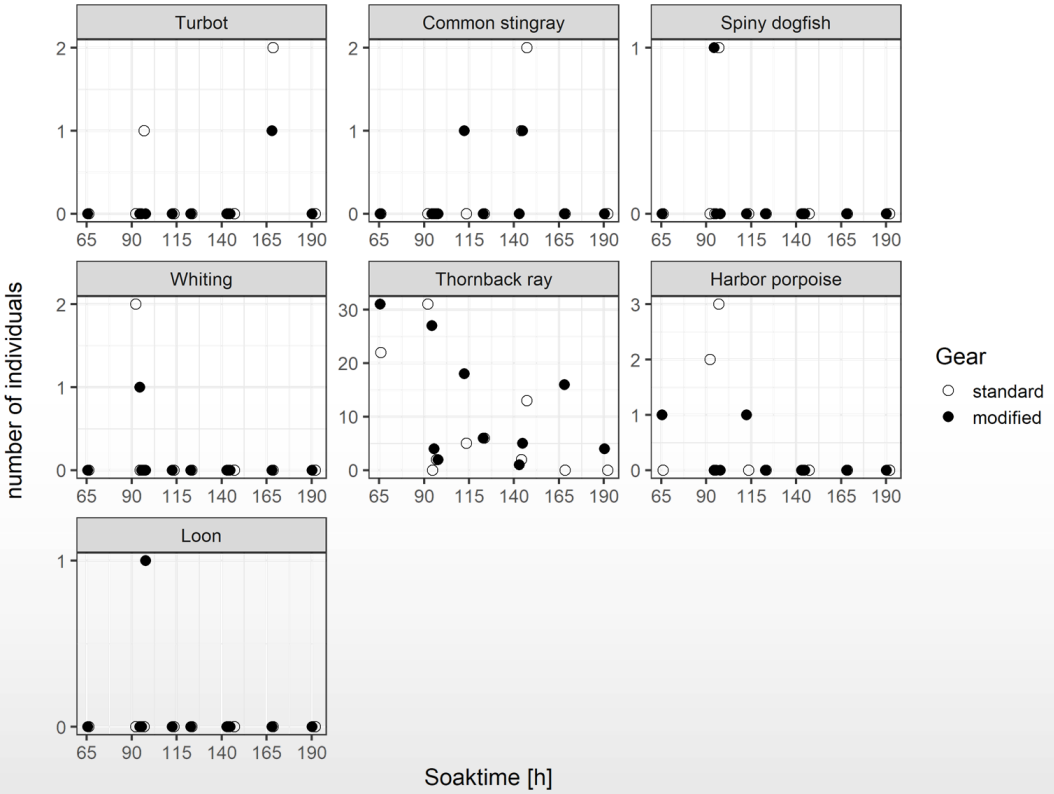
Commercial trial

Standard gillnet



PearlNet

…to be repeated

extra

Commercial trial