Knowledge gaps and research options for coastal birds and seabirds of the Dutch North Sea

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WAARDEN BURG Ecology

Goal of project

Knowledge gaps and research options for coastal birds and seabirds of the Dutch North Sea

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Wageningen Marine Research
report: C093/25

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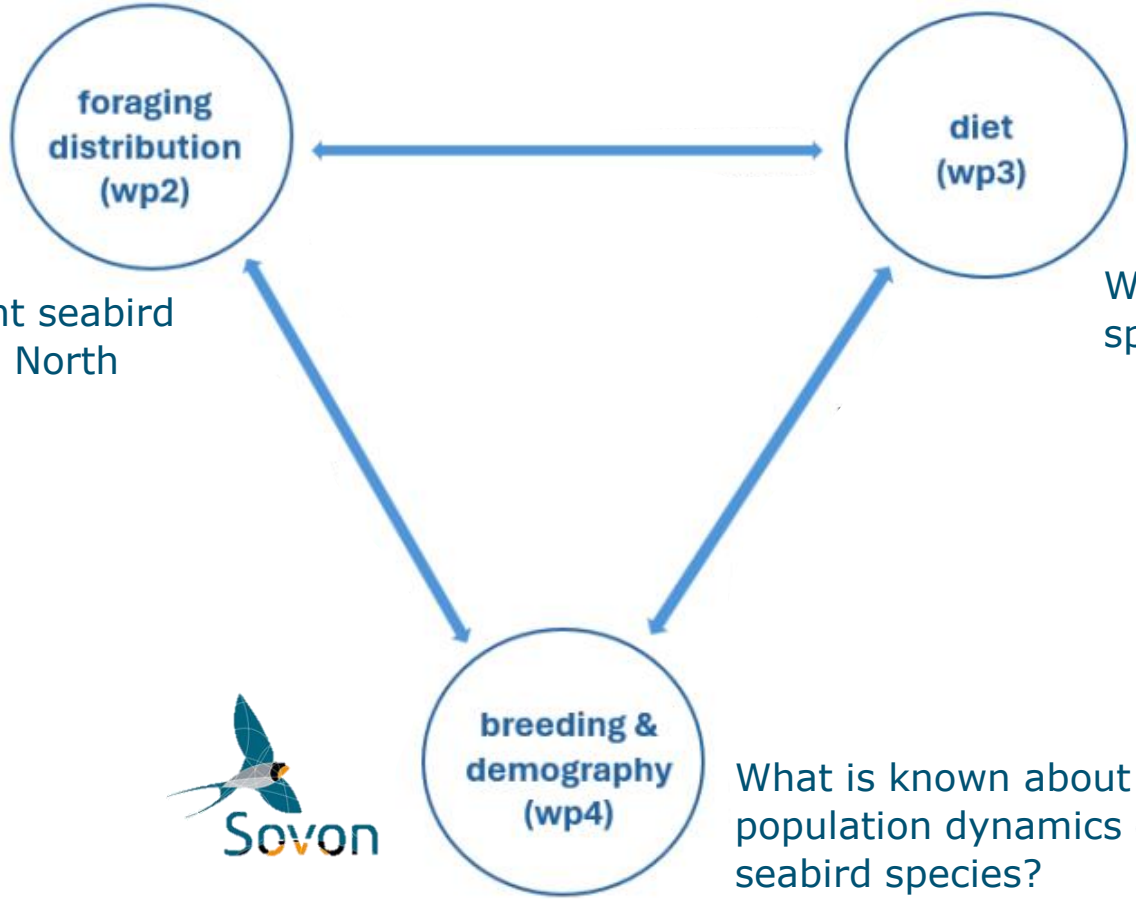
Review published and unpublished research on a selection of seabird species that are common in the Dutch waters and define knowledge gaps and future research possibilities

Contribute information to 'model trains' developed in MONS to explore ecosystem responses to North Sea transitions

Important to increase knowledge on foraging and breeding ecology in light of big changes that are happening at sea & unfavourble conservation status of several seabird species

