Looking for *Jasus:* Challenges and implications of tracking rock lobster in a temperate marine reserve

Nessia, H., LaScala-Gruenewald, D., Pederson, H., Radford, C., & Shears, N.

Photo: Paul Caiger

THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

SCIENCE

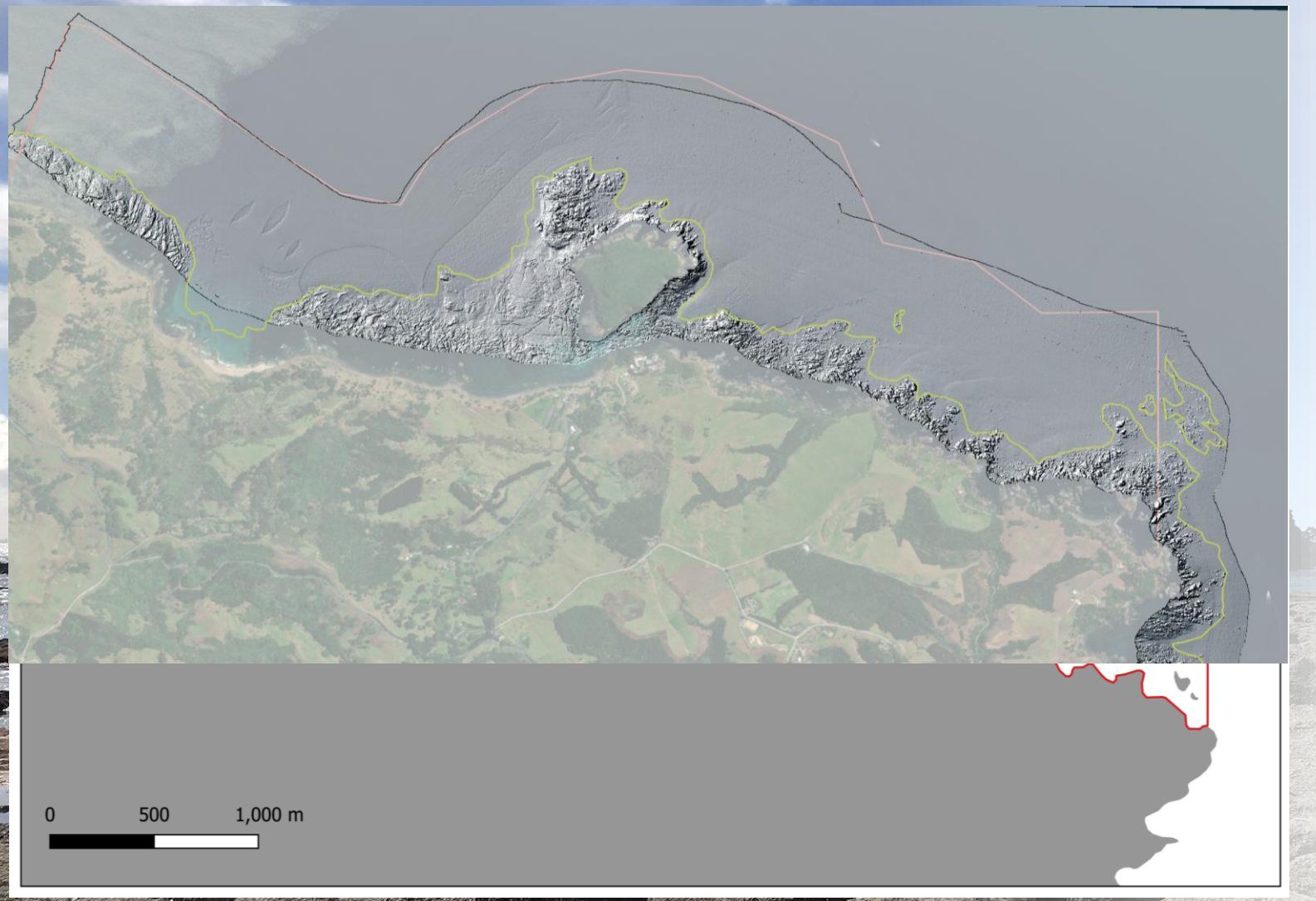
LEIGH MARINE LABORATORY

INNOVASEA

The southern spiny rock lobster *Jasus edwardsii*

- Found in southern Australia and New Zealand
- Feeds on molluscs, crustaceans, and sea urchins
- Important fisheries species (commercial, recreational, and customary quotas)
- Northeastern stocks overfished but MPAs generally effective at increasing populations

The Cape Rodney-Okakari Point (CROP) Marine Reserve



- New Zealand's oldest marine reserve (est. 1975)
- Continuous rocky reef along longshore margin, 12-25m depth

The Cape Rodney-Okakari Point marine reserve

- Long-term movement studies of *Jasus edwardsii* carried out since the 1970's
- Large aggregations of *Jasus edwardsii* in the late 1990's
- CROP population with higher densities and individual sizes than adjacent fished populations

