UNIVERSITY OF
Rhode Island

RIDEM

Seasonal patterns of distribution and abundance of waterbirds in relation to shellfish aquaculture in coastal Rhode Island

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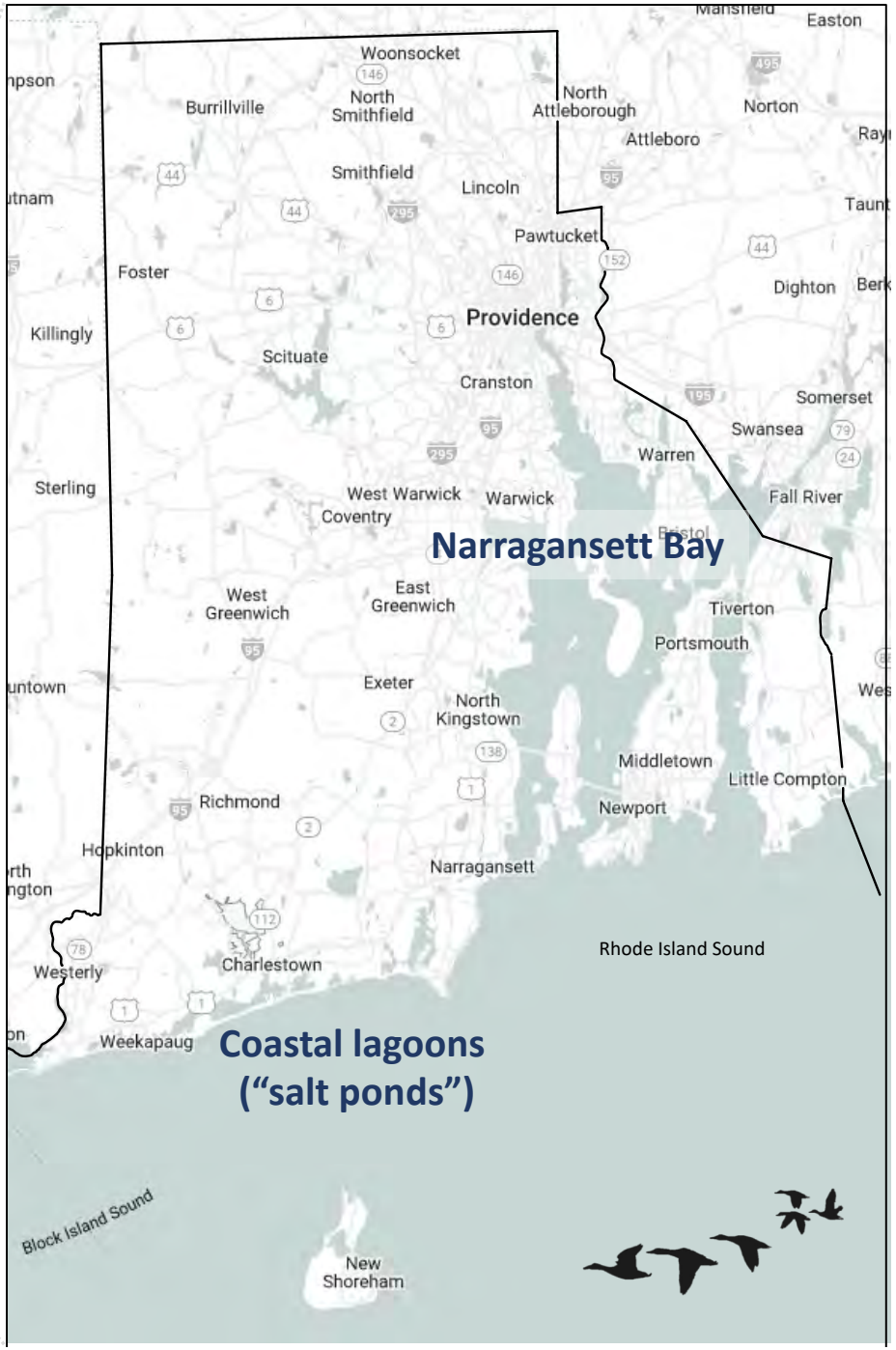
Rhode Island

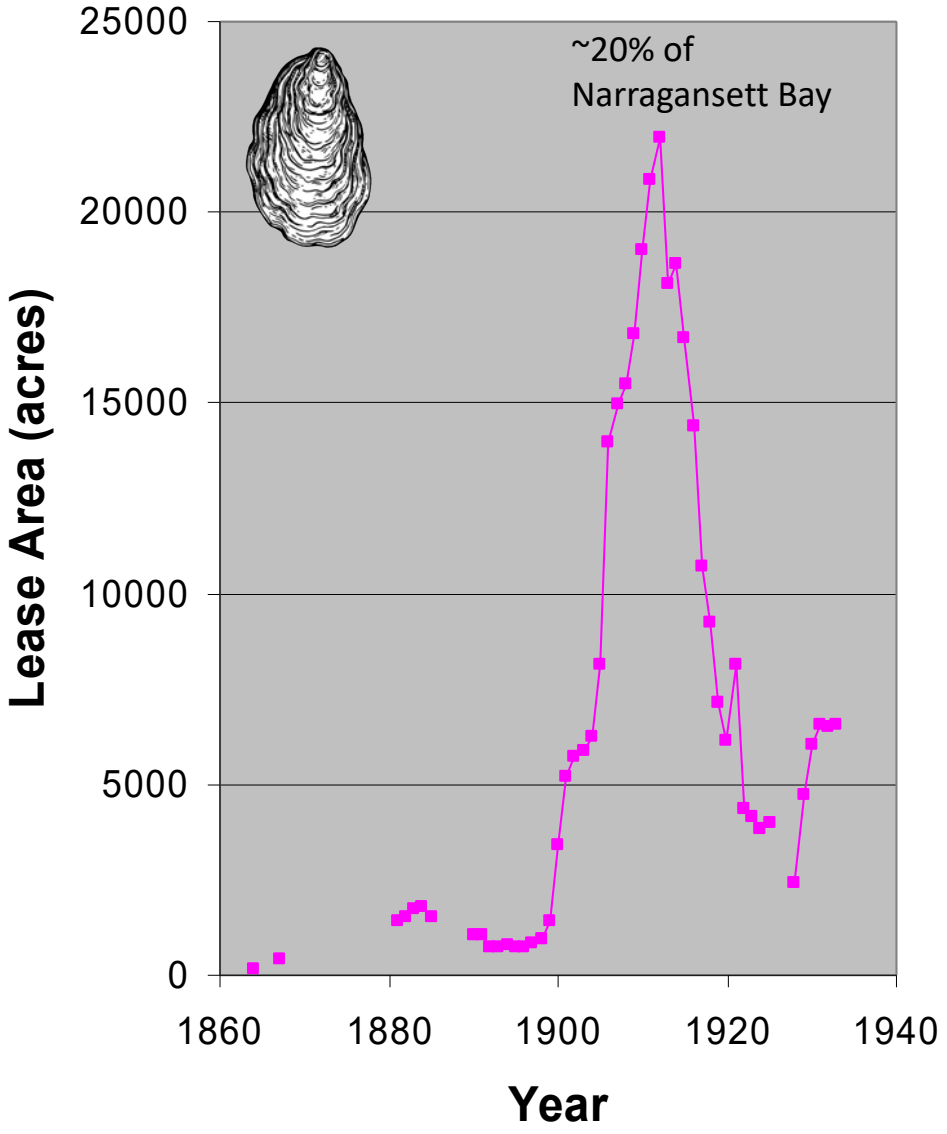


Rhode Island is important for many waterbird species throughout the year





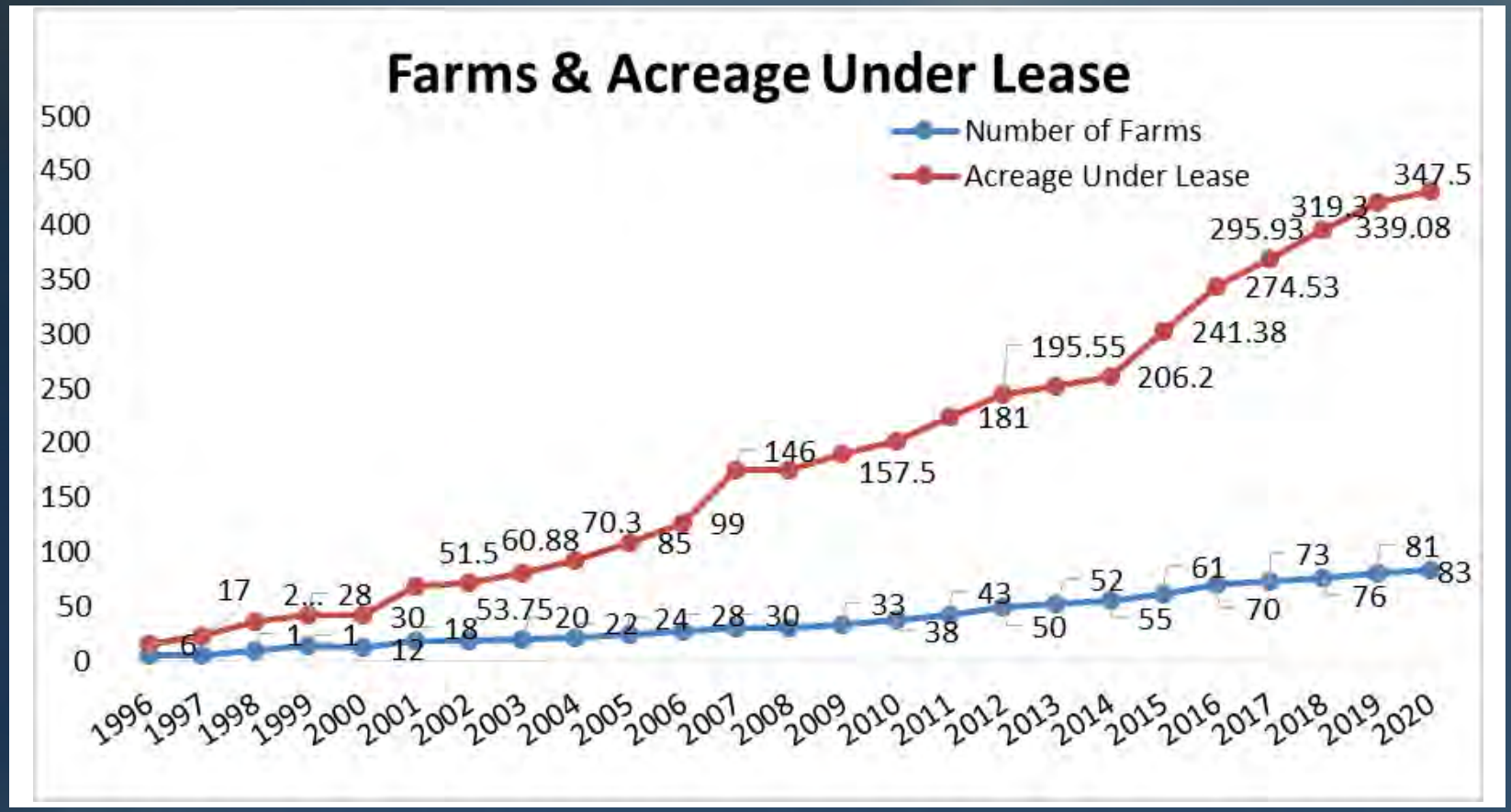


Growth and decline of RI's oyster aquaculture industry between 1864 and 1933

Oyster shell piles from two oyster shucking houses at Fields Point, Narragansett Bay, 1911

Shellfish aquaculture is increasing in coastal RI



Mostly oysters, some mussels, clams, kelp

Objectives

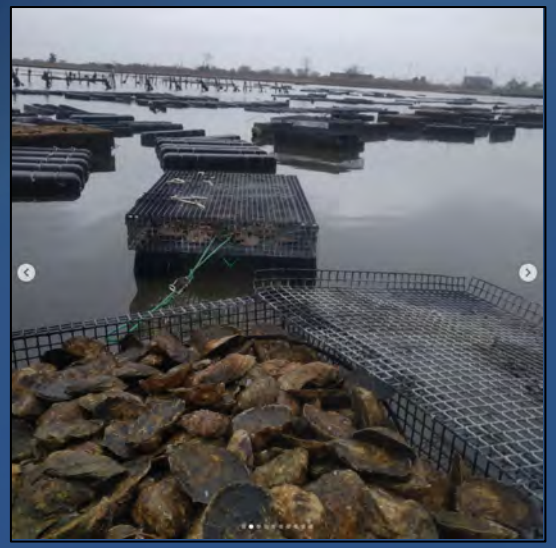
1. Is there spatial overlap between waterbirds and shellfish aquaculture?
    - At what times of year, and which species groups?