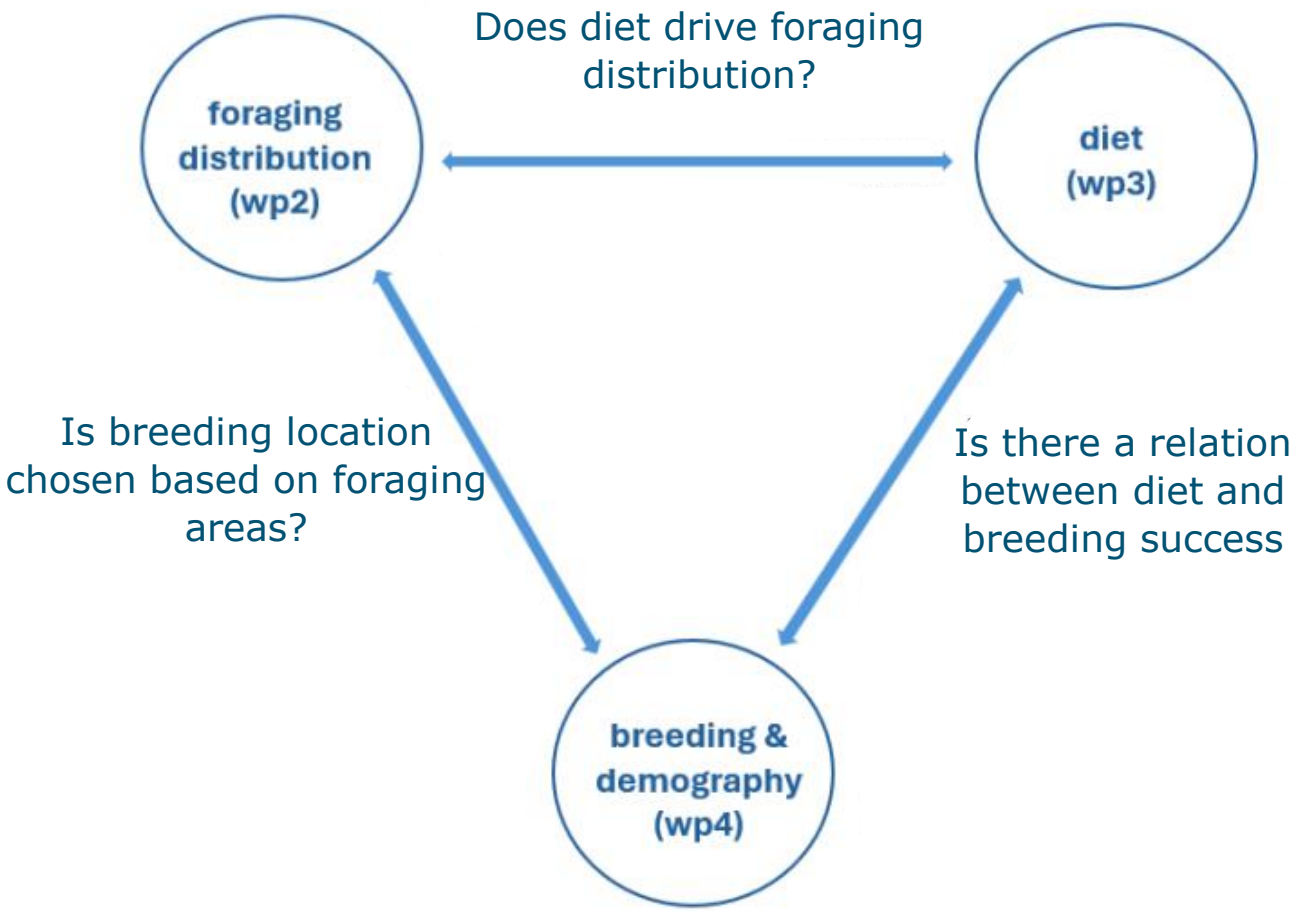
Literature review of:

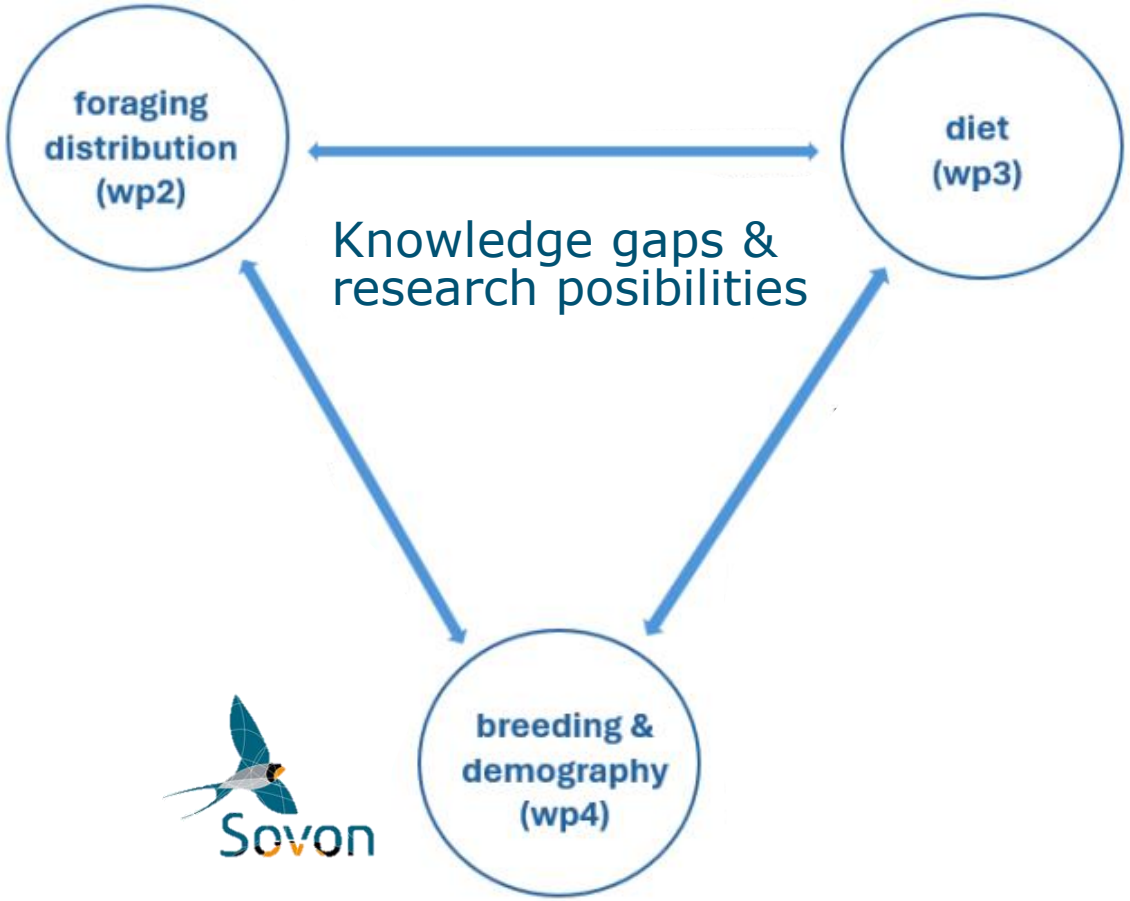


How do different seabird species use the North Sea?

What do different seabird species eat?

What is known about the population dynamics of seabird species?


Does diet drive foraging distribution?
foraging distribution (wp2)
diet (wp3)
Is breeding location chosen based on foraging areas?
Is there a relation between diet and breeding success
breeding & demography (wp4)


foraging distribution (wp2)
diet (wp3)
Knowledge gaps & research posibilities
breeding & demography (wp4)

Dutch breeding birds

Coastal surface feeders:
- Common tern
- Sandwich tern

Coastal & pelagic surface feeders:
- Lesser black-backed gull
- Herring gull
- Great black-backed gull

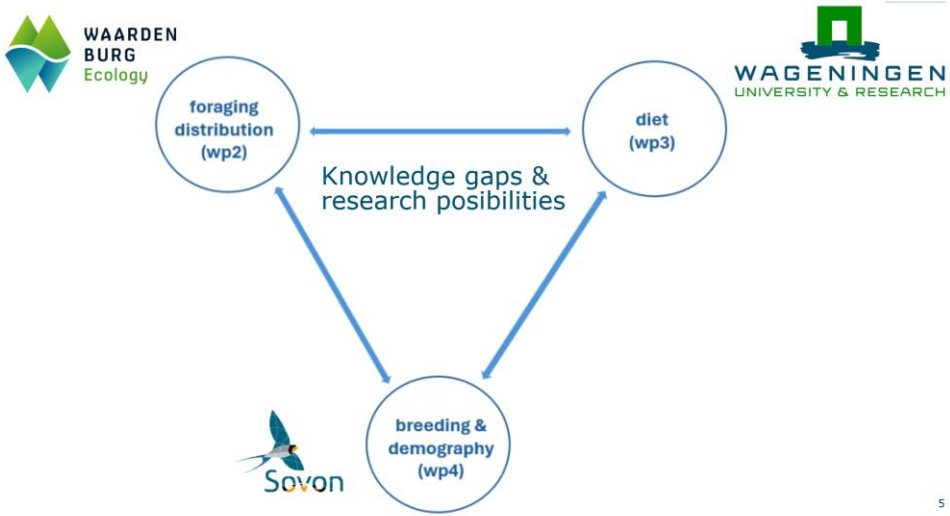
Coastal diving feeders:
- Red throated diver
- Common scoter

Pelagic diving feeders:
- Common guillemot
- Razorbill

Pelagic surface feeders:
- Northern fulmar
- Black-legged kittiwake
- Northern gannet

During this talk:

- Some highlights of every working package
- Knowledge gaps
- Potential research avenues



WP2 - Waardenburg Ecology

- Literature review:
  - What are the most important foraging areas?
  - Which environmental factors determine these foraging areas?
- Both counts as tracking studies were included

Review of GPS tracking studies North Sea in relation to environmental factors (n=65, 11 species)

Why do foraging birds go to certain areas?

Environmental factors included in studies:

Abiotic variables

For instance depth, hydrodynamics, temperature, weather,

Biotic variables

For instance primary production, prey types, fishery intensity.

