
SLU
DEPARTMENT OF
AQUATIC RESOURCES
(SLU Aqua)
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Spatiotemporal patterns in harbour porpoise (*Phocoena phocoena*) bycatch in the Swedish gillnet fishery (In review; Global Ecology and Conservation)

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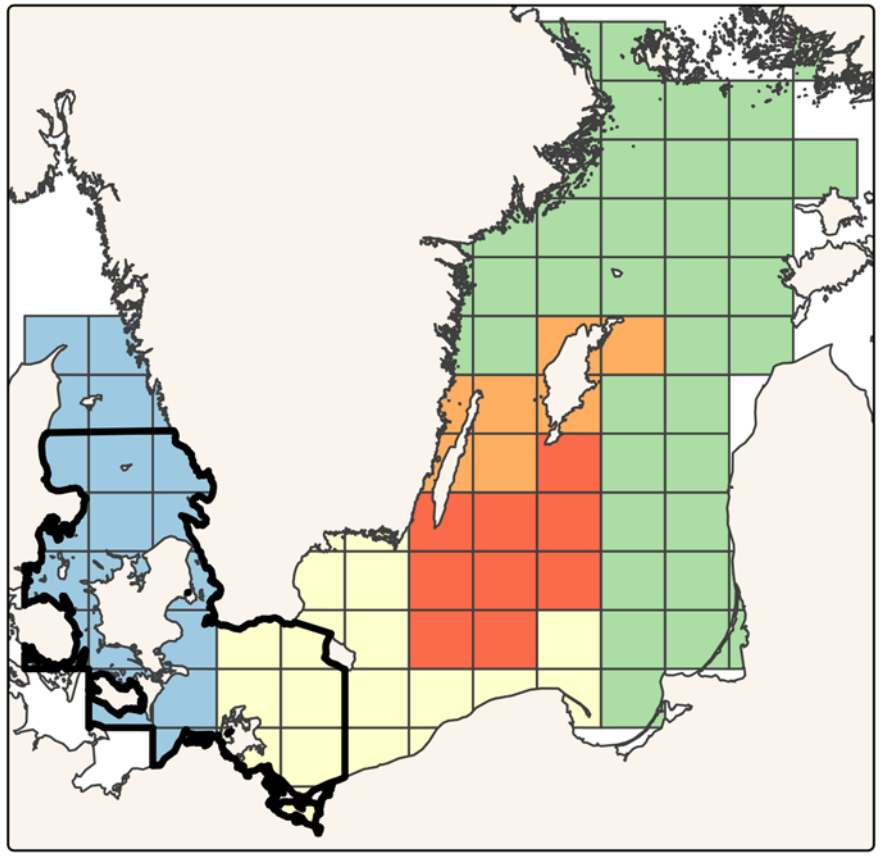
Aim:

- Estimate the number of harbour porpoise bycaught in the Swedish gillnet fishery
  - Spatiotemporal patterns in bycatch?
  - How many harbour porpoise are bycaught along the Swedish south coast?

Monitoring (2020-2024)

- Electronic monitoring
  - 400-600 fishing trips per year.
- Onboard observers
  - 100-150 fishing trips per year.