2. In which ways might waterbirds and aquaculture impact each other?

1. Submerged oyster culture:

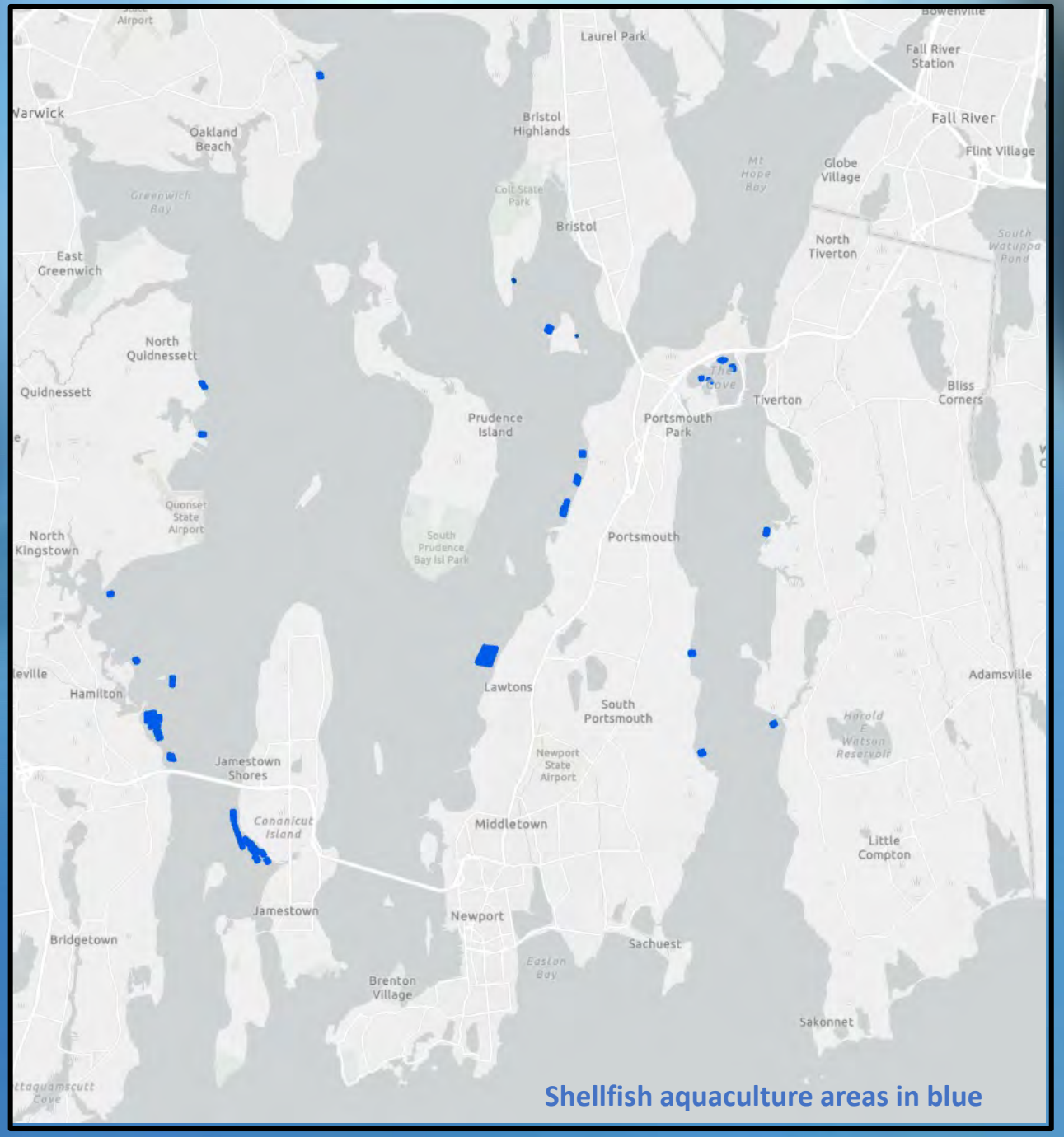
Bottom culture
Bottom trays/cages
Suspended gear

2. Floating oyster culture:

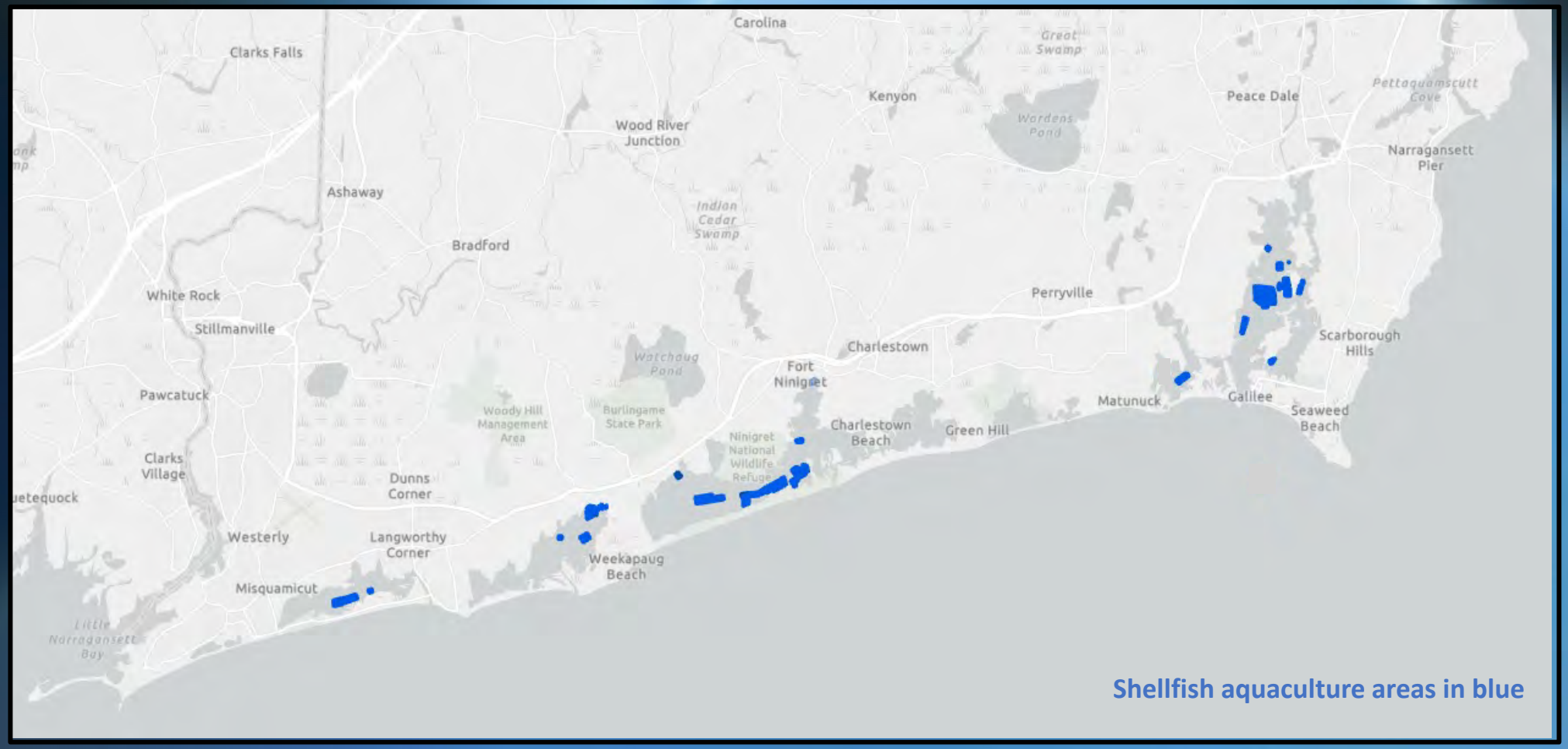


Floating cages/bags

Shellfish aquaculture areas Narragansett Bay

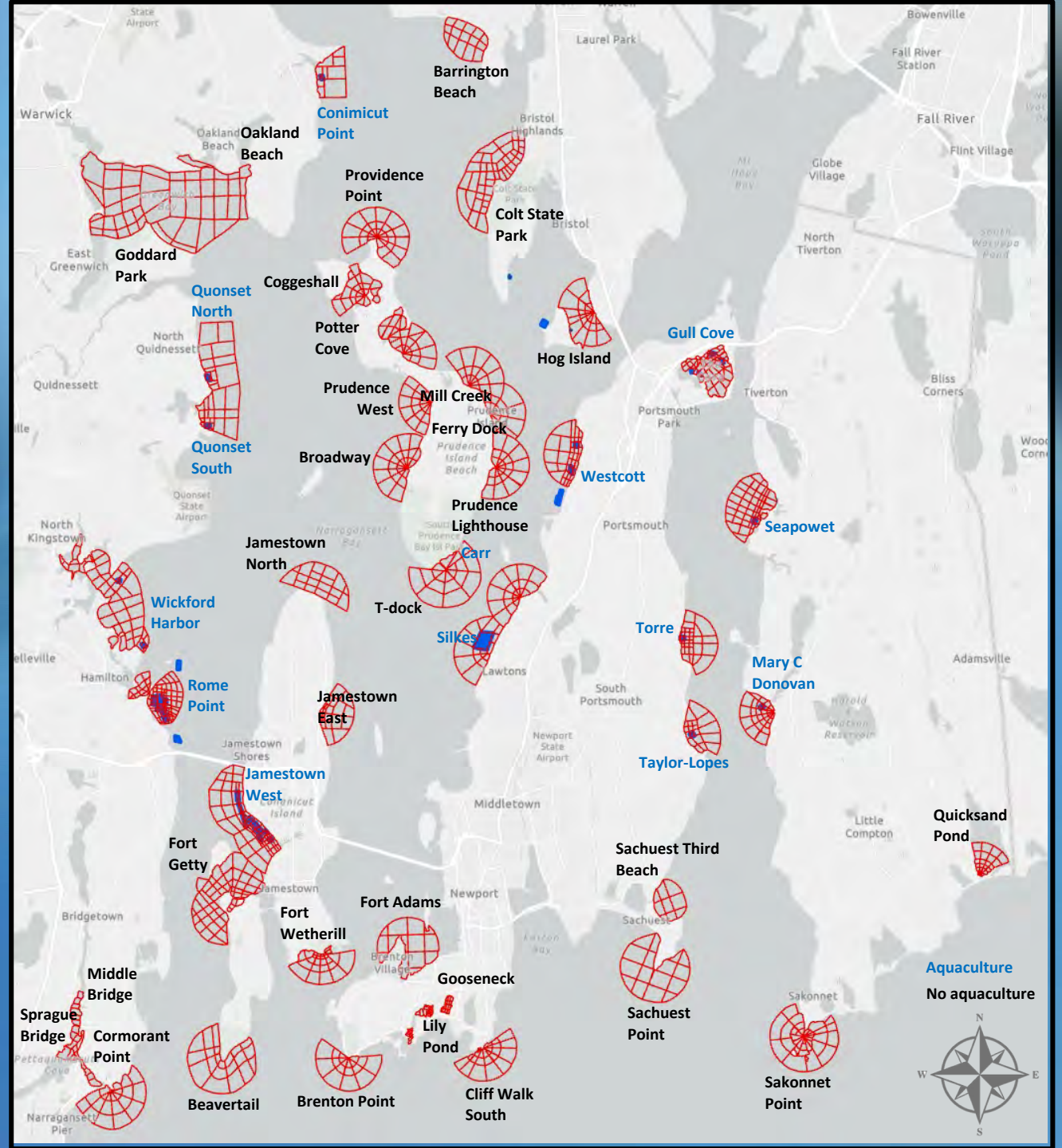


Shellfish aquaculture areas in southwestern RI

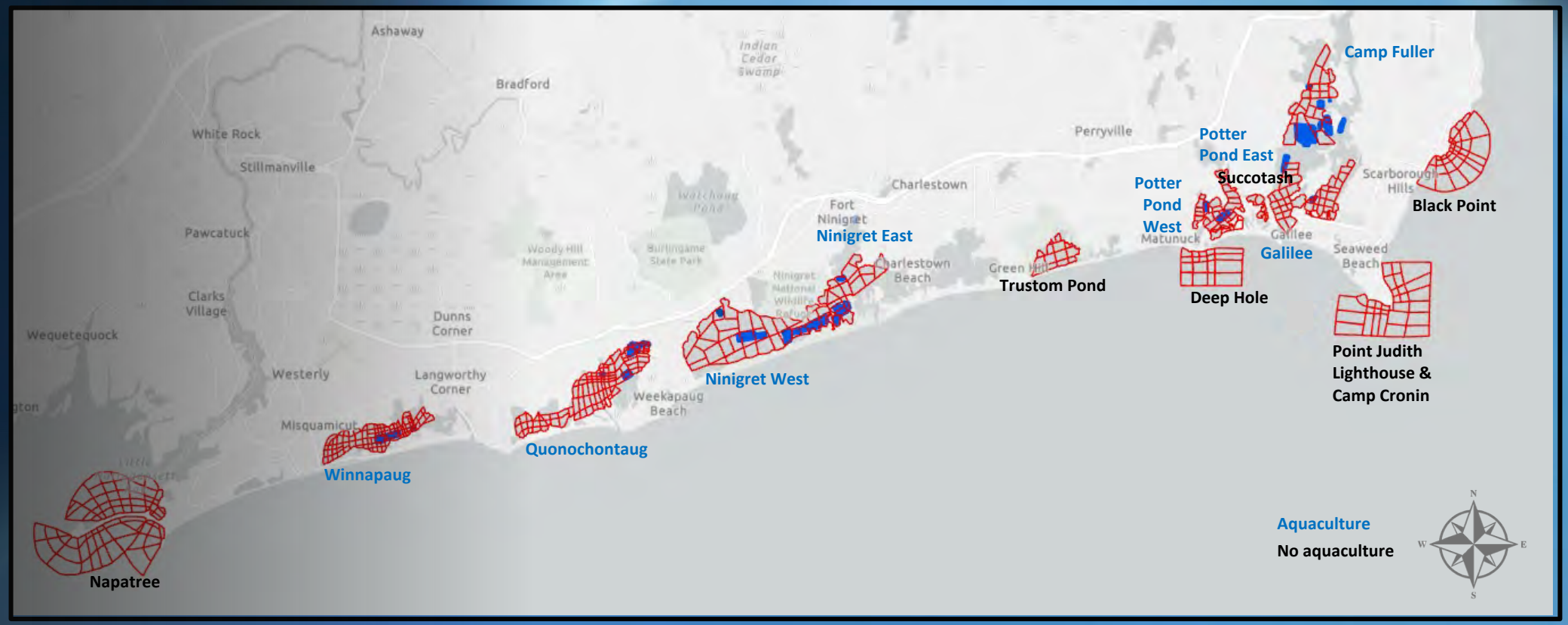


Shellfish aquaculture areas in blue

Land-based waterbird survey sites Narragansett Bay



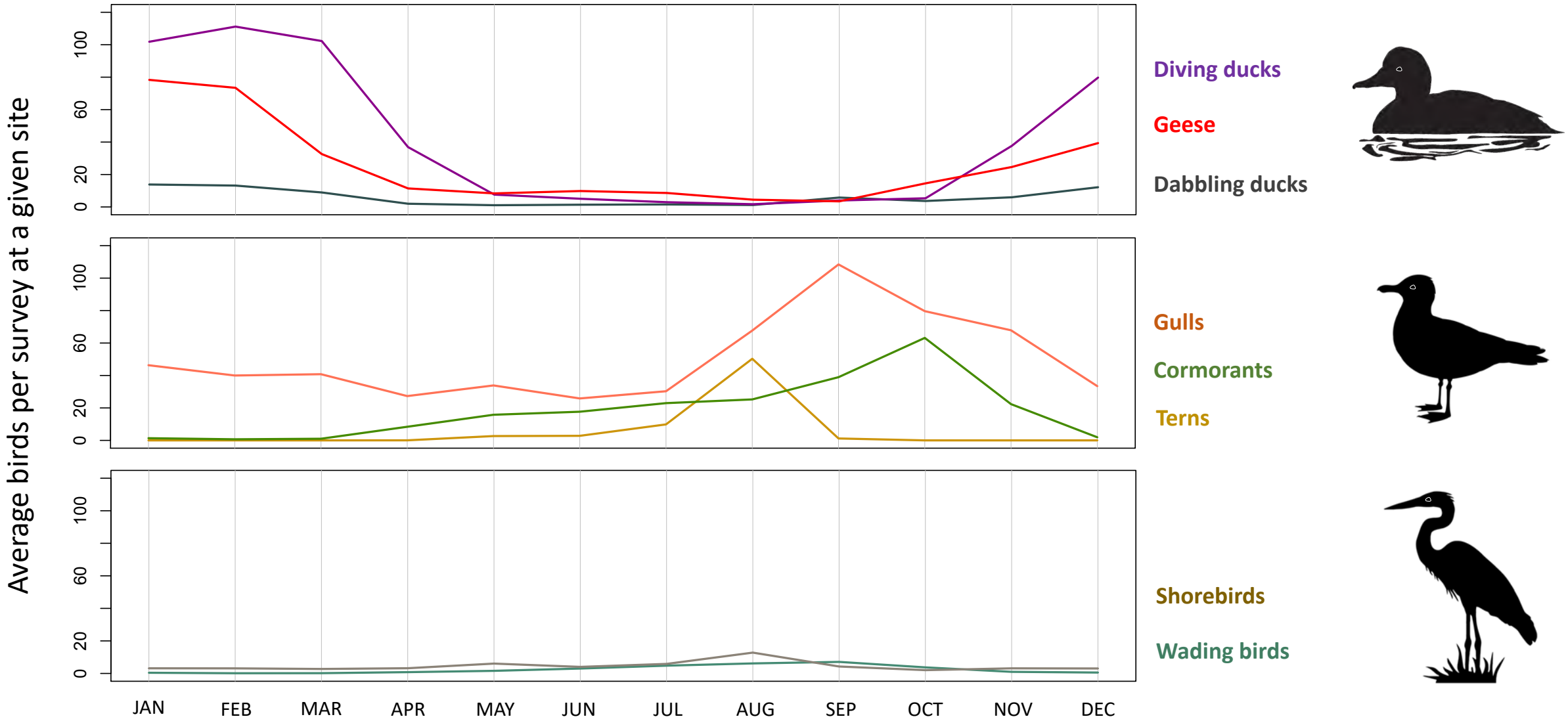
Land-based waterbird survey sites in southwestern RI



Survey grids

Surveyed ~weekly, from Dec 2020 through April 2022

Seasonal abundance of waterbird species groups in Rhode Island



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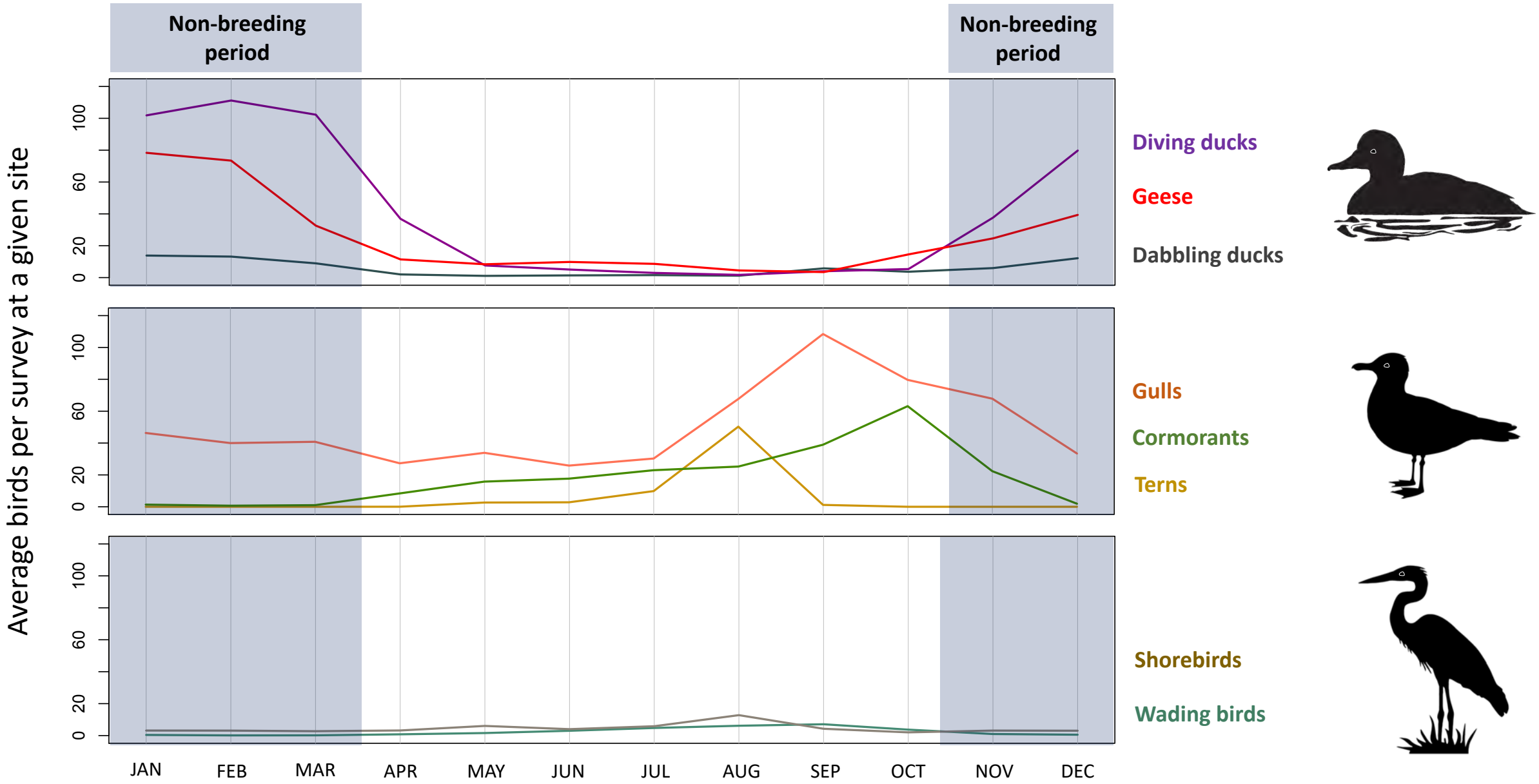

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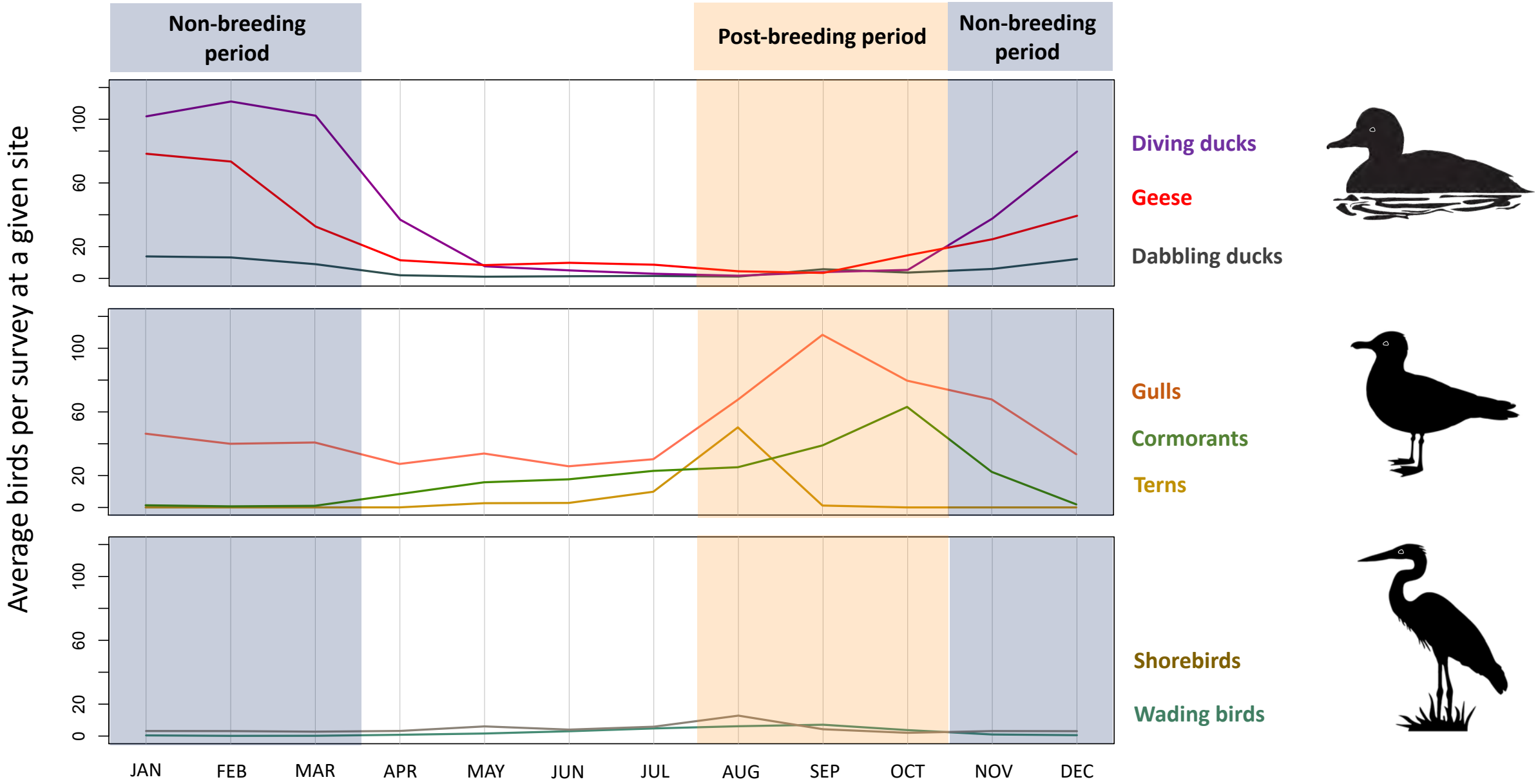

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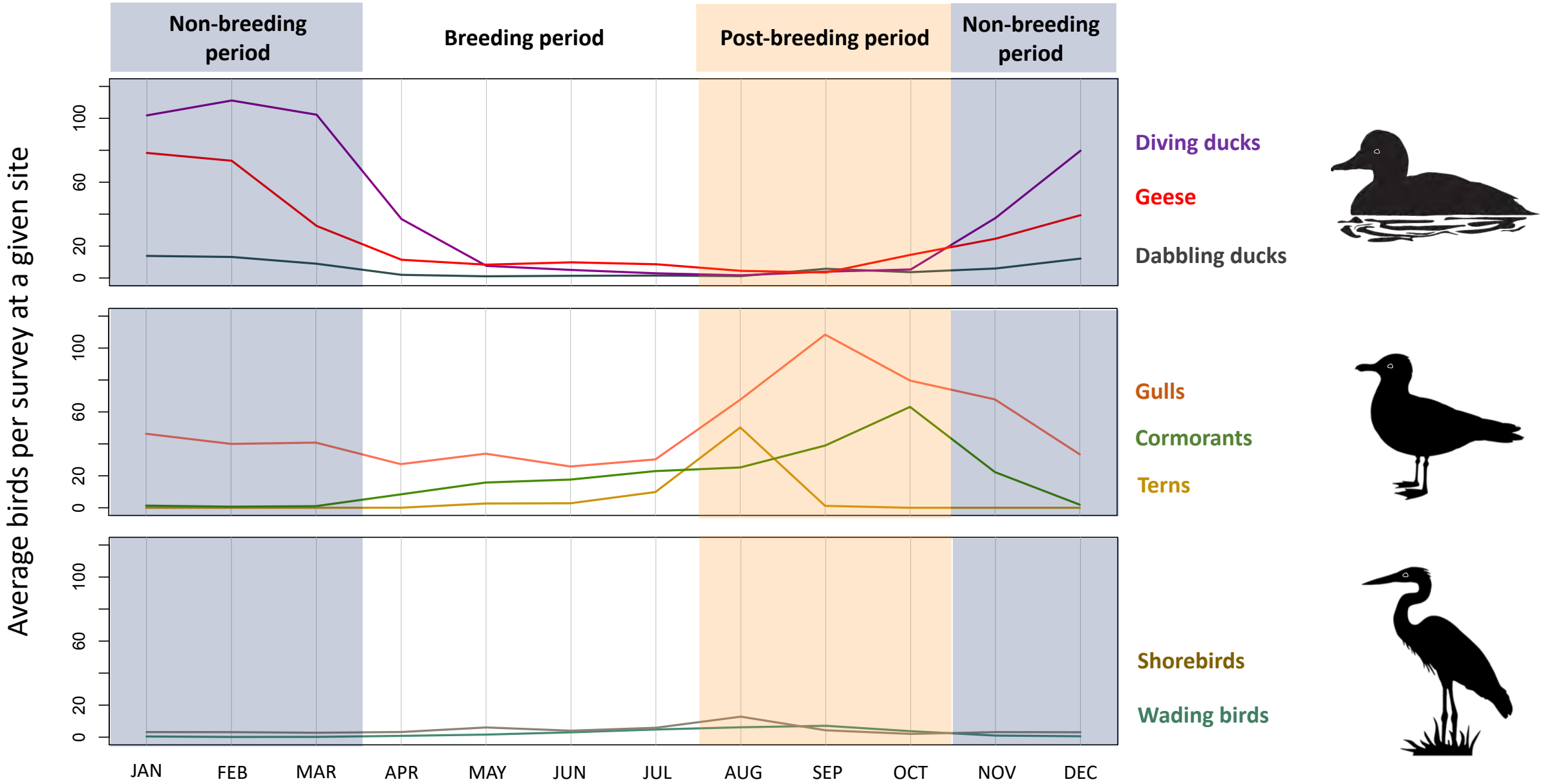
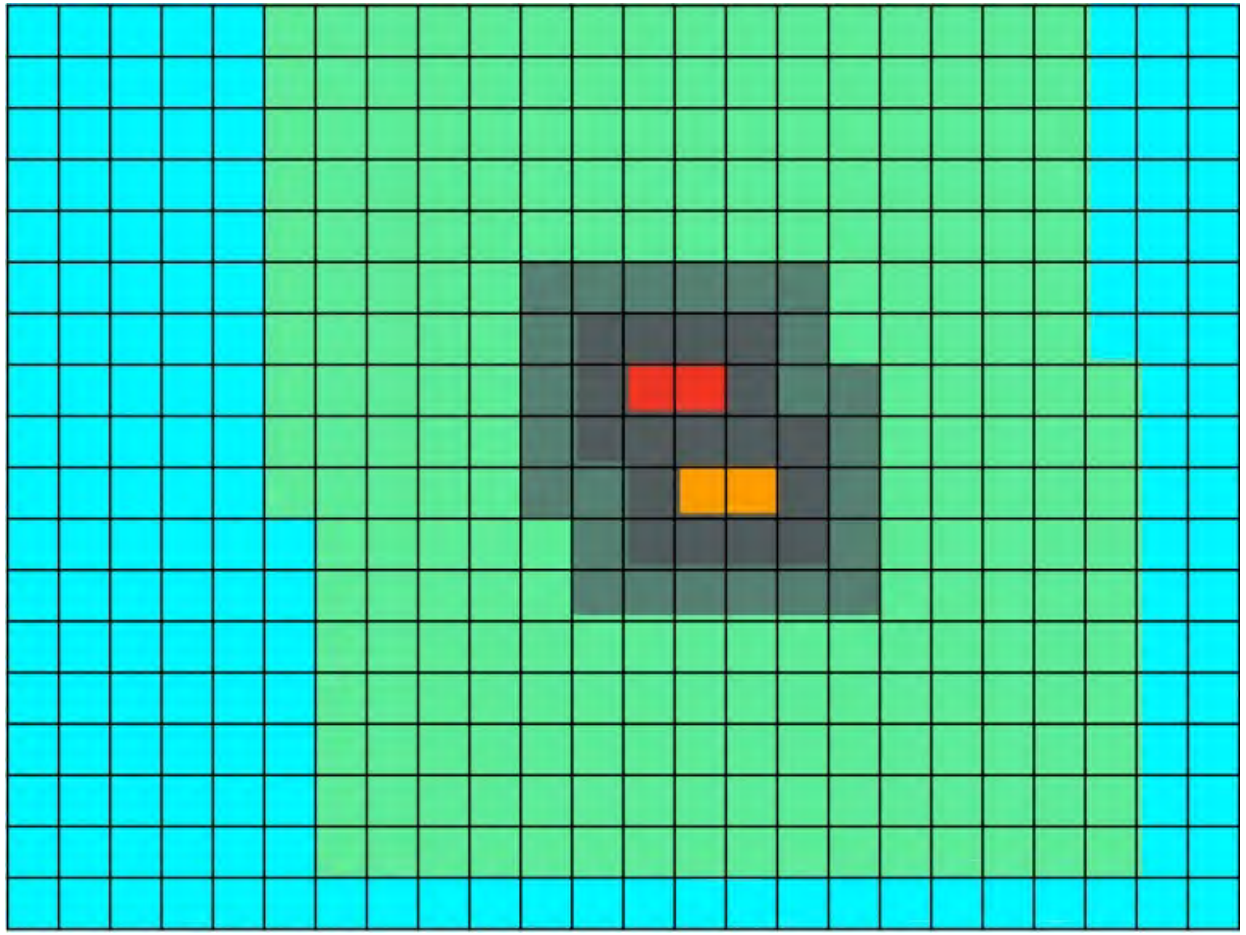


Bird concentrations in relation to aquaculture



Hypothetical survey grid

Grid cell with **floating** aquaculture

Grid cell with **submerged** aquaculture

In grid cell adjacent to aquaculture

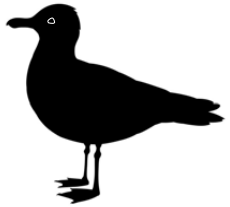
150m+ from aquaculture

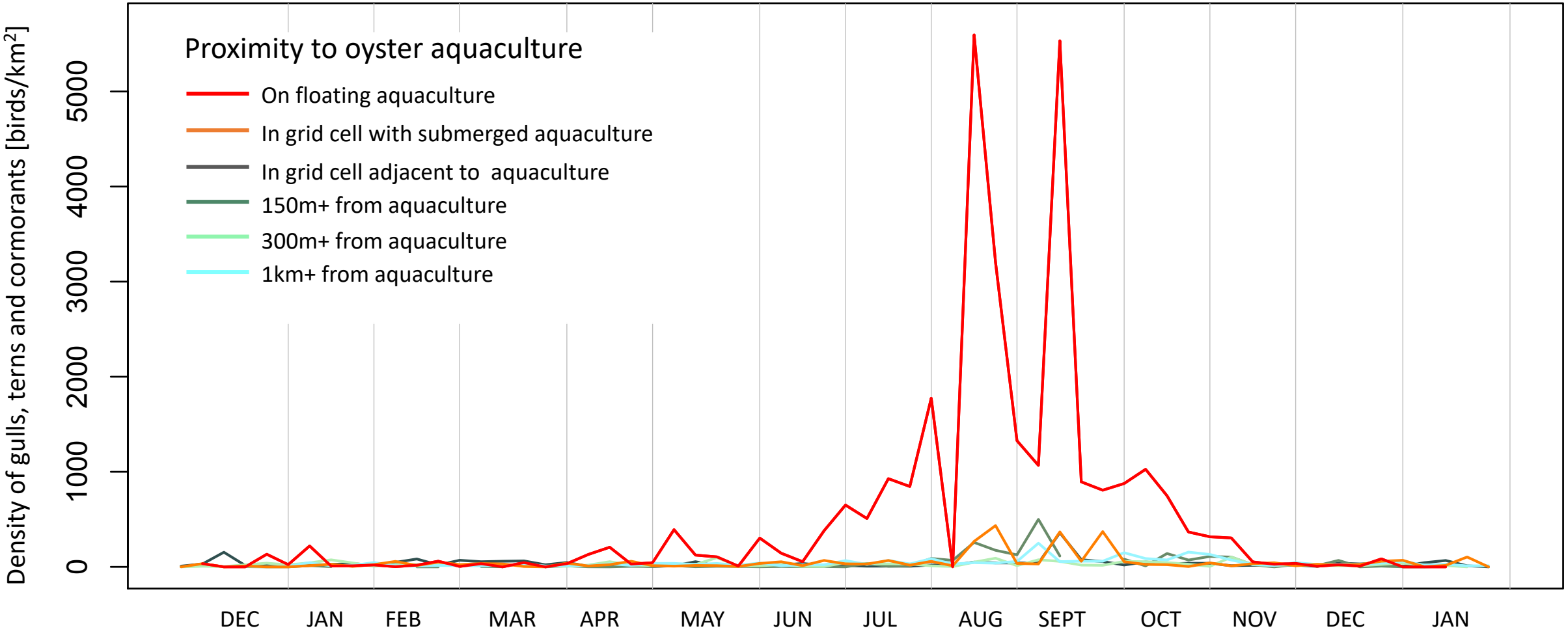
300m+ from aquaculture

1km+ from aquaculture

Increasing distance from aquaculture

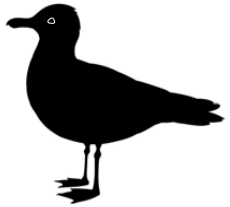
Gulls, terns and cormorants

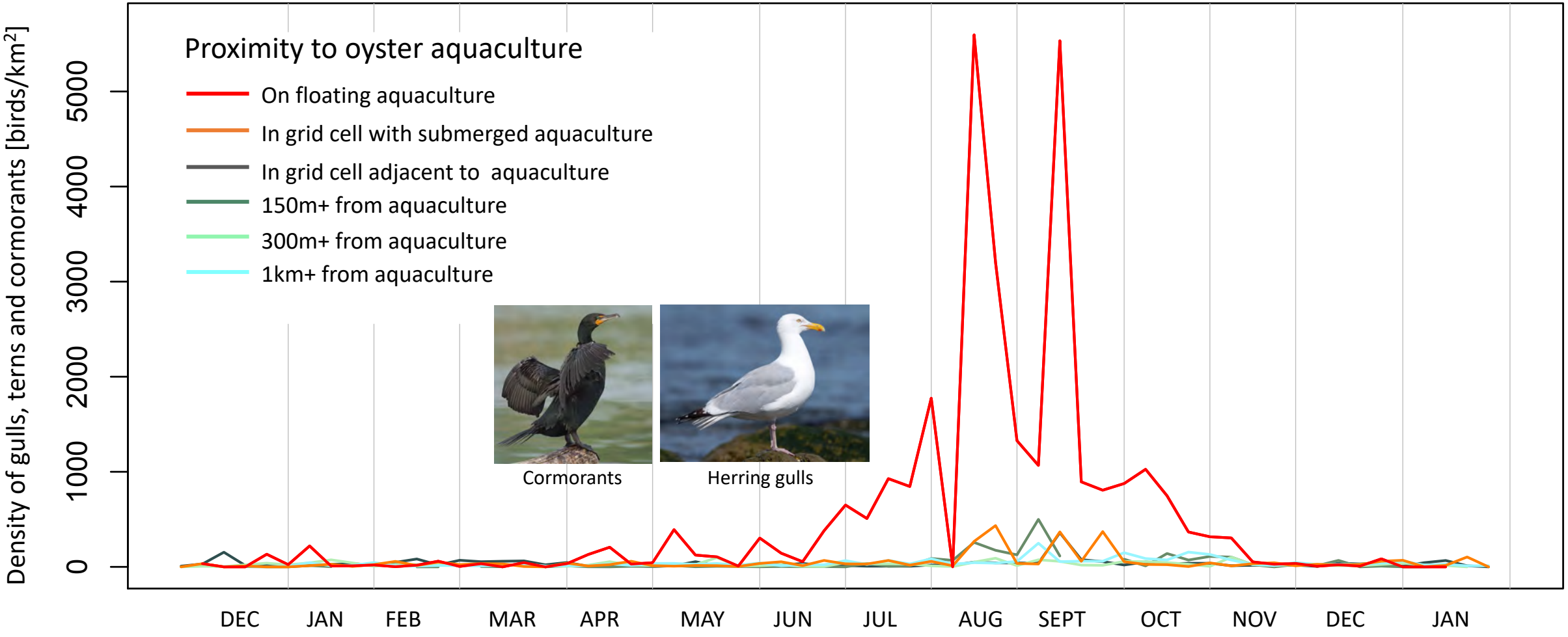




Bird density very high on floating cages in later summer and early fall (post-breeding period)

Gulls, terns and cormorants



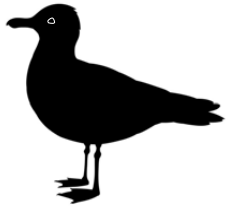


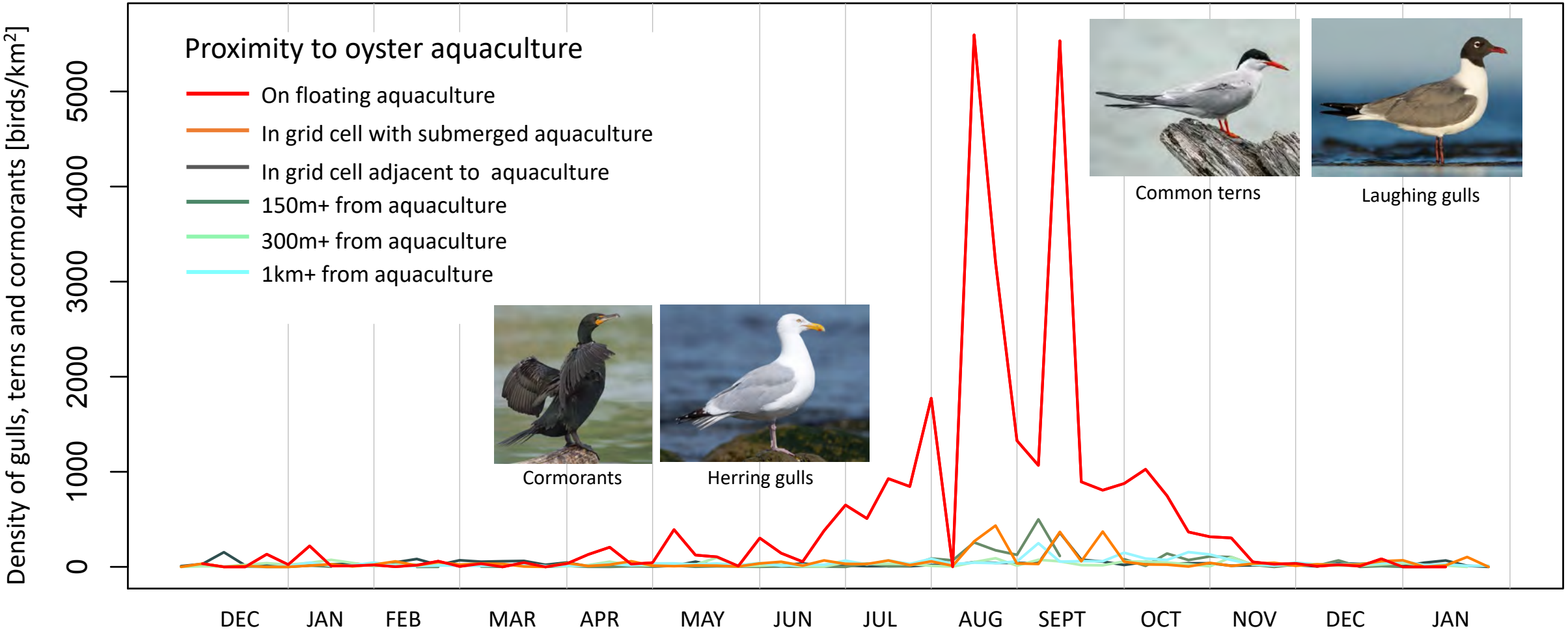
Cormorants

Herring gulls

Bird density very high on floating cages in later summer and early fall (post-breeding period)

Gulls, terns and cormorants





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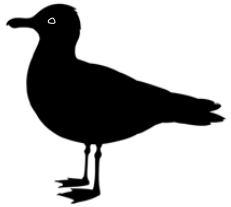
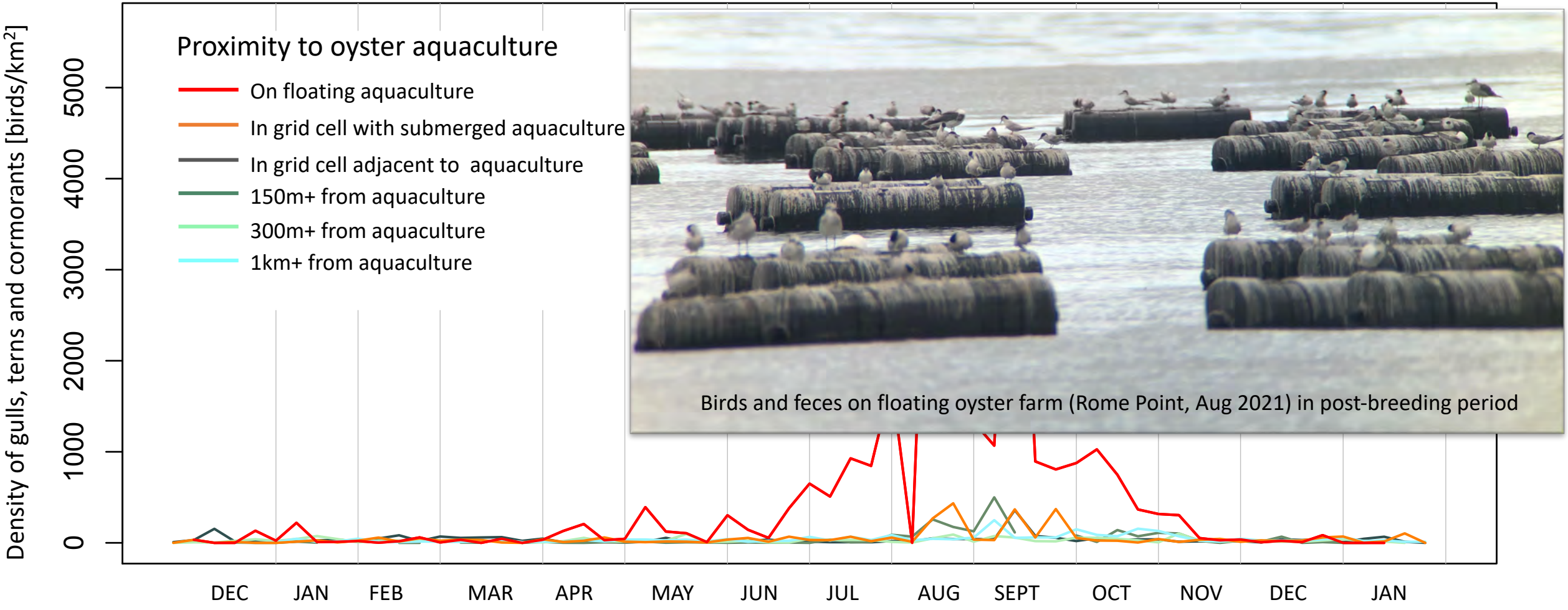
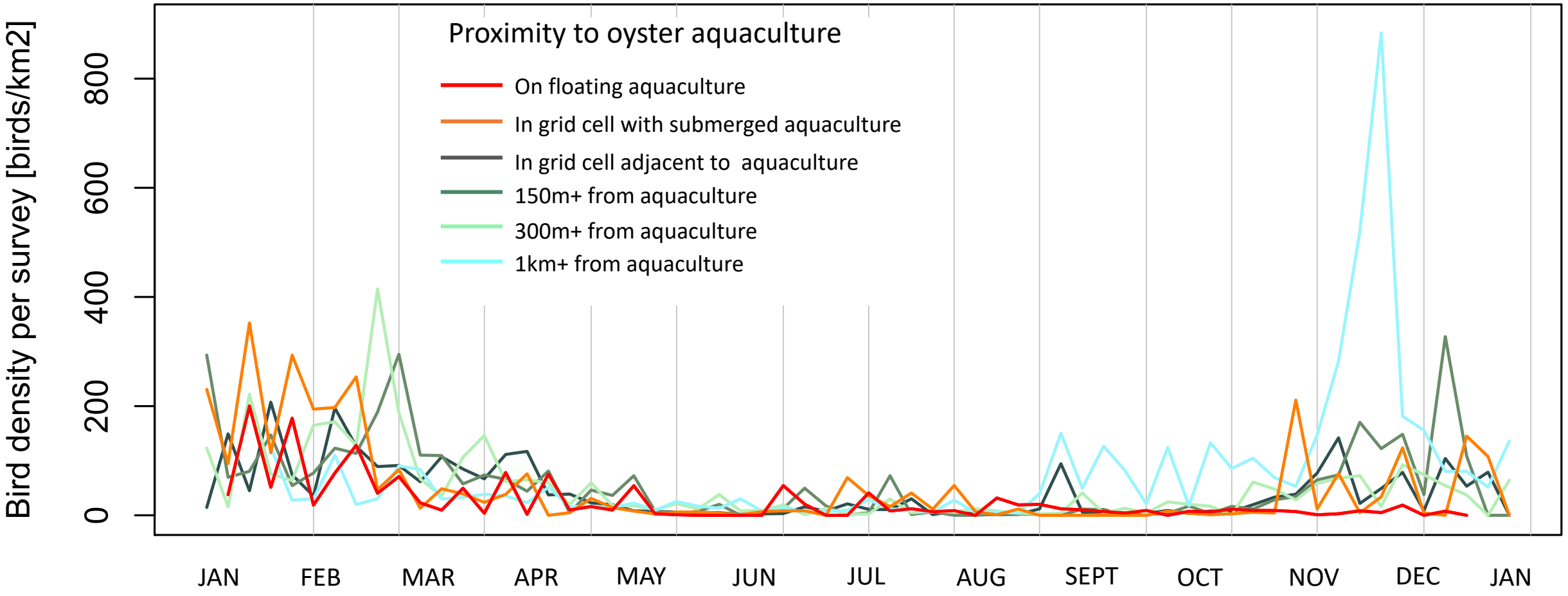




Birds and feces on floating oyster farm (Rome Point, Aug 2021) in post-breeding period

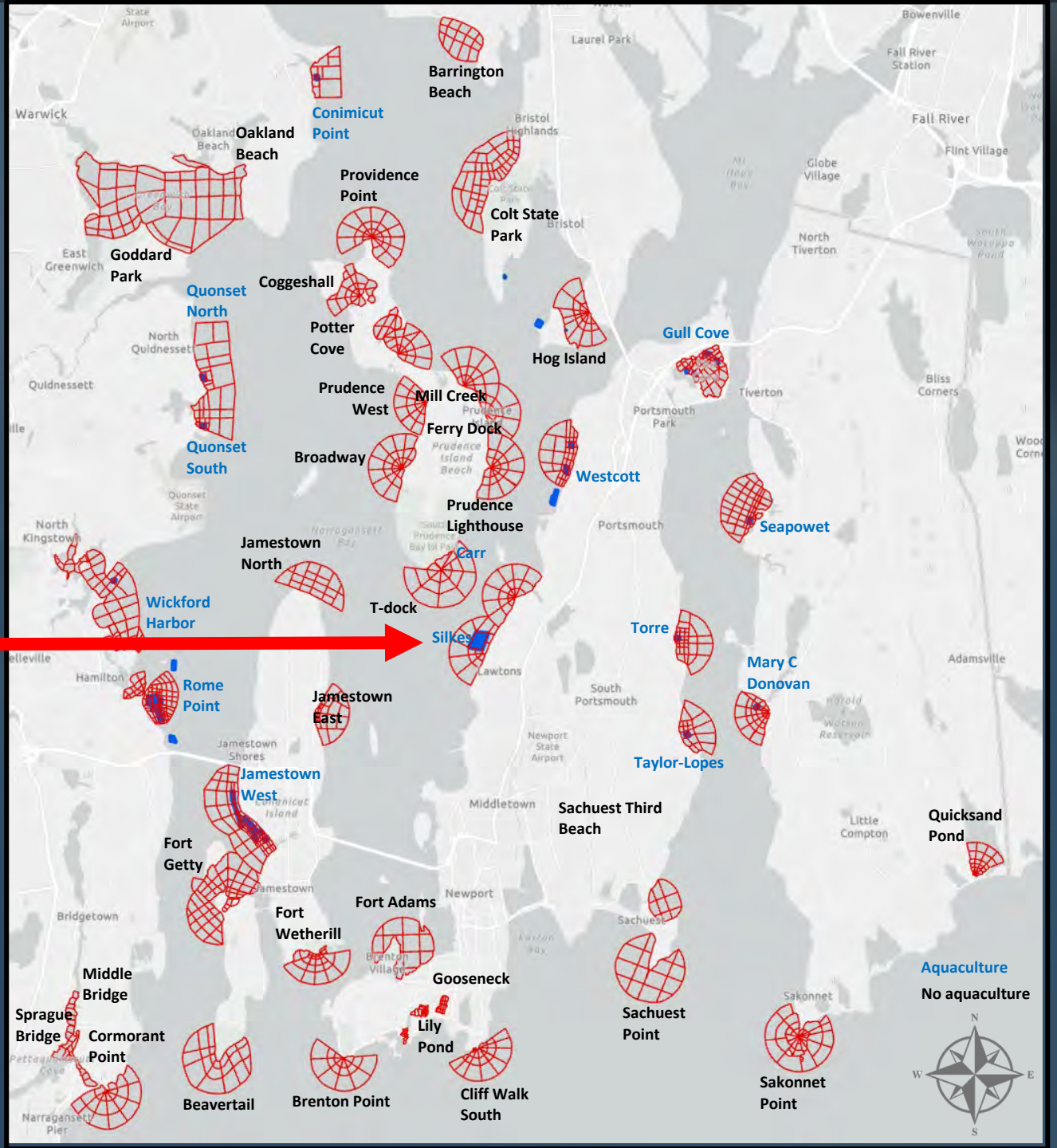
Bird density very high on floating cages in later summer and early fall (post-breeding period)

Waterfowl

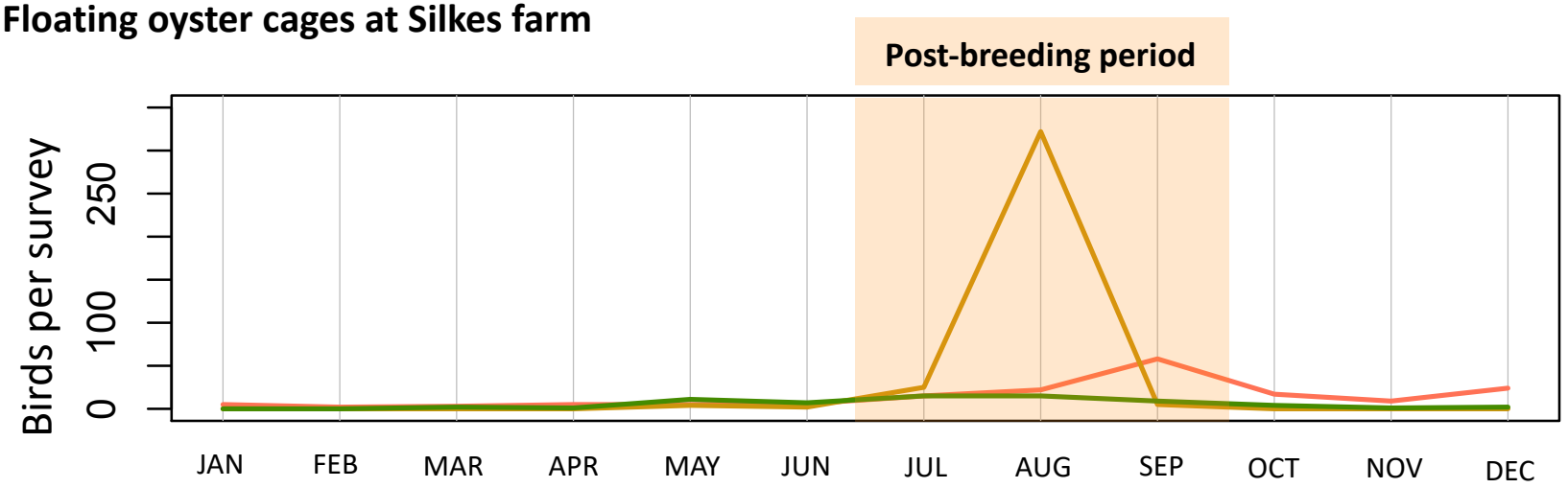


Present in high numbers in all areas in winter, regardless of aquaculture.

Silkes aquaculture area



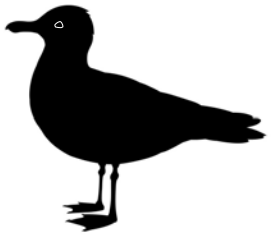
Floating oyster cages at Silkes farm



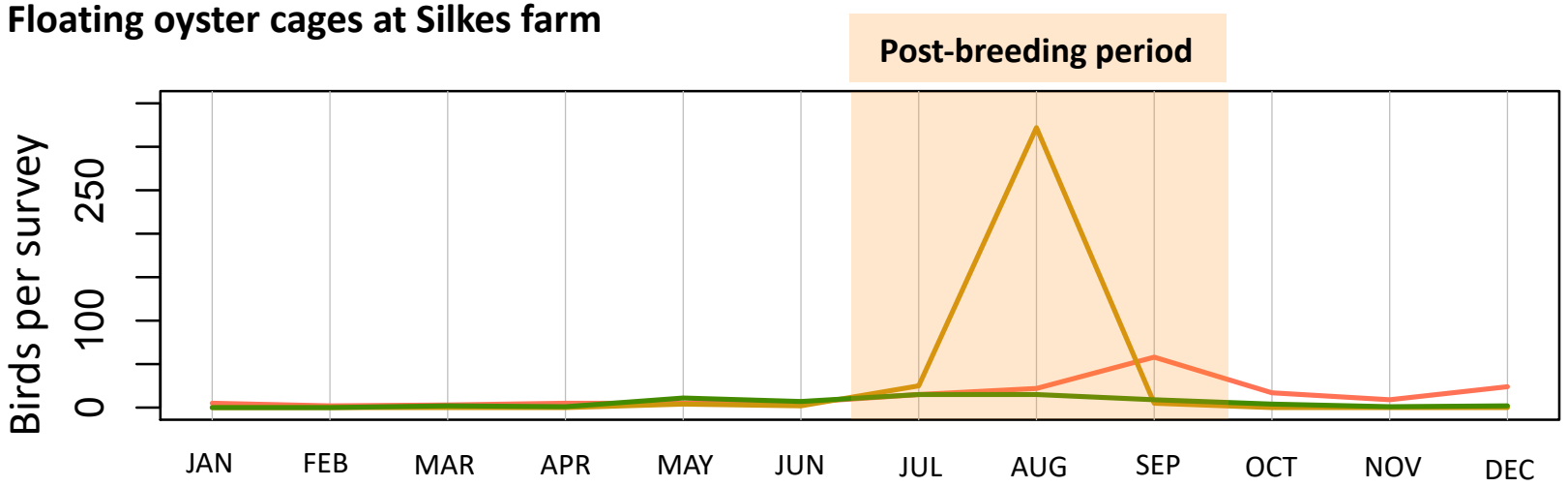
Terns

Gulls

Cormorants



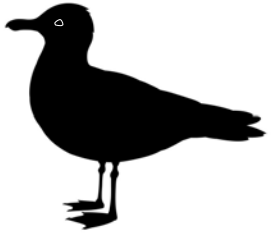
Floating oyster cages at Silkes farm



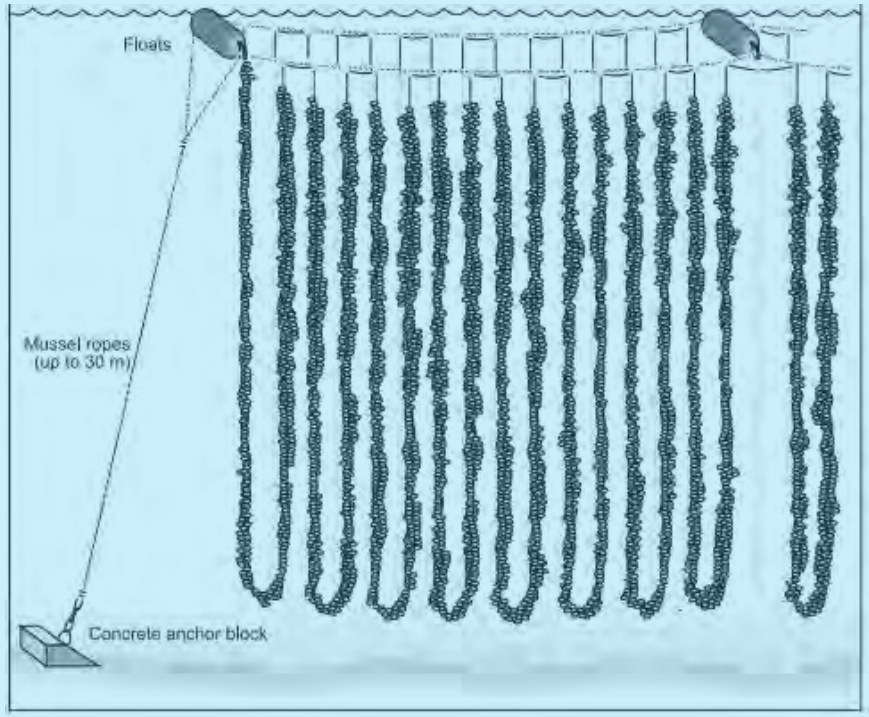
Terns

Gulls

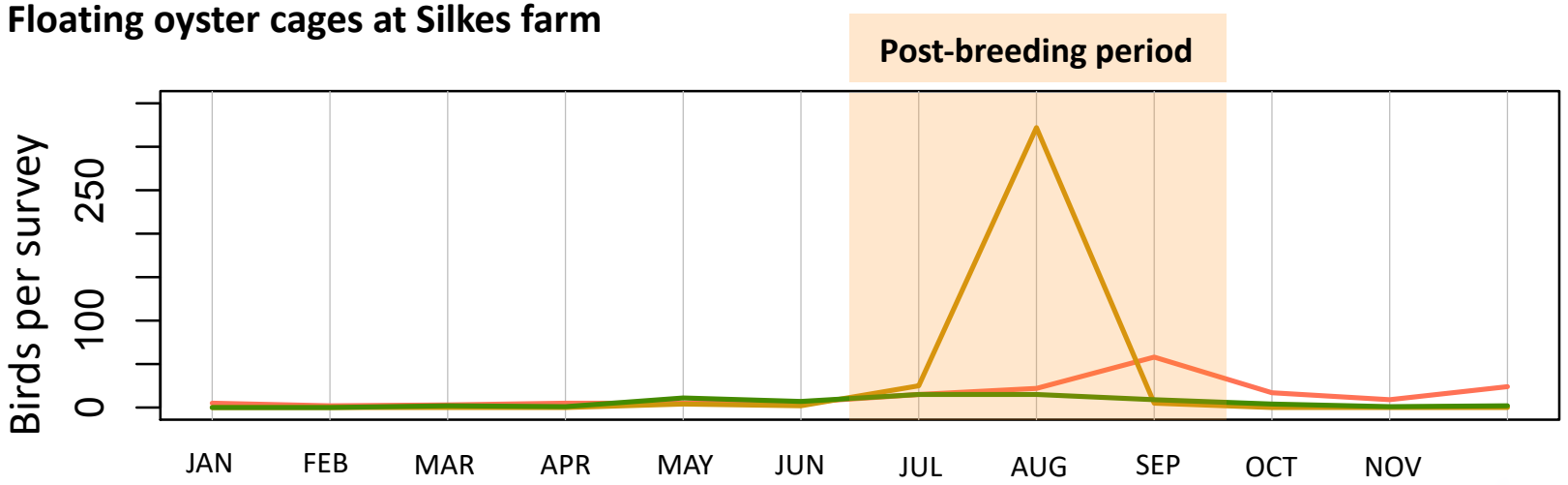
Cormorants



Mussel long lines at Silkes



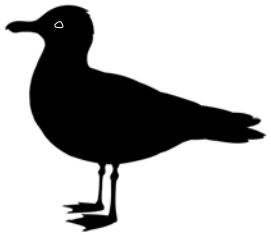
Floating oyster cages at Silkes farm



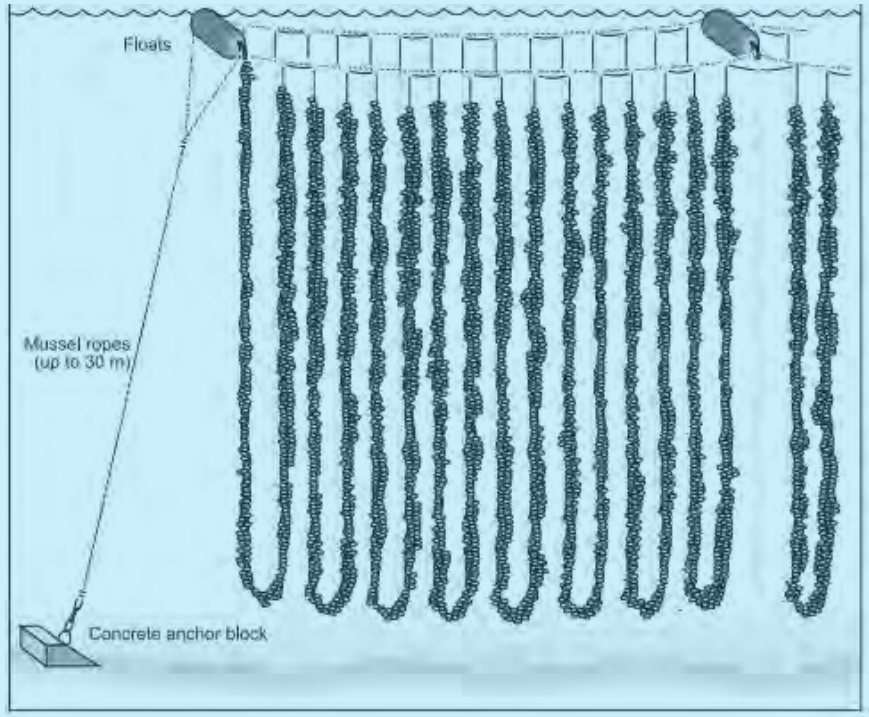
Terns

Gulls

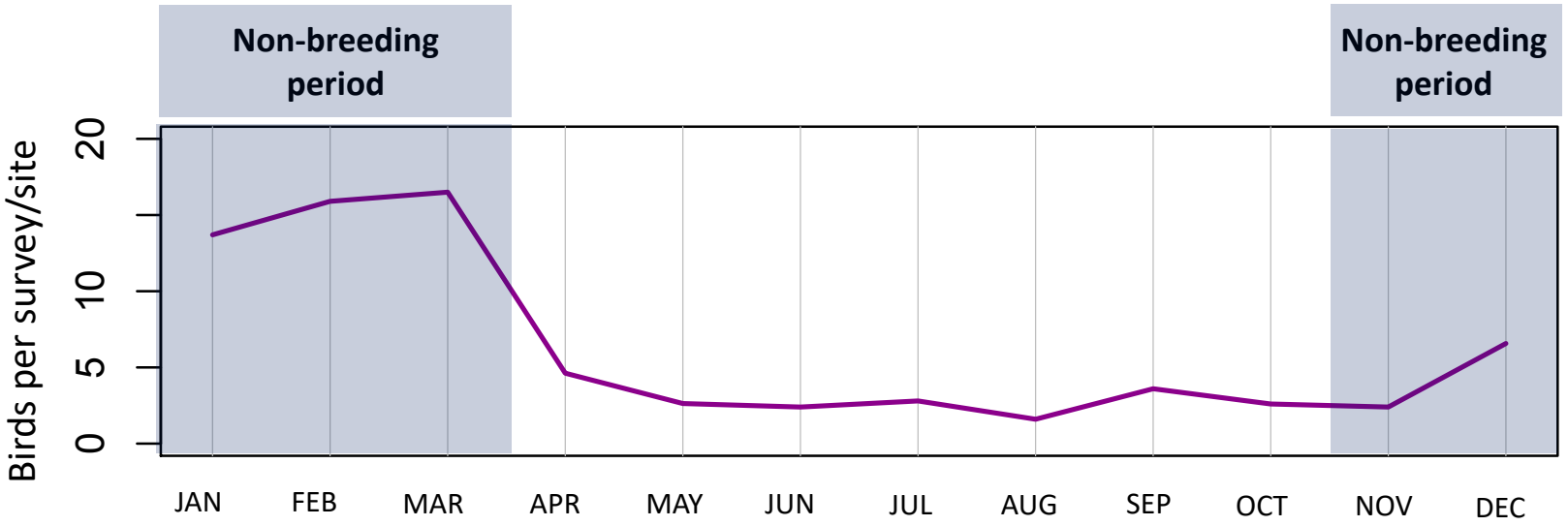
Cormorants



Mussel long lines

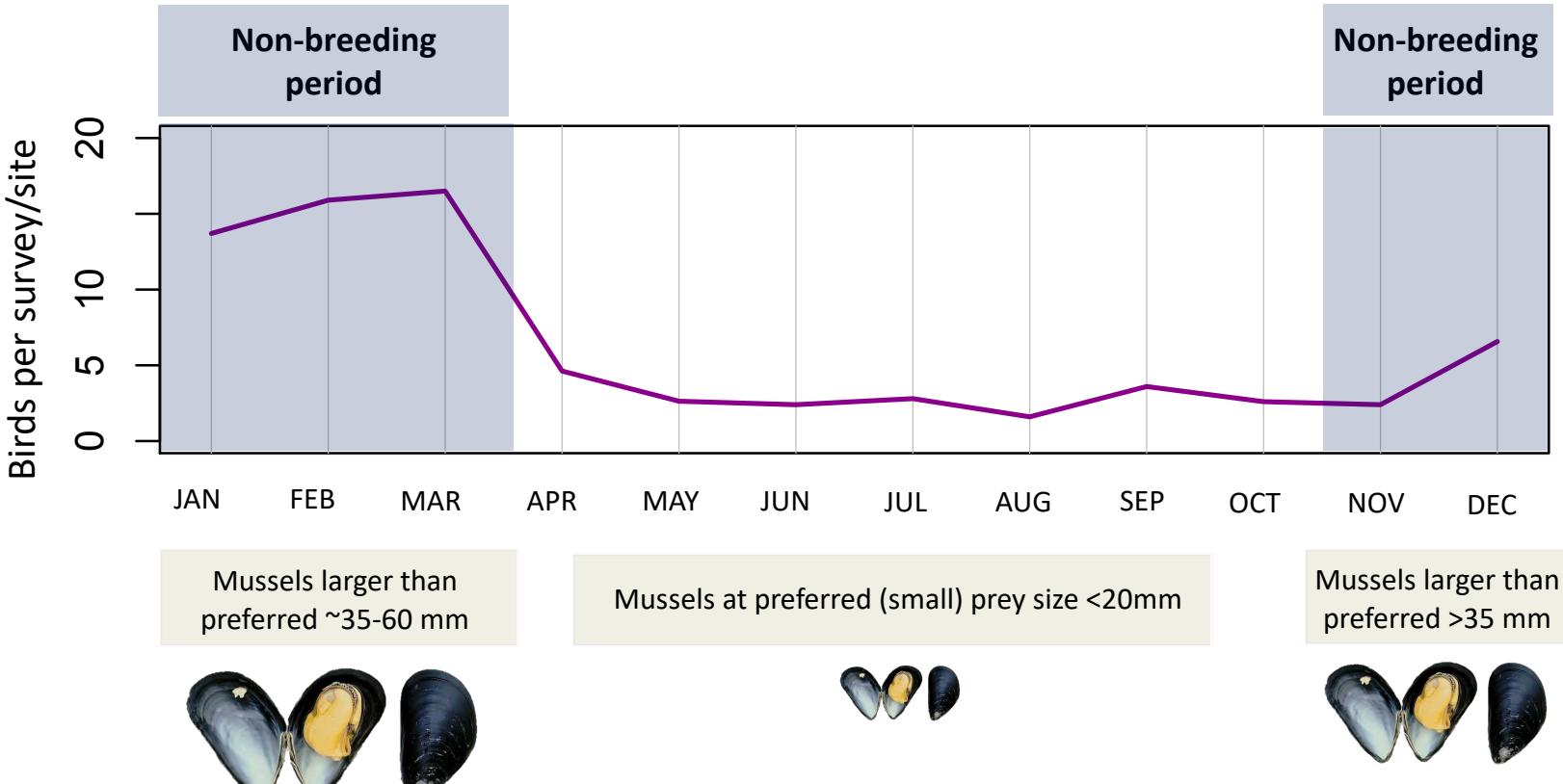


Common eider tend to be around in winter



Wintering common eider at all other survey sites besides Silkes

Common eider tend to be around in winter (when cultivated mussels are quite large)



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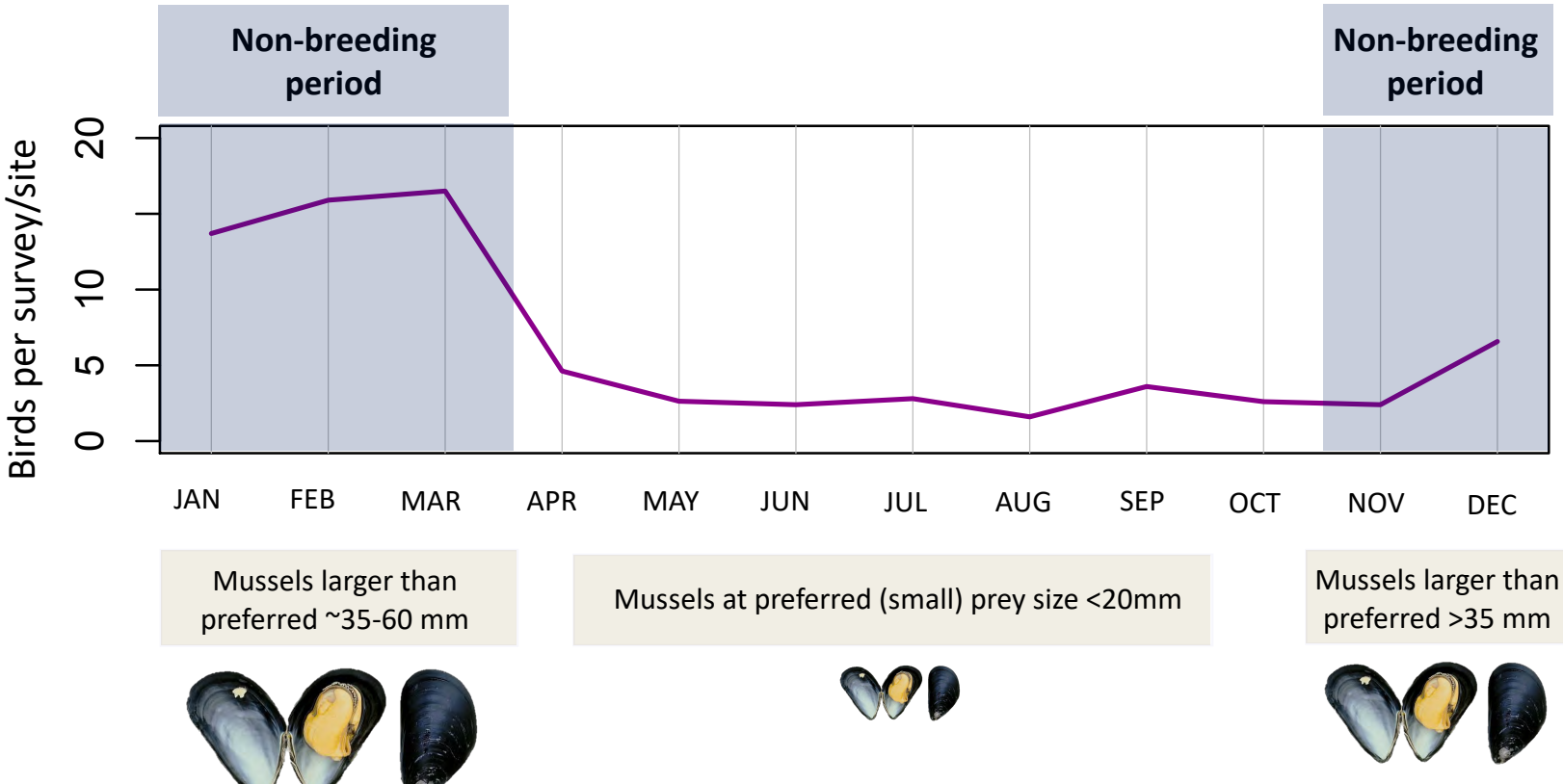
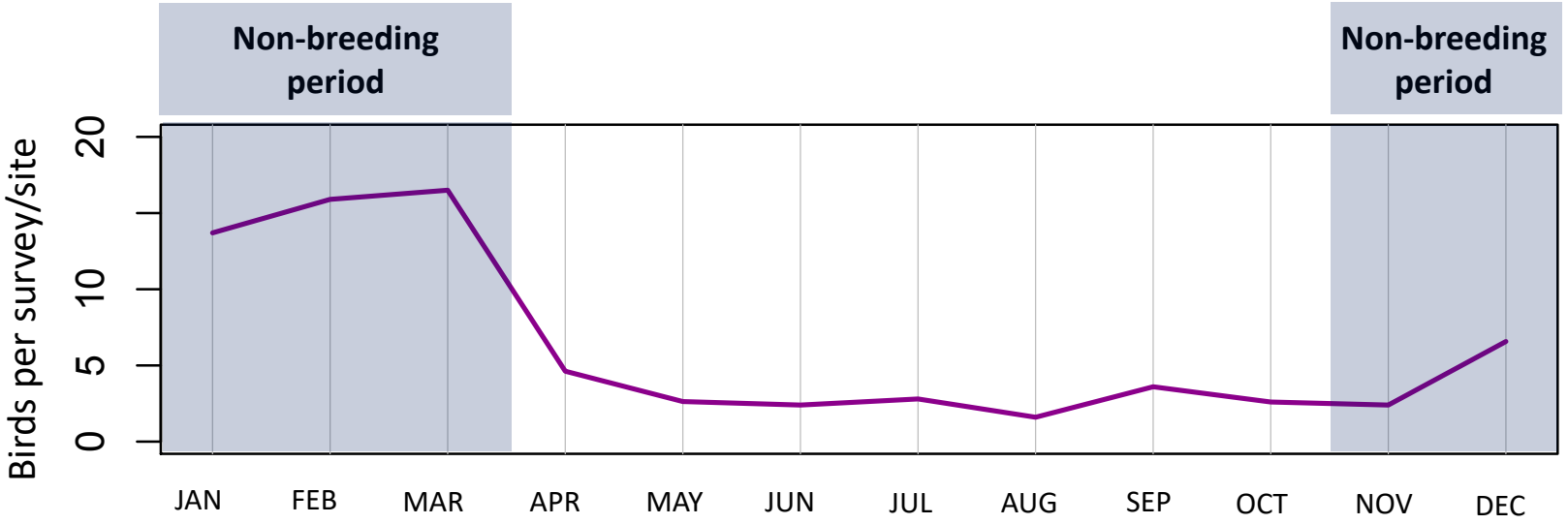


Wintering common eider at all other survey sites besides Silkes

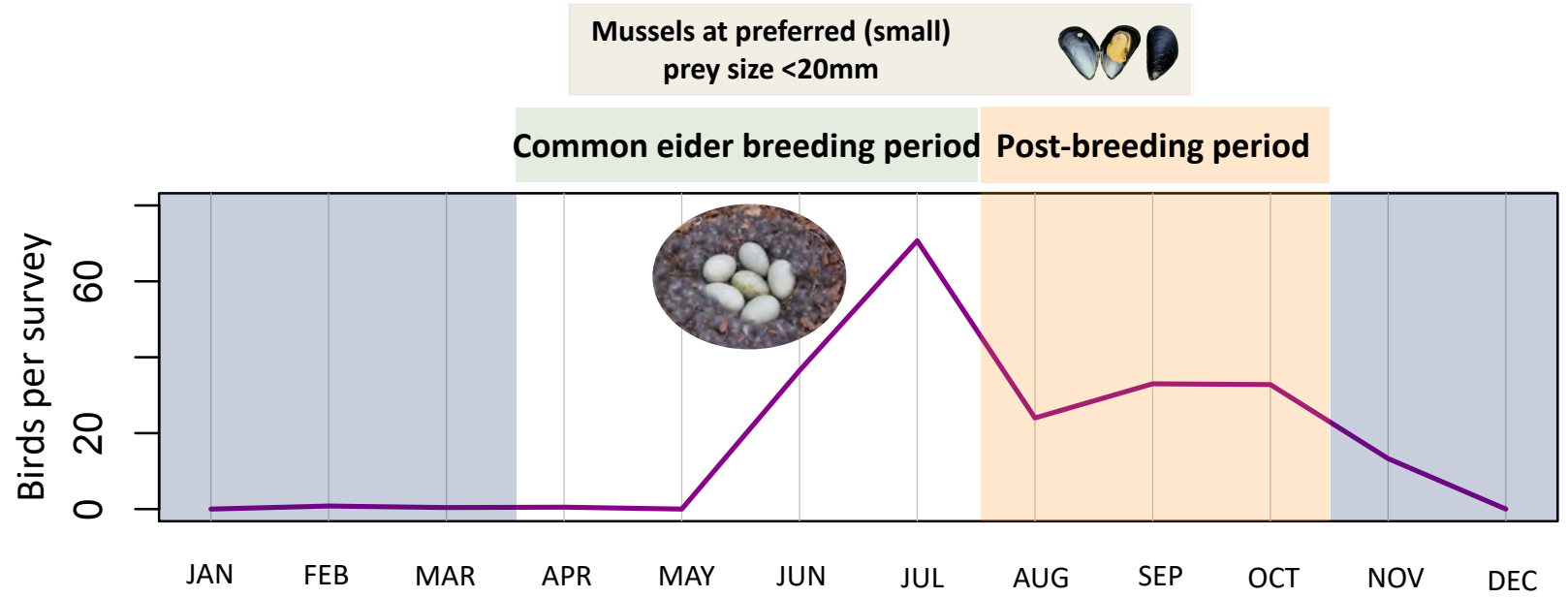
Rhode Island also has a resident breeding common eider population

…where do they hang out?

Resident breeding population of common eider attracted to mussel farm in summer



Wintering common eider at all other survey sites



Resident common eider at Silkes mussel farm

Conclusions

1. Is there spatial overlap between waterbirds and shellfish aquaculture?
   - At what times of year, and which species groups?

Non-breeding period: (winter)

Wintering waterfowl are present in aquaculture areas but not in higher numbers.

Post-breeding period: (summer/fall)

Gulls, terns and cormorants use floating oyster farms as roosting sites.

Resident common eider are attracted to, and most likely forage on, cultivated mussels.

Conclusions

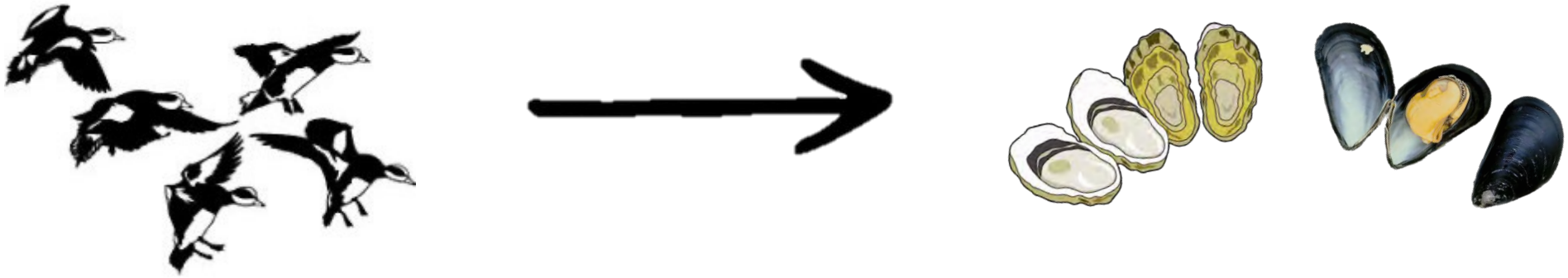
2. In which ways might waterbirds and aquaculture impact each other?

No indications that human activity on oyster farms disturb birds, or that presence of oyster farms displaces birds.

Floating farms may be important roosting sites for birds before fall migration.

Conclusions

2. In which ways might waterbirds and aquaculture impact each other?



Direct predation of mussels by resident common eider

Birds roosting on floating farms may undermine water quality - consumption of raw oysters harvested in those areas can potentially be a food safety problem (needs further research)

Thanks!

Waterbird survey crew:

- Lesley Howard
- Liam Corcoran
- Michaela Barcelos
- Branden Costa
- Jessica Szpila
- Clara Cooper-Mullin
- Jake Wilson
- Matt Zucconi
- Sam Miller
- Clay Graham
- Colby Slezak
- Joel Eckerson
- Nathan Archer
- Patrick Felker
- Marie Haviland
- Kylie Rezendes
- Owen Valentine
- Finn Harty
- Peter Paton
- Harrison Hepding
- Lincoln Dark
- Ciara Frawley

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