



National Environmental
Research Program

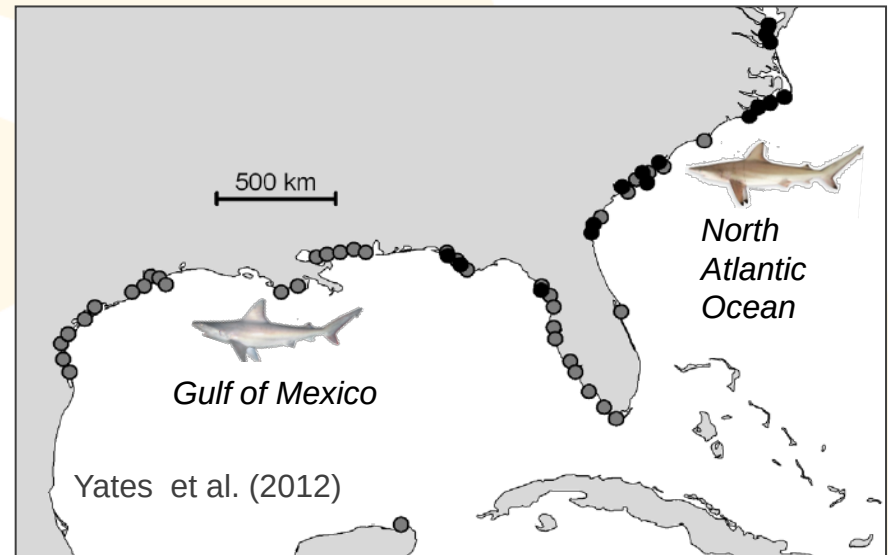
Drivers of juvenile shark biodiversity and abundance in inshore ecosystems of the GBR

Andrew Tobin

Pete Yates, Michelle Heupel, Colin Simpfendorfer

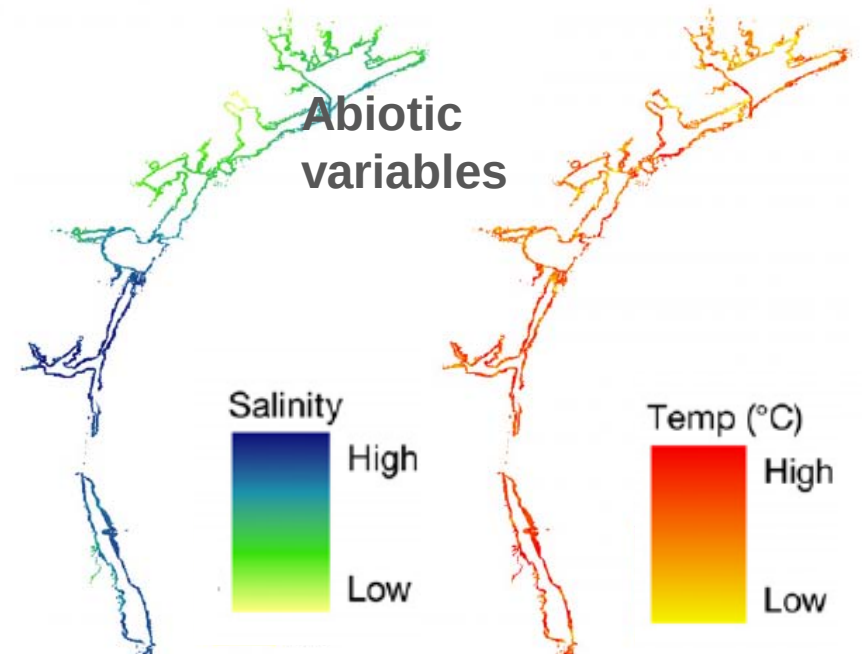