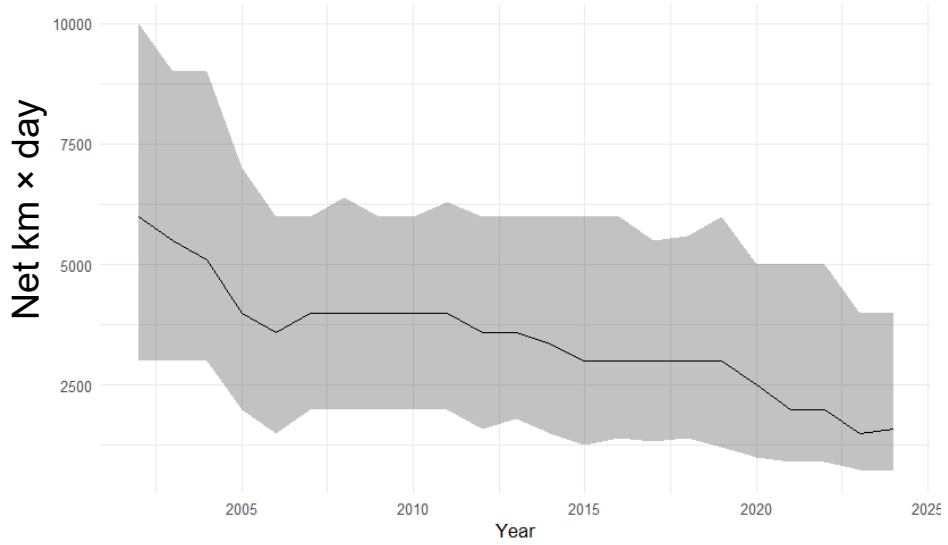


Monitoring (2020-2024)

Area	Quarter	Number of hauls	Monitoring effort	Coverage
West	1	733	921	0.094
West	2	1320	1879	0.170
West	3	624	522	0.061
West	4	477	350	0.059
South	1	8	19	0.027
South	2	215	457	0.120
South	3	191	409	0.200
South	4	47	111	0.180

Fishing effort

- Fisheries logbook data
- Decreased gillnet fishery (Hentati-Sundberg, J. 2017; Aqua Reports 2017)



Methods

Model based estimation of bycatch

1. Estimating bycatch rate

- Number of individuals bycaught during haul *i*

$$n_i \sim \text{Poisson}(\lambda_i)$$

- Expected number of individuals bycaught during haul *i*

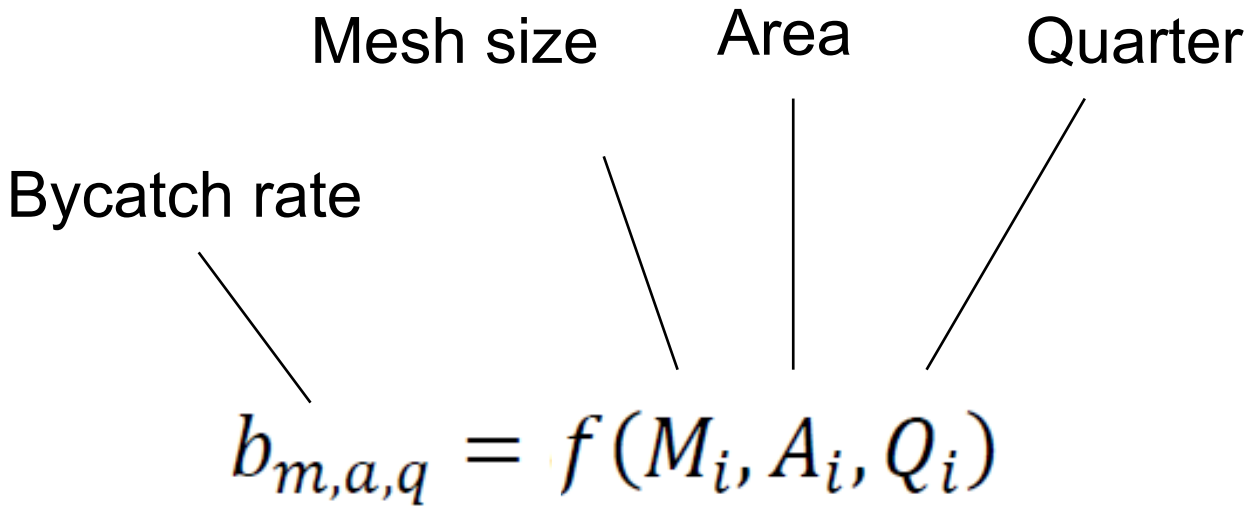
$$\log(\lambda_i) = f(M_i, A_i, Q_i) + \log\left(eff_i^{monitoring}\right)$$