No studies with prey densities included

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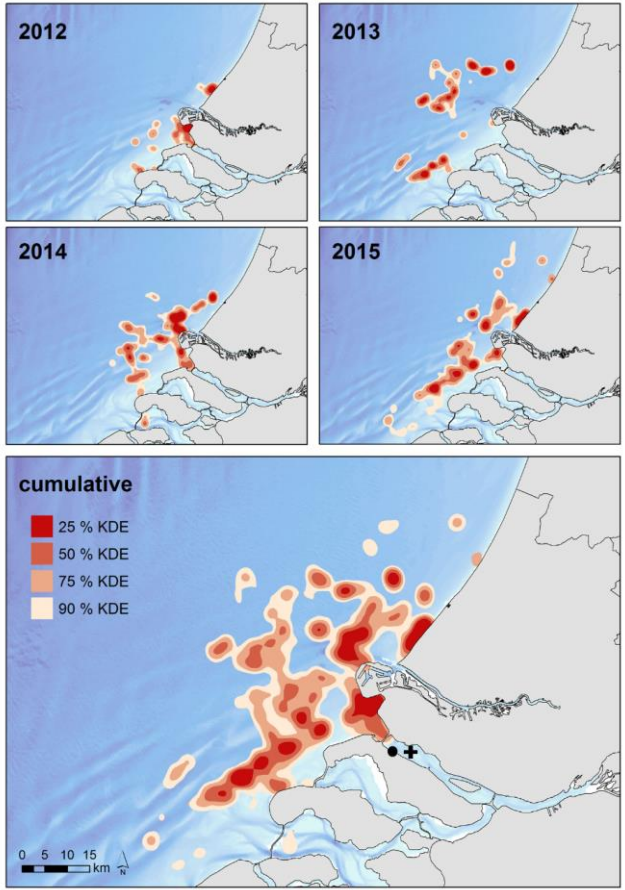
Maps based on GPS - Fijn et al., 2017



Sandwich tern example

Habitat (depth, distance to coast)

Prey type

No actual prey density distributions available

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Work in progress

(figure removed)

Great Black-backed Gull tracking

Prey, fishing activity?

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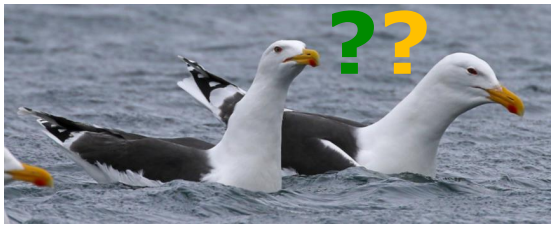
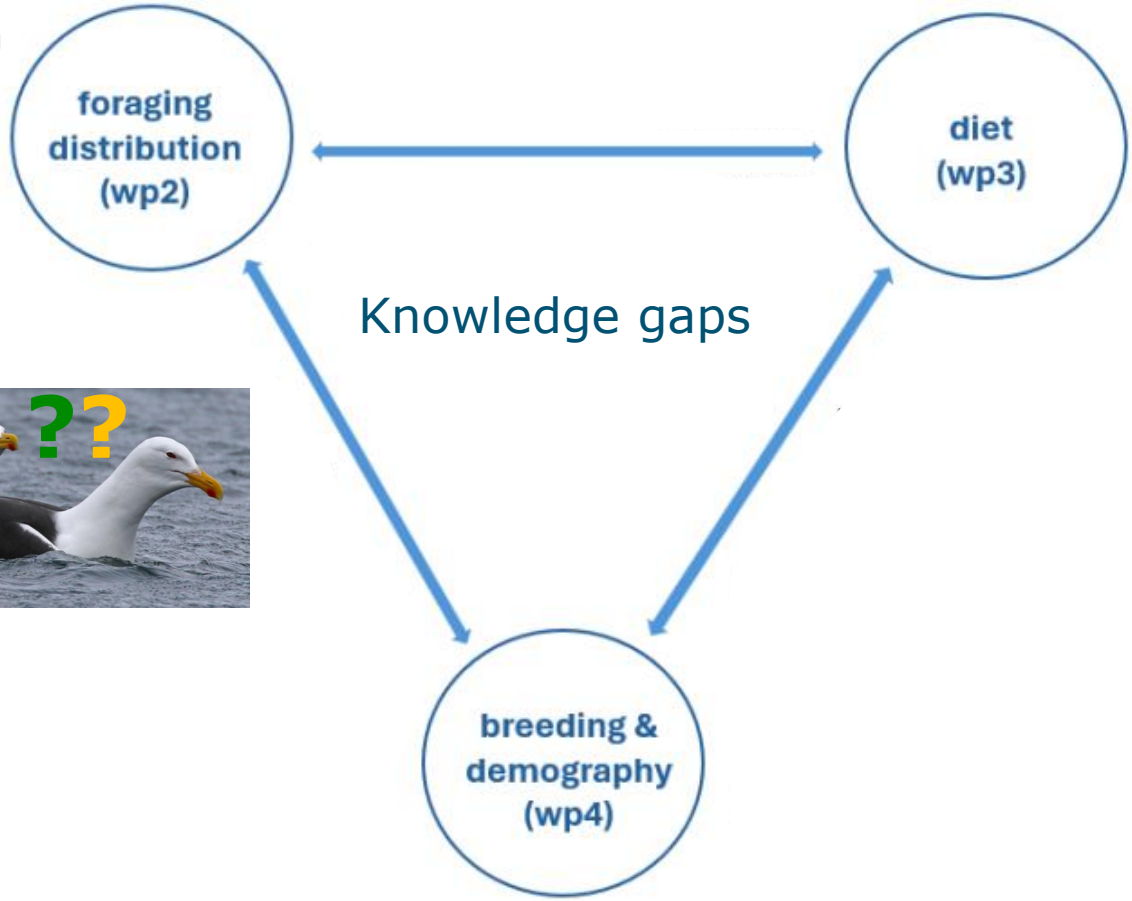
No actual prey density distributions available