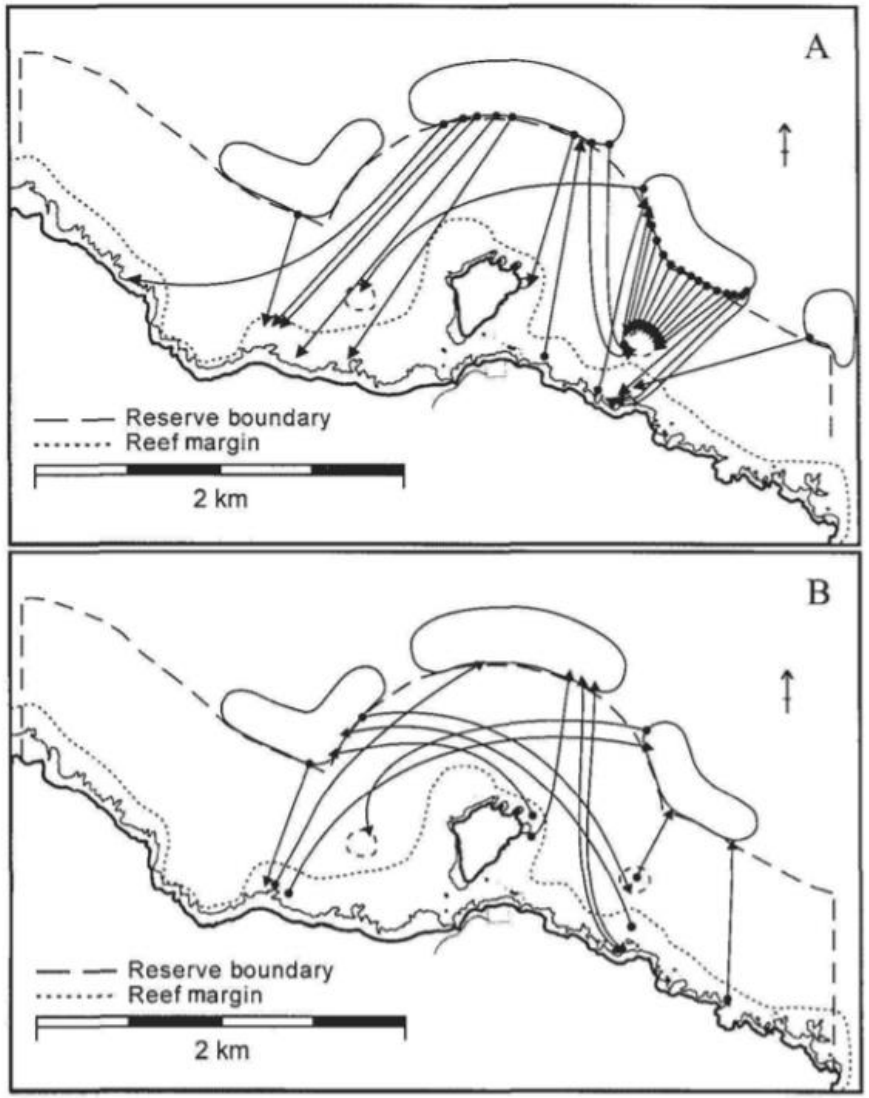
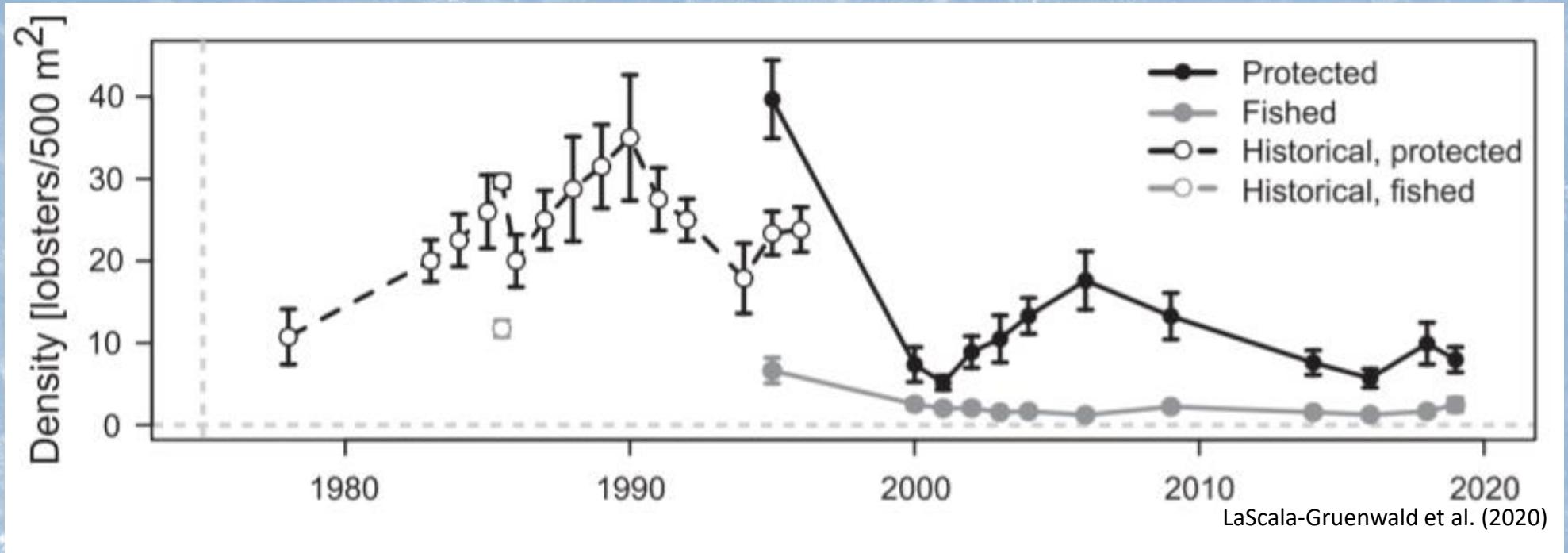


Fig. 6 Offshore movements of: **A**, female; and **B**, male *Jasus edwardsii* around the Leigh Marine Reserve, north-east New Zealand.

Kelly & MacDiarmid (2003)

The Cape Rodney-Okakari Point marine reserve



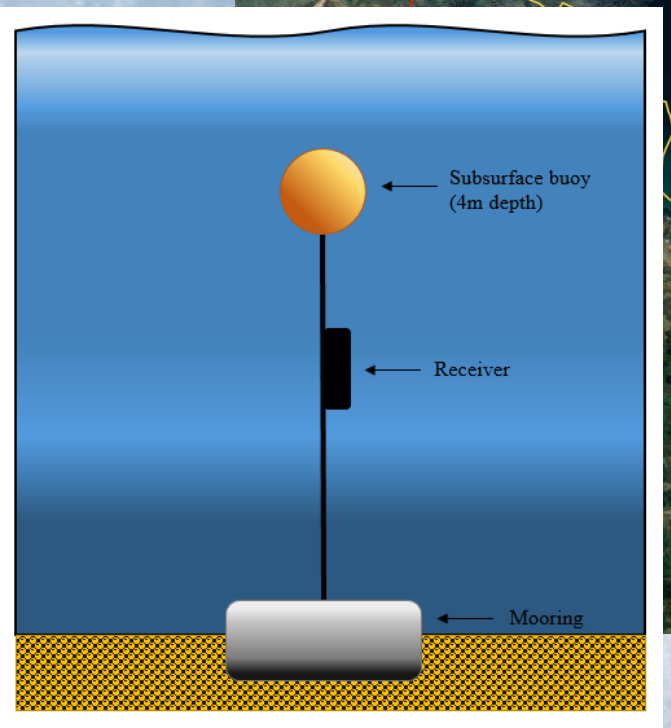
LaScala-Gruenwald et al. (2020)

- High fishing pressure on the boundary- reserve population in decline
- Is boundary fishing contributing to the long-term decline?

Questions

1. Do these offshore movements still occur?
2. What movements do lobsters undertake spatially and temporally in the marine reserve?
3. Are these movements comparable to historical records?

Methods: Passive acoustic array



Tagging Methods

- Lobsters were caught and tagged from March 2018 to February 2019
- Divided into small (<100mm CL), medium (100-150mm CL) and large (>150mm CL)
- Total of 60 tagged lobsters released into the array (32 males, 31 females)
- Receivers serviced and downloaded every three months

Methods: Analysing movement

- Triangulation unsuccessful- low simultaneous detections on >2 receivers
- Weighted positioning used instead (Simpfendorfer et al. 2002)
- Tracking data available for 52 lobsters
- Class weighted positions as ‘reef’, ‘reef edge’ (100m buffer) or ‘sand’
- Compare habitat use, distance travelled, and diel activity between size classes, sex, and seasons