2. Estimating total bycatch

Bycatch = Bycatch rate × Fishing effort

Based on monitoring data

Potential predictors of bycatch rate



Model comparison

Models tested

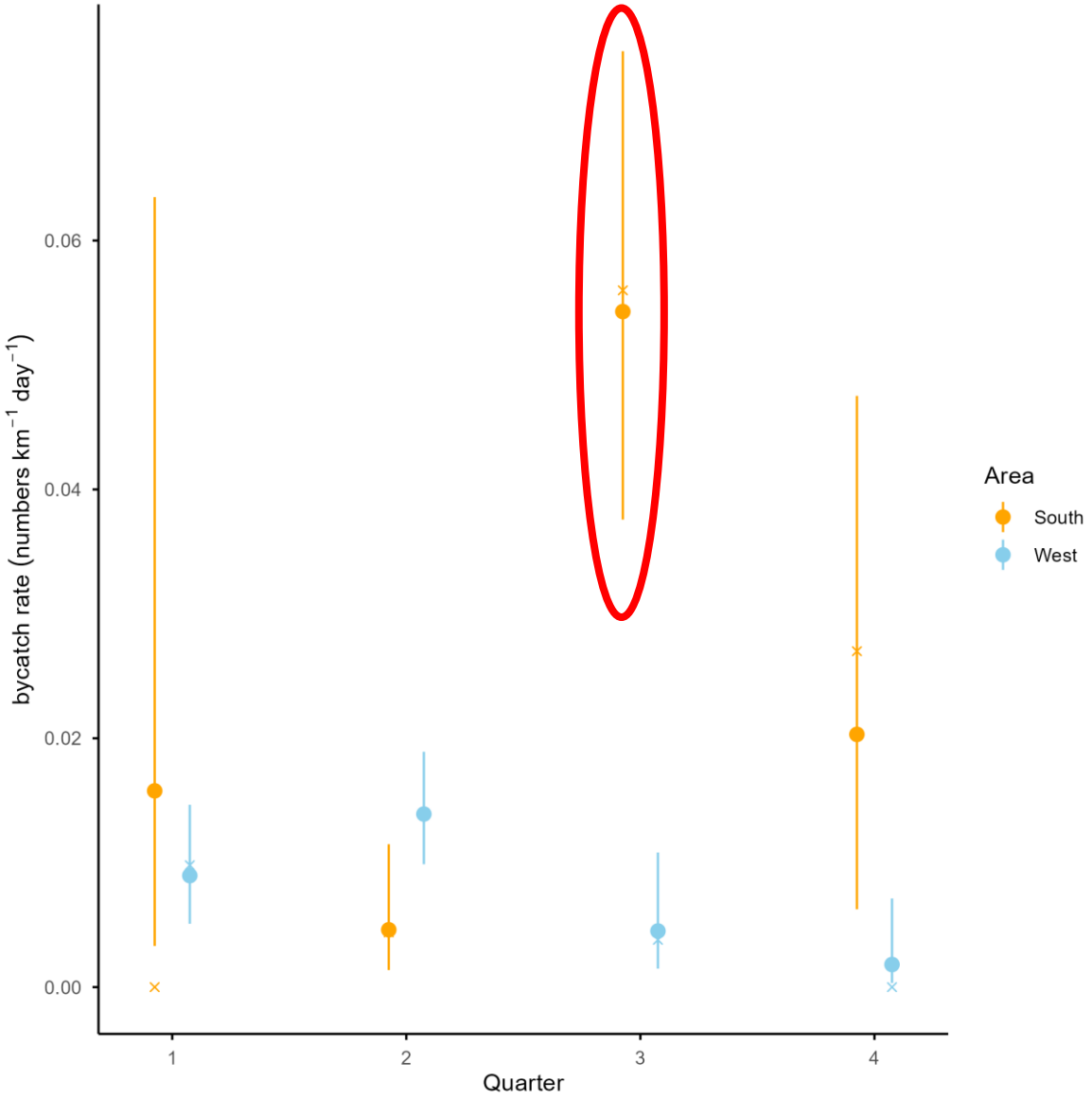
Model	α	β_M	β_A	β_Q	$\beta_{A\times Q}$
Model 1	x	x	x	x	x
Model 2	x	x	x	x	
Model 3	x		x	x	x
Model 4	x		x	x	
Model 5	x				