Winter:
Relatively much info on distribution, but little on relation to distribution prey (forage fish)

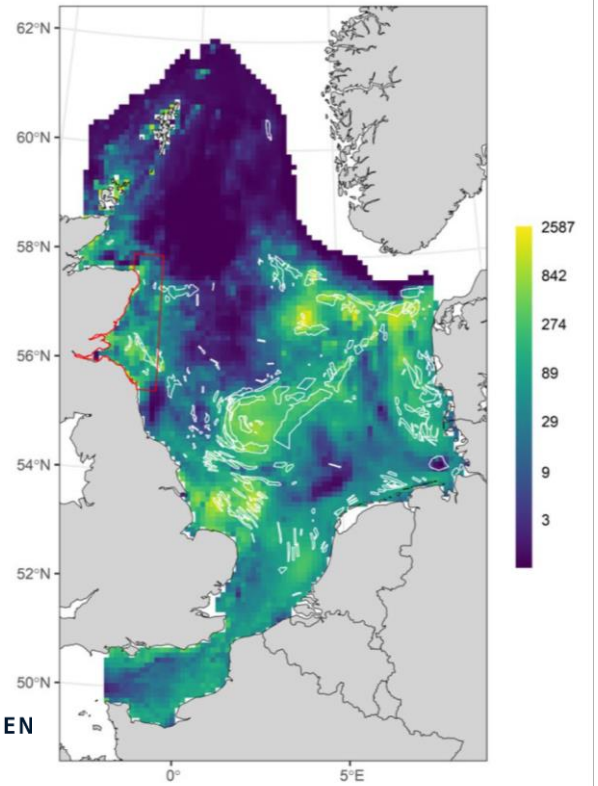




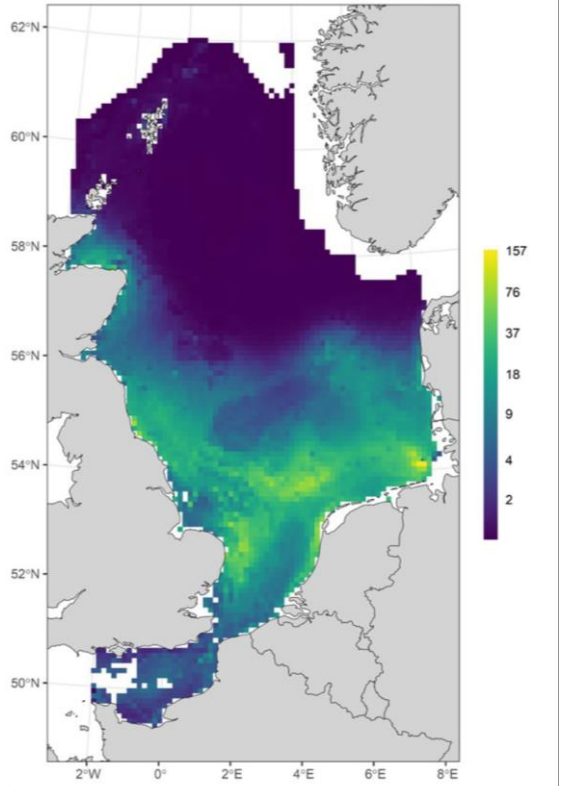
Forage fish biomass distribution (2000-2020)

Benaksas (2025)

Sandeel biomass



Sprat biomass



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Diet of coastal birds and seabirds of the Dutch North Sea

Author(s): Susanne van Donk[1], Eileen Hesse[1], Michaël Kolman[2], Susanne Kühn[1], Mardik Leopold[1], Eleni Melis[1], Martin Poot[1], Fokje Schaafsma[1]

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WP3 - Wageningen Marine Research

- Literature review 12 seabird species
  - Type of food
  - Size selection
  - Relationship diet with other variables (bird condition, weather etc)
- Analysis of non-published data (red-throated diver, common guillemot, northern fulmar)
- New stomach analysis (common guillemot, Sandwich tern)

How was information gathered in literature?