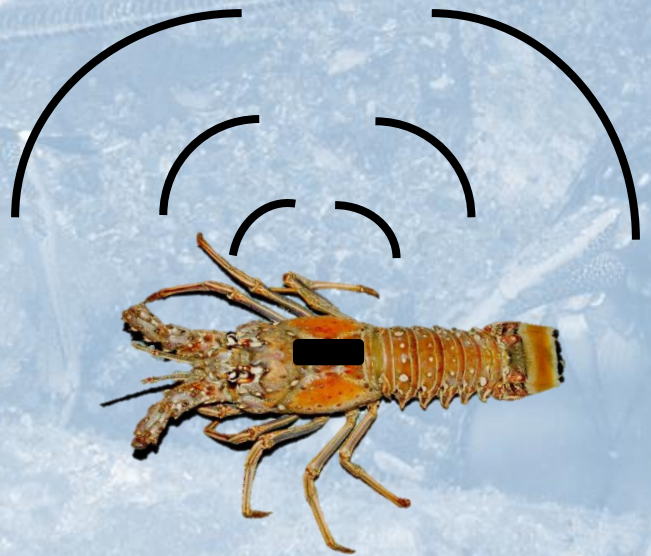
Methods: Weighted Positioning

RECEIVER A

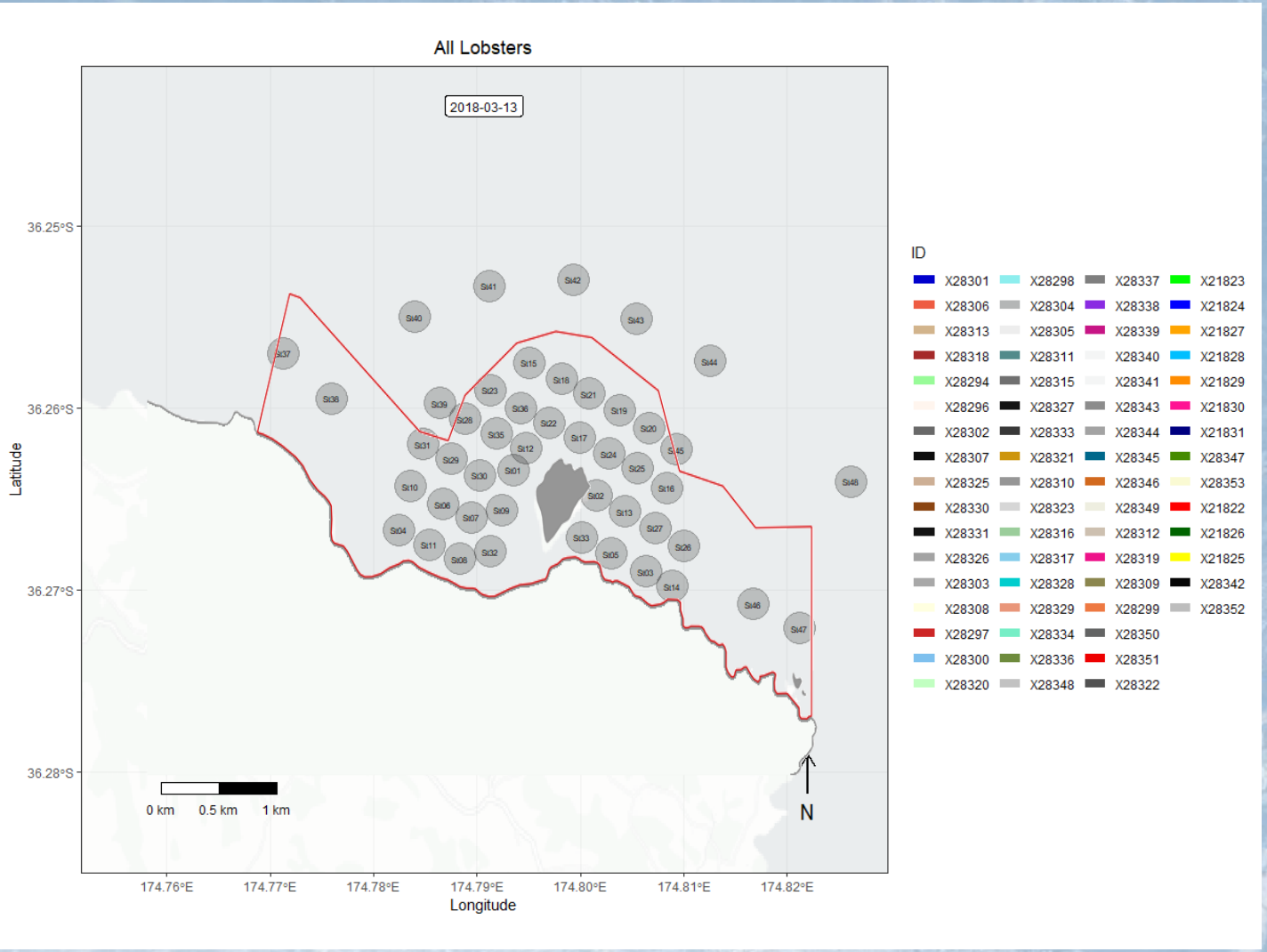
RECEIVER B

20
DETECTIONS

5
DETECTIONS

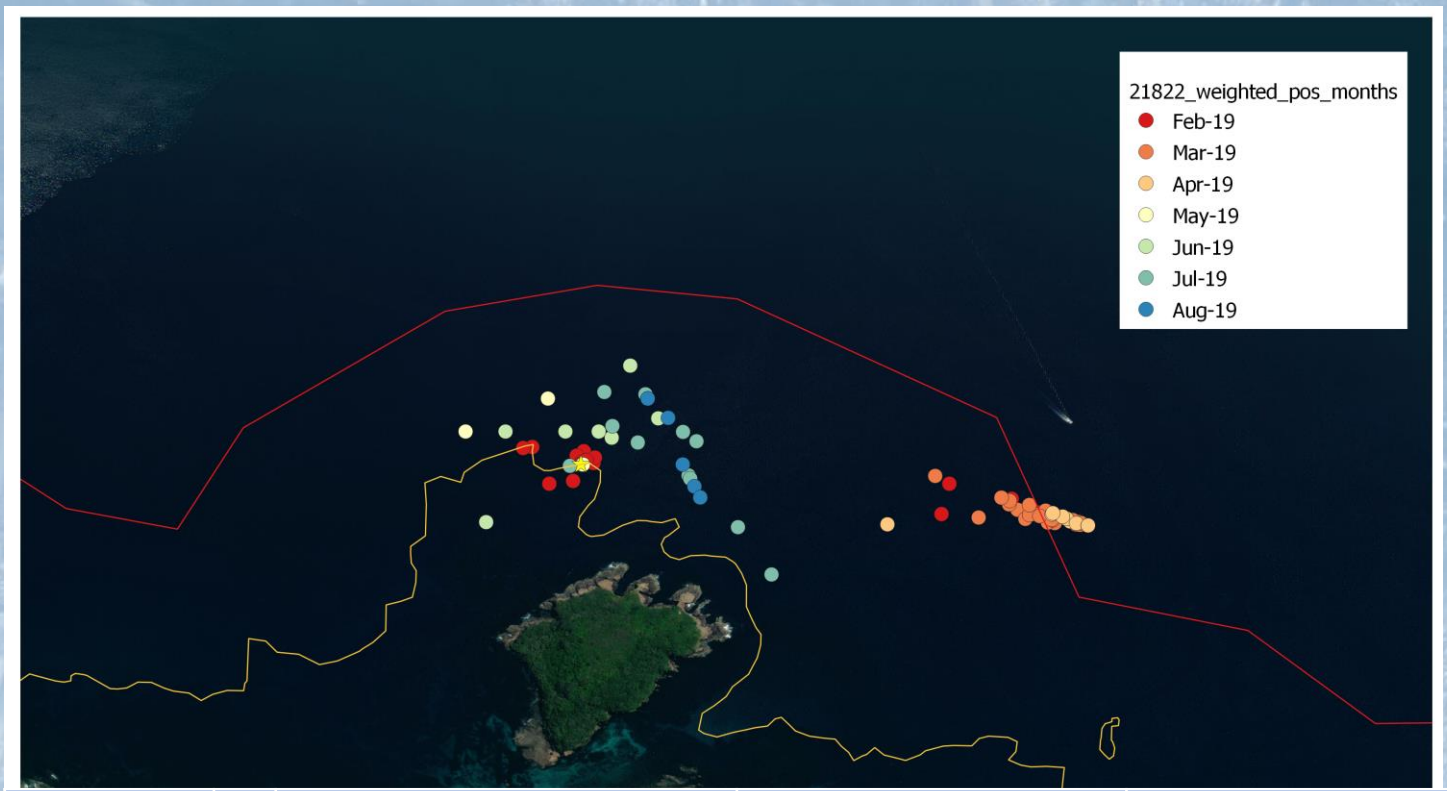


Lobster Positioning



- April 2018 to May 2020
- No detections on outer receivers
- Only one lobster detected beyond boundary