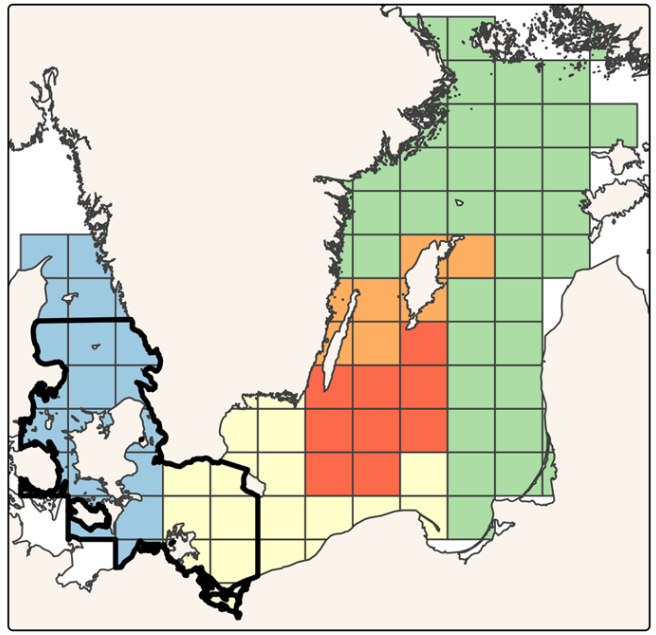
Leave-one-out cross validation

Model	ΔELPD
Model 1	0.00 (0.00)
Model 3	-0.05 (1.10)
Model 2	-12.19 (4.60)
Model 4	-12.26 (4.49)
Model 5	-18.81 (8.87)