Prey remains from stomach analysis, regurgitates of feces

Observations

DNA analysis or stable isotope analysis

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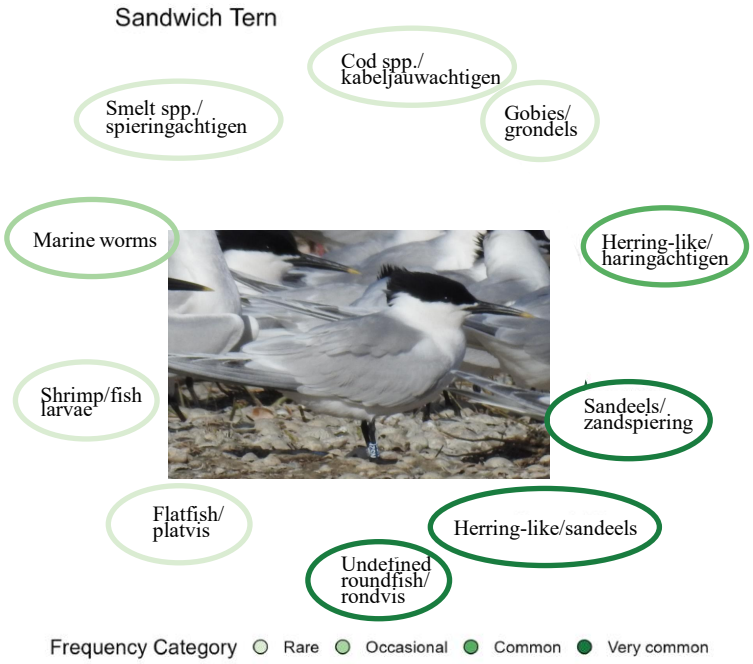
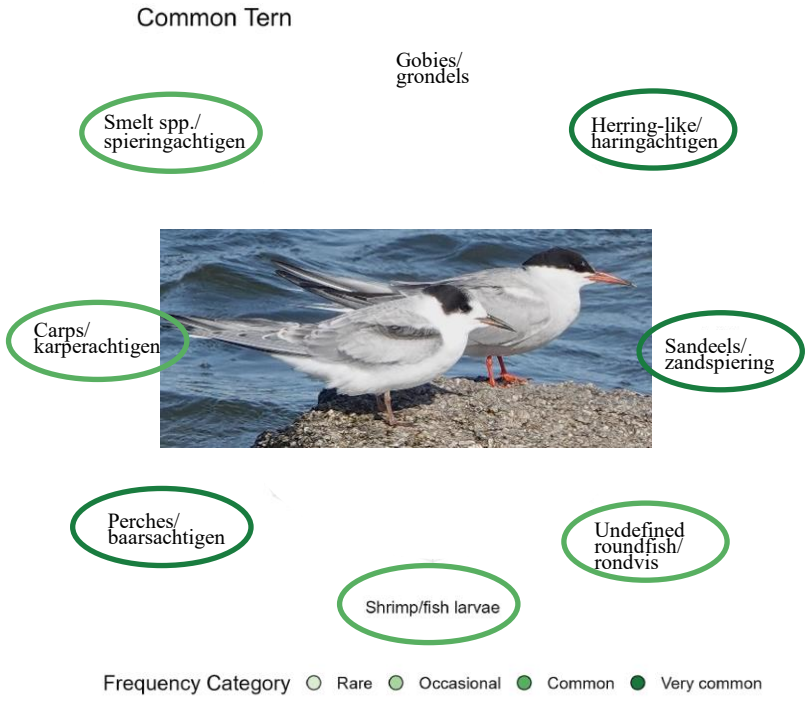
Results prey in literature

- 39 fish species (both marine and freshwater)
- Fish but also (marine) worms, shrimp, crabs, shellfish, terrestrial prey
- Common fish species:
    - Herring-like: sprat & herring
    - Sandeel species
    - whiting, ‘flatfish’ (plaice, dab, sole)
- Caught by humans (bycatch) or birds
- Example breeding birds and overwintering birds

Literature review – example breeding terns in the Netherlands





Overwintering birds - Relation diet & body condition – common guillemot

Poor condition

sandeels, whiting, sprat, and herring

Good condition

sprat, followed by herring, and sandeels

Winter:
Relatively much info on distribution, but little on relation to distribution prey (forage fish)