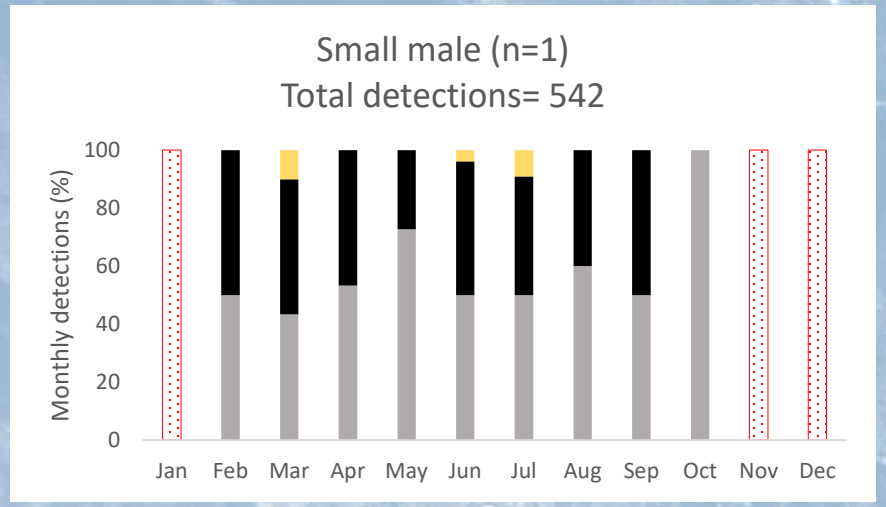
Lobster positioning: distance travelled

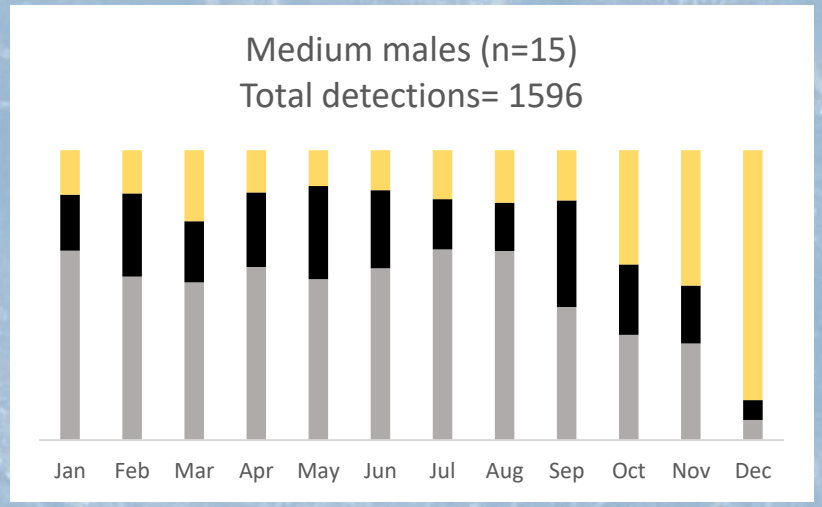


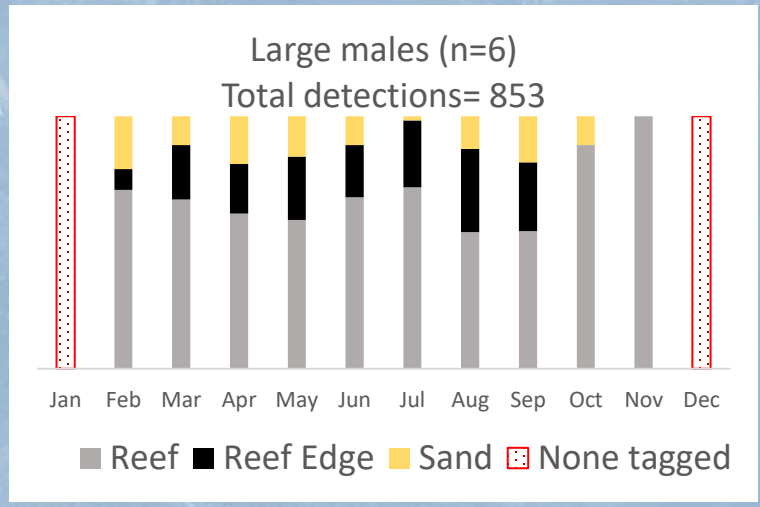
		Max. displacement distance (m)		Gross movement (m/day^{-1})	Net movement (m/day^{-1})
	n	$\bar{x}$	Range	$\bar{x}$ ± SE	$\bar{x}$ ± SE
Males	22	419 ± 14.8	108-1291	30.7 ± 2.1	16.2 ± 2.1
Females	28	440 ± 8.4	143-1185	26.0 ± 0.6	4.0 ± 0.2
Kelly (2001)	32	993 ± 170	100-3100	11.13 ± 3.9	1.35 ± 0.7

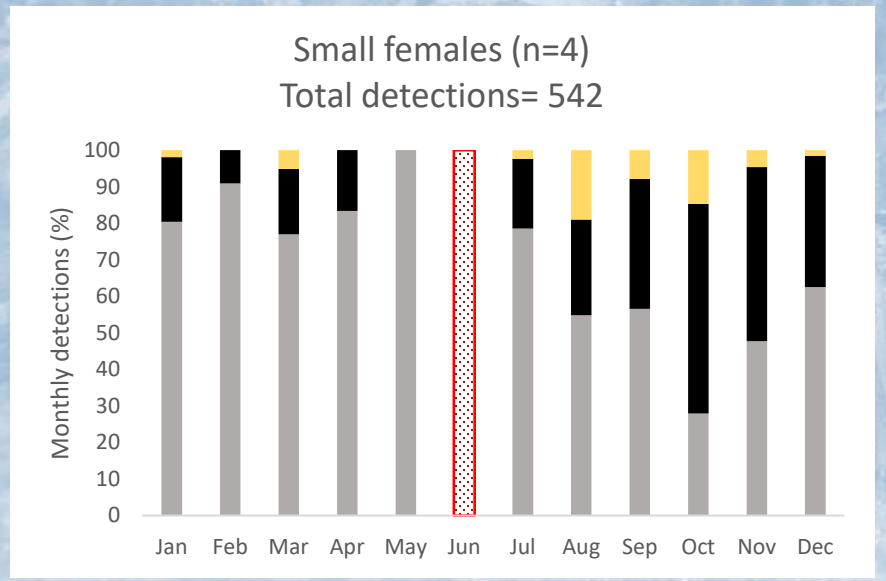
- Only one medium male lobster found leaving reserve boundary
- Low distances travelled
- Similar distances between males and females