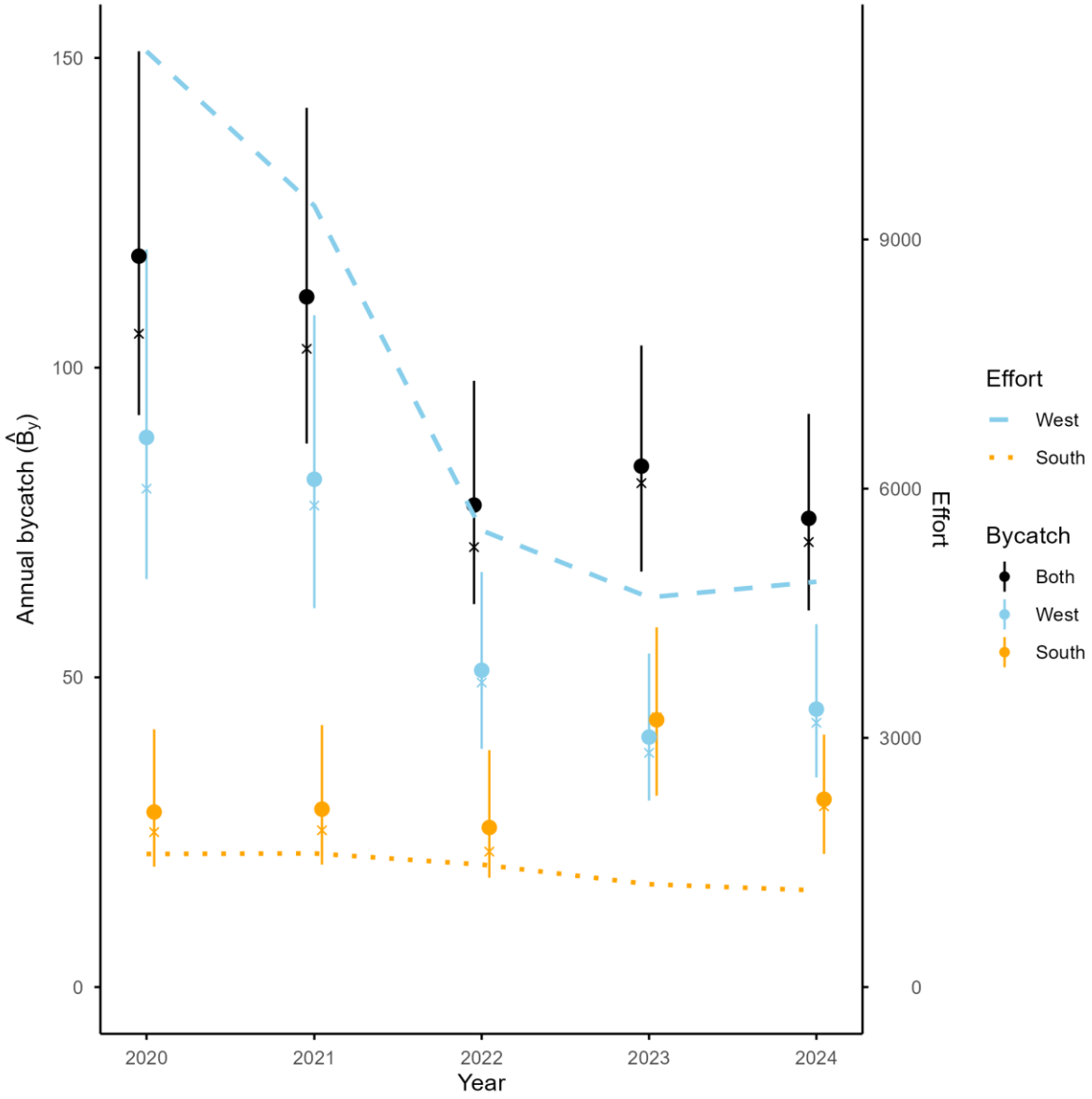
Results

Bycatch rates

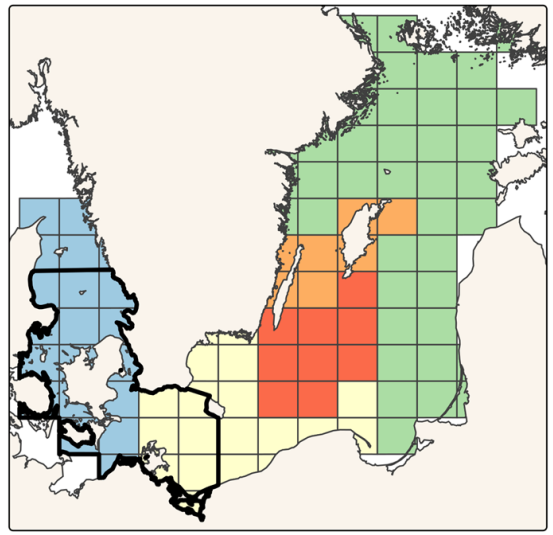




Total number of bycaught harbour porpoises



$$\hat{B}_y = \sum_a \sum_m \sum_q \hat{b}_{m,a,q} \sum_{i \in I_{y,m,a,q}} eff_i^{fishery}$$



Discussion

- Total harbour porpoise bycatch has decreased
  - Caused by a decreased gillnet fishery
- Temporal pattern in bycatch rates along the Swedish south coast coincide with temporal patterns in detection rates (Carlén et al. 2018; Biol. Cons.).
  - These individuals likely belong to the Belt Sea subpopulation

Thank you for your attention

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