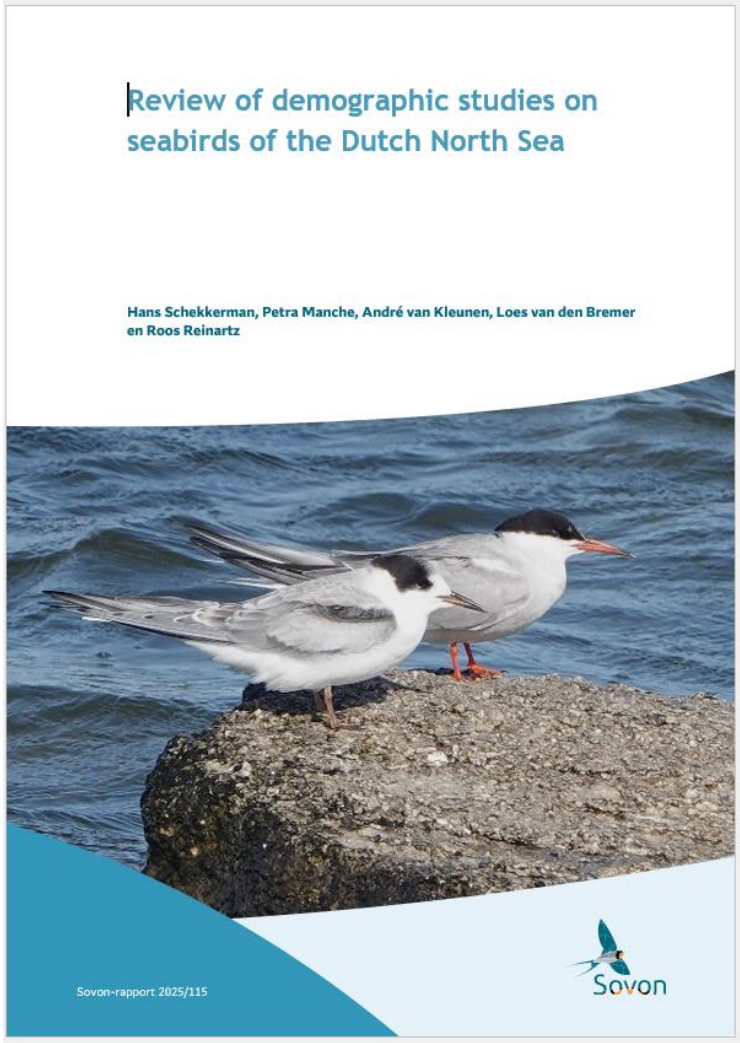
foraging distribution (wp2)

diet (wp3)

breeding & demography (wp4)

Knowledge gaps

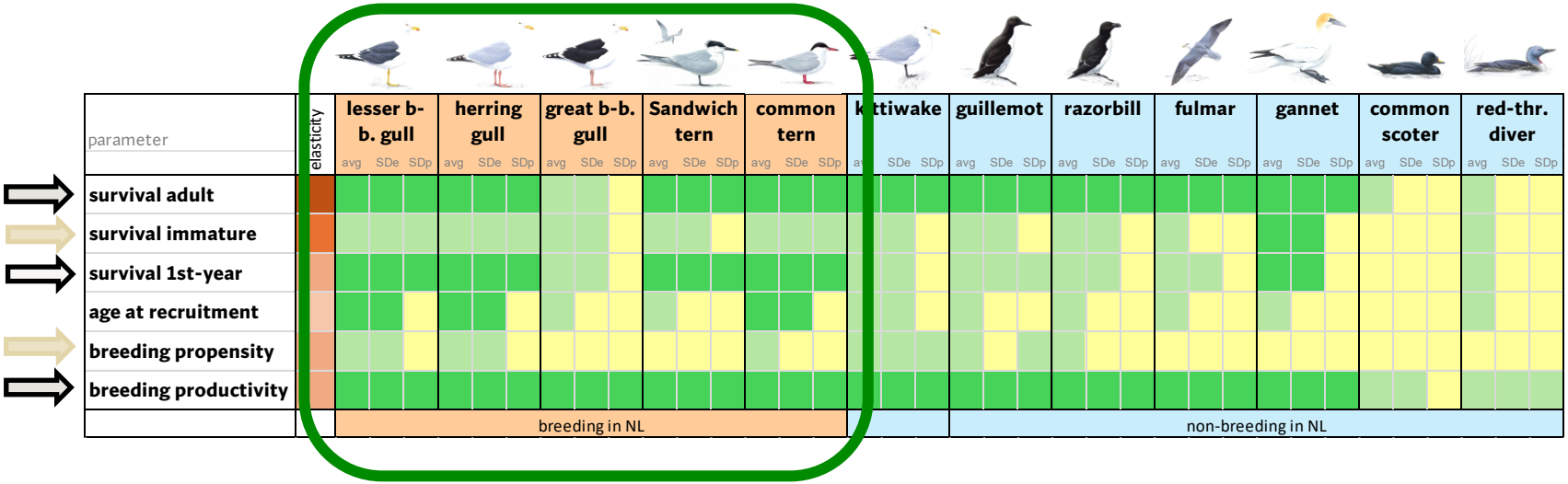
Breeding diet:
Relatively good info on diets in breeding season, but less on spatial patterns (foraging areas) & winter diet