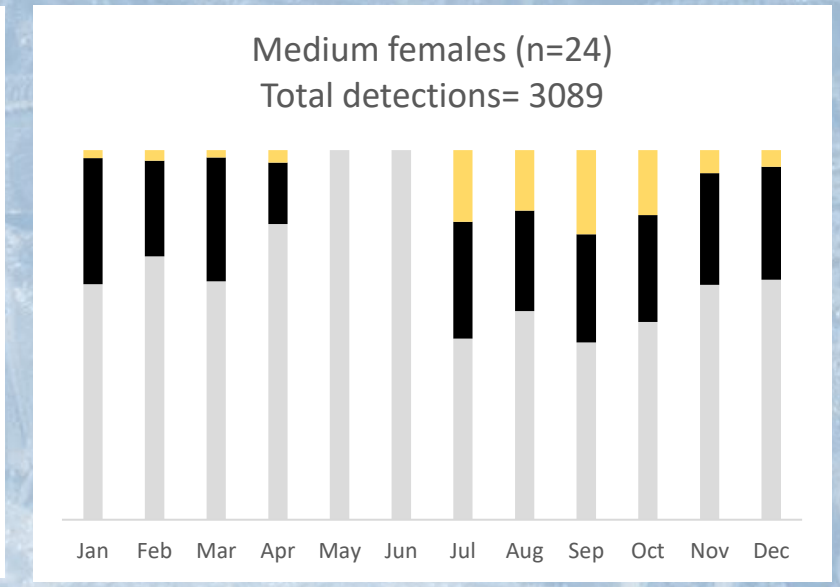
Lobster Positioning: Spatial movements





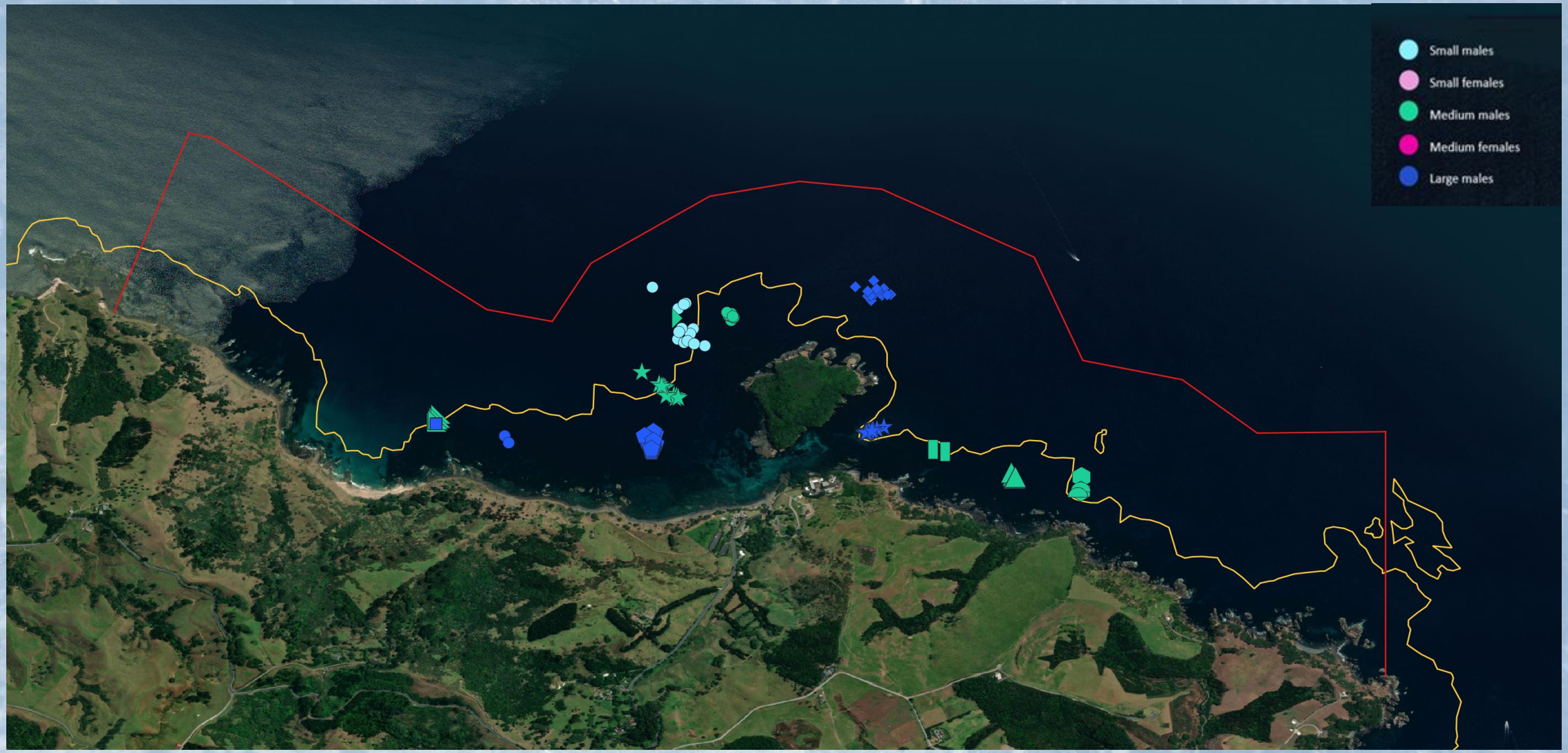




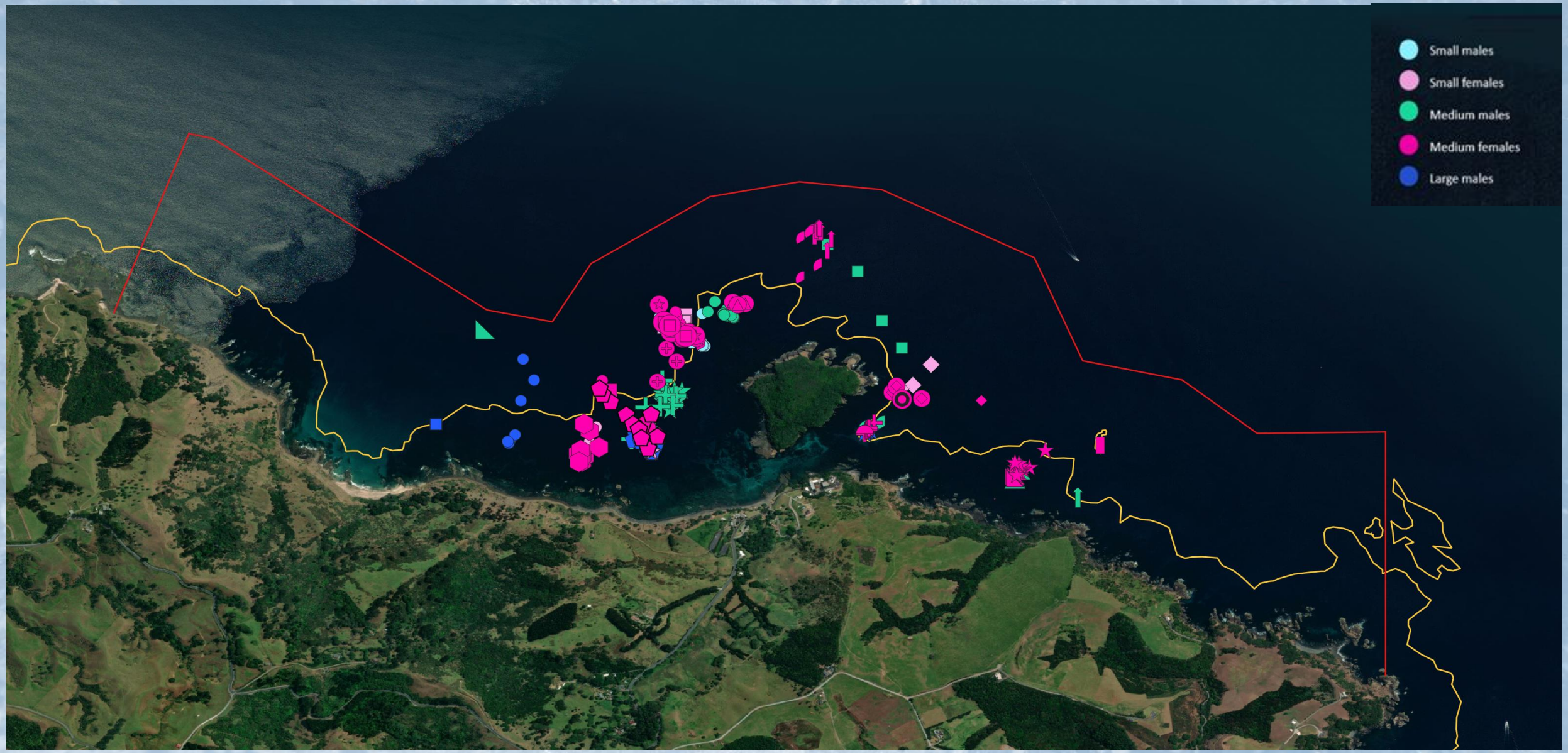


- Patterns follow those described in Kelly's work
- Males move onto the sand in December after moulting to feed
- Females on the reef edge/sand for egg release in Spring

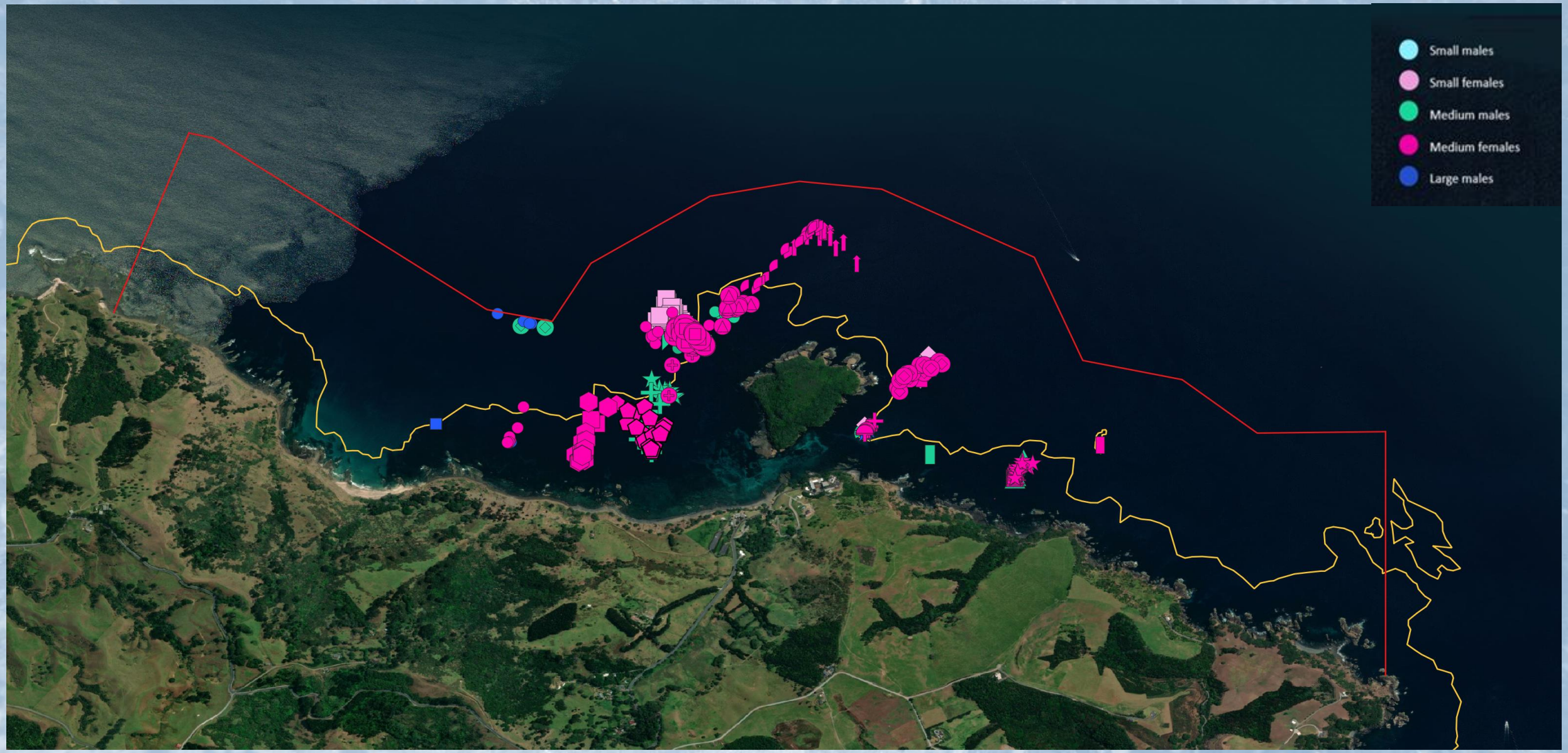
Lobster positioning: June (mating season)



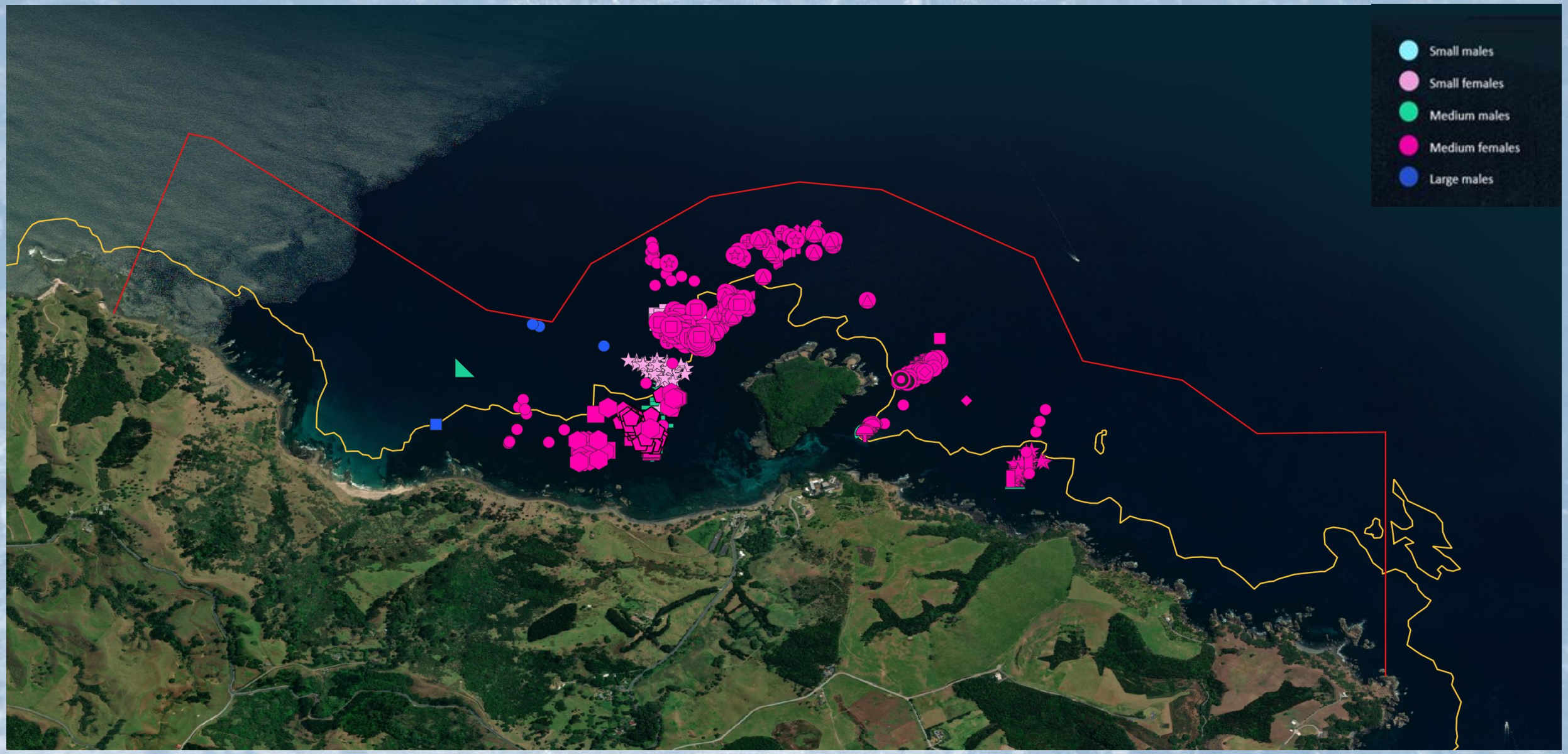
Lobster positioning: July (mating season)



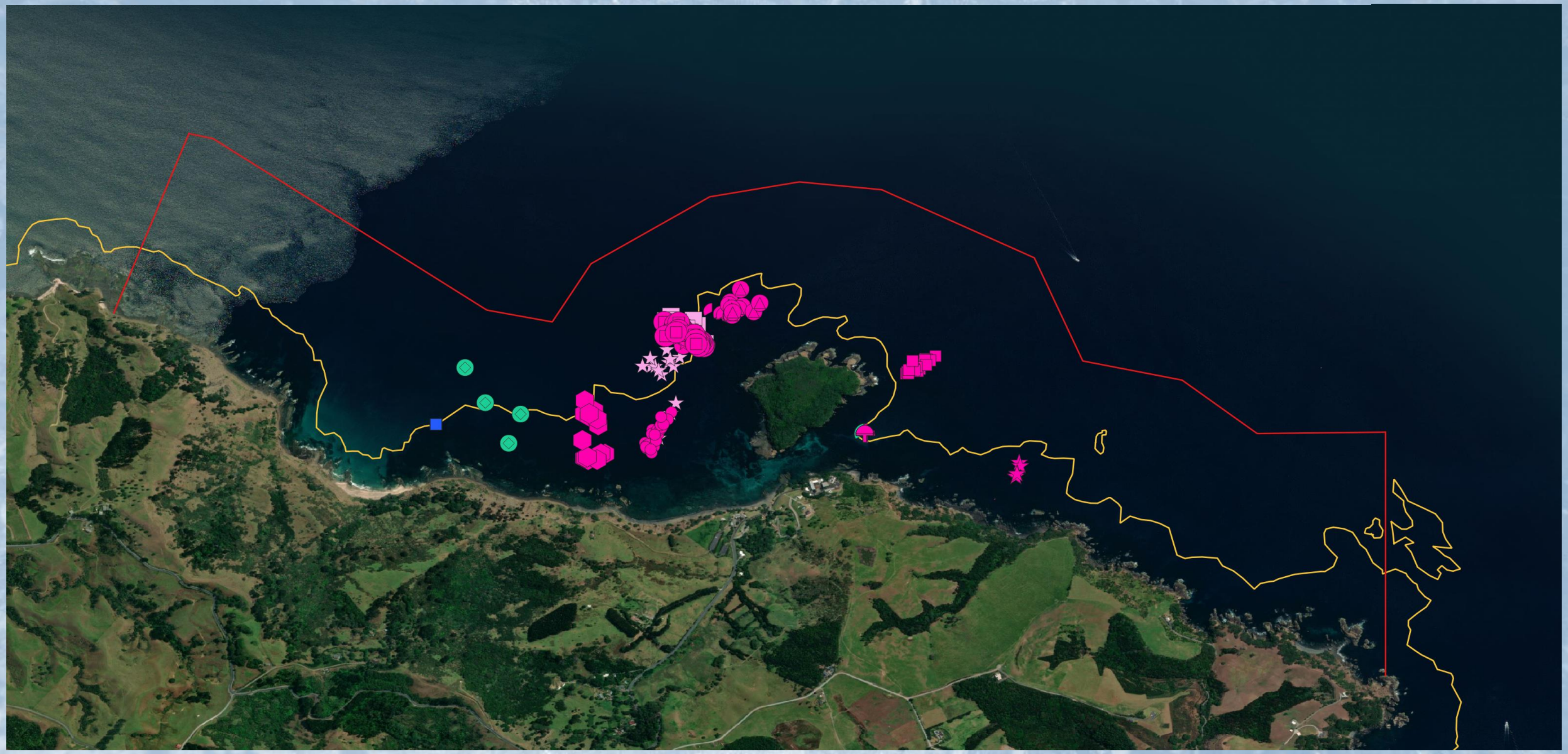
Lobster positioning: August



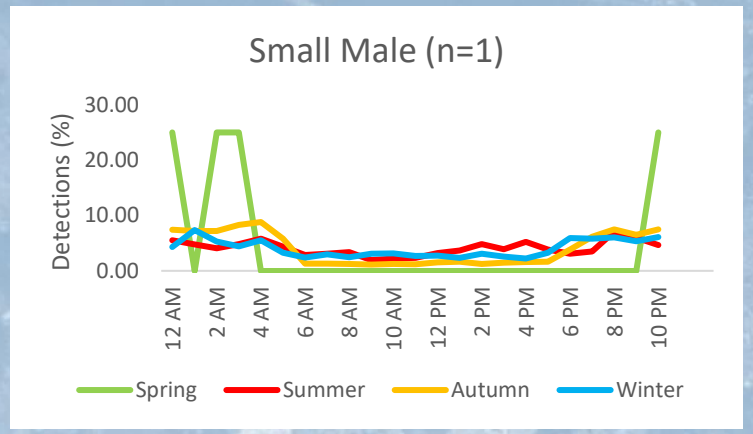
Lobster positioning: September-October

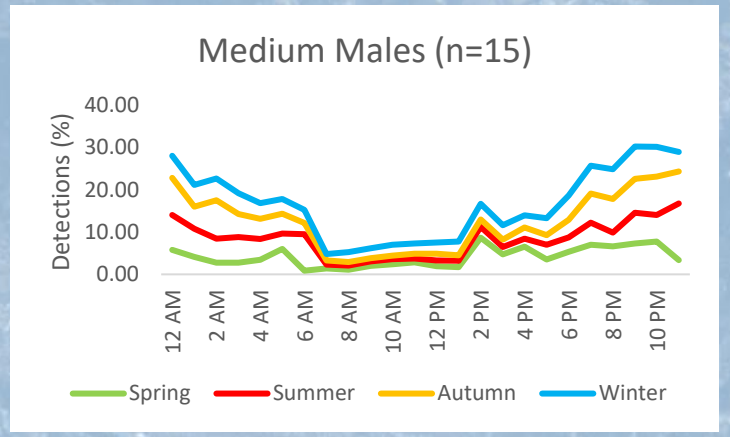


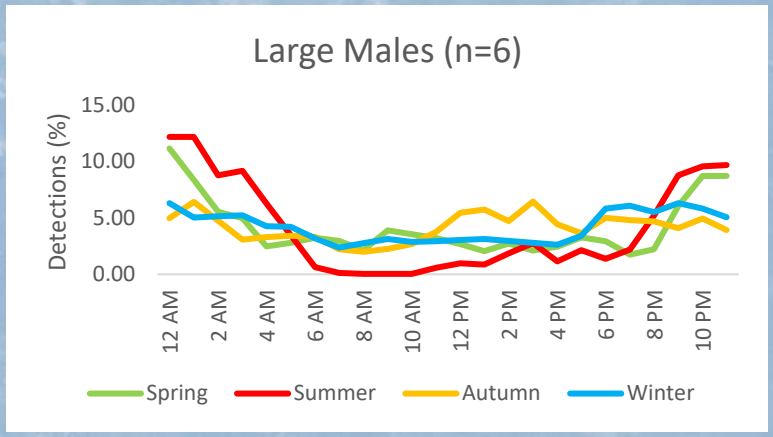
Lobster positioning: November

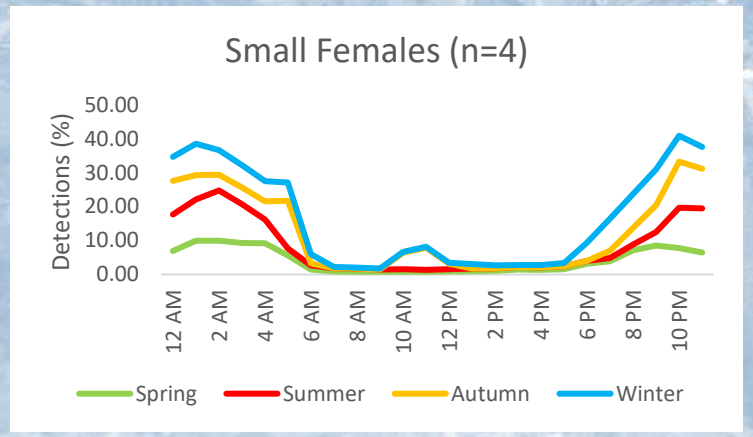


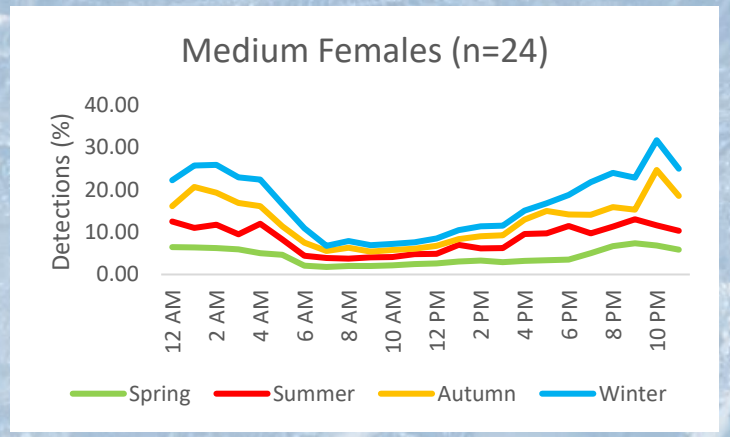
Lobster positioning: Diel activity











- Peak activity from early evening to early morning
- Peaks in afternoon activity for medium males and small females

Implications for tracking lobster

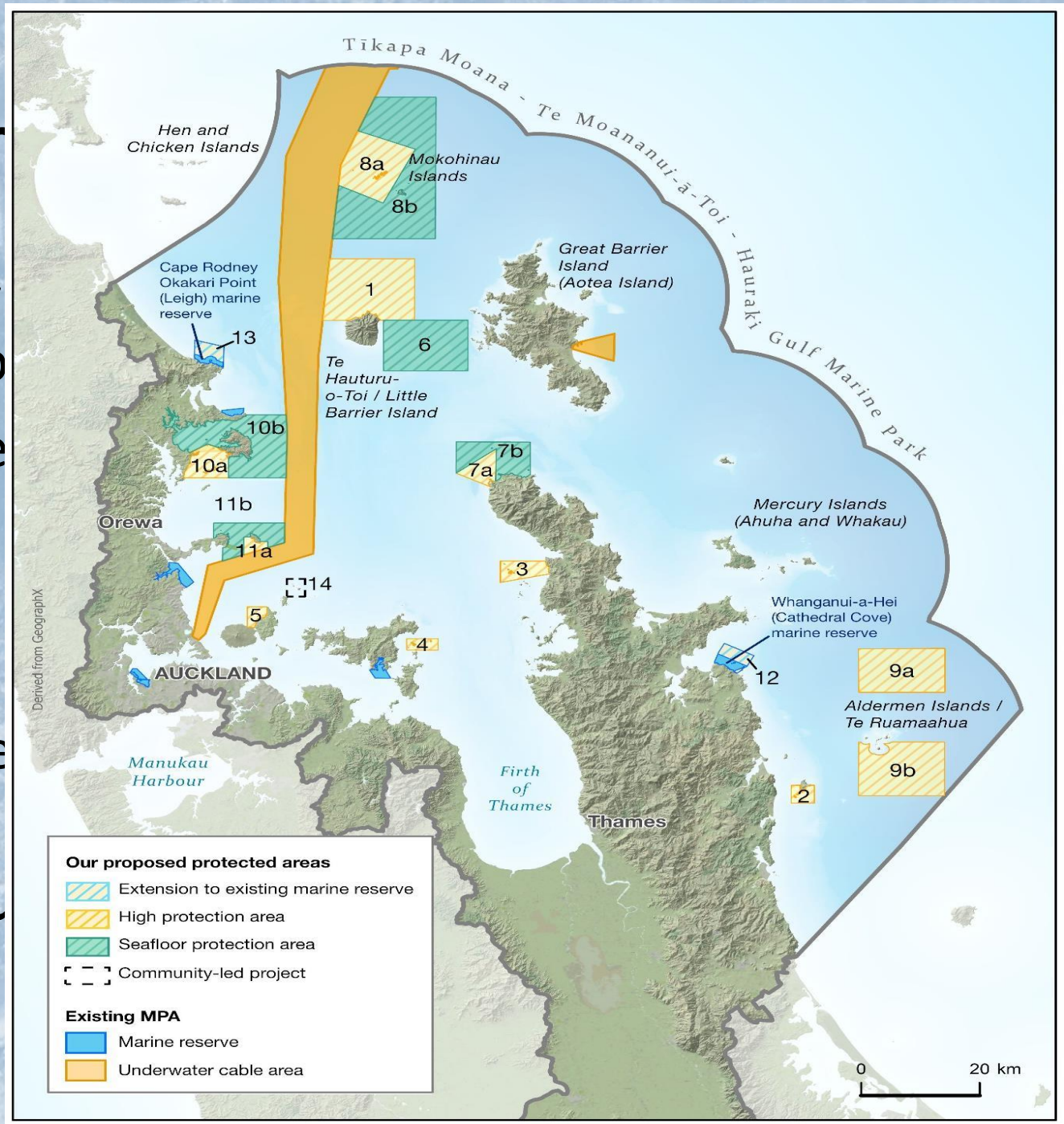
- Complex reef habitat- triangulation unsuccessful, data too coarse to show use of reef
- Weighted positioning is less accurate than triangulation **but** can still provide broadscale movement and activity data
- A presence/absence design may have been more efficient (higher densities of receivers in reef habitat, more spaced out on sand)
- Array design is highly specific to the question asked!

Questions

1. Do these offshore movements still occur?
   - Only one detected beyond the boundary.
2. What movements do lobsters undertake spatially and temporally in the marine reserve?
   - Habitat use appears to be seasonal to coincide with lobster biological processes
3. Are these movements comparable to historical records?
   - **Movement appears to be largely reduced but habitat use follows the same pattern.**

Sum

- A passive acoustic array can prov
  infer large-scale movements, hab
- Current lobster movements appe
  scale than earlier studies
- Likely to be a reflection of smalle
  moving onto sandflats in smaller
- Extent of movement beyond rese
  to scale with population size
- **Extend boundary to provide futu**



Acknowledgements

- Beate Schuler and the Oceans of Change project
- The Department of Conservation
- Nick Shears, Craig Radford, Richard Taylor, and Diana LaScala-Gruenewald
- Hugh Pederson at Innovasea
- Tim Haggitt
- Lucy van Oosterom, Brady Doak, Paul Caiger, Errol Murray, Peter Browne, Jimmy Rapson, Esther Stuck, Jaime Rowntree, Boyd Taylor
- Benn Hanns, Ashley Flood, Al Alder, Eliana Ferretti
- All Leigh Marine Laboratory staff and students

Thanks for listening!

Questions?