WP4 - Sovon

- Literature review on demographic parameters (e.g. for population models):
  - annual survival: adult – immature - 1st-year
  - age at first breeding
  - breeding propensity (% adults breeding)
  - breeding productivity (fledged young/pair)
  - variation: between studies / between years
- Relationships between demographics and food availability
- Emphasis on gulls and terns (NL breeding populations)

Demographic parameter values



good estimates | to be improved | little or no information

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Relationships between demography and food

demographic parameter	lesser bl-b. gull	herring gull	great bl-b. gull	sandwich tern	common tern	kittiwake	guillemot	razorbill	fulmar	gannet	common scoter	red-thr. diver
adult survival	-	-	-	-	A	A	(A)	(A)	-	-	-	-
immature survival	-	-	-	-	B	-	-	-	-	-	-	-
age at recruitment	-	-	-	-	-	-	-	-	-	-	-	-
breeding propensity	-	-	-	-	-	-	-	-	-	-	-	-
breeding productivity	B	B	-	B(A)	A	A	A	A	A	(A)	(B)	-

quantitative | qualitative / proxy | little or no information

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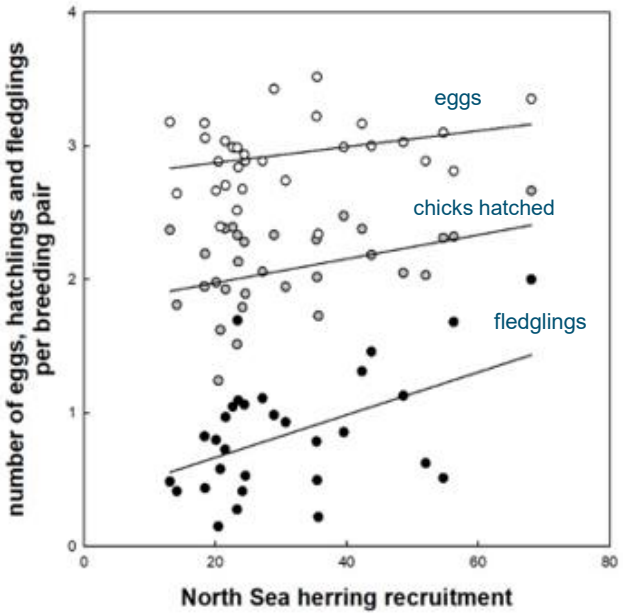
Example: relationship food & reproduction common tern

Wilhelmshaven, German Wadden Sea, since 1992

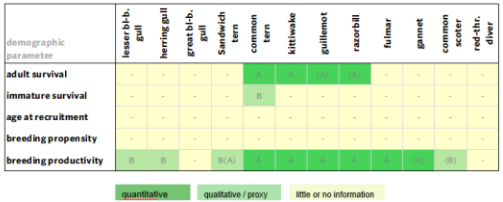
P. Becker, S. Bouwhuis *et al.*



No effect found on adult survival

Winter:
Relatively much info on distribution, but little on relation to distribution prey (forage fish)

Breeding diet:
Relatively good info on diets in breeding season, but less on spatial patterns (foraging areas) & winter diet



Better demographic estimates necessary for modelling:
(immature) survival, breeding propensity, breeding success, dependency on (small scale!) food availability

Research plan overwintering birds

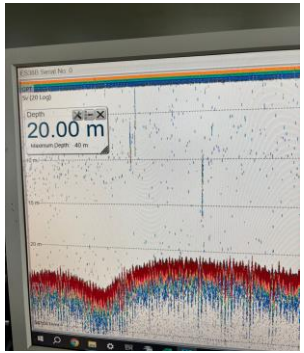
GPS tracking from breeding sites in UK

Trapping birds at sea: diet and condition

Observing birds at sea while monitoring fish →

Increasing the effort to collect freshly dead birds from beaches

MONS coastal pelagic fish survey 2026



Research plan breeding birds

Focal colonies on Wadden and Delta/Holland coast

Combine research on foraging behaviour (tracking + counts), diet and demographic parameters over several years

Measure prey availability in surroundings

Thank you for your attention!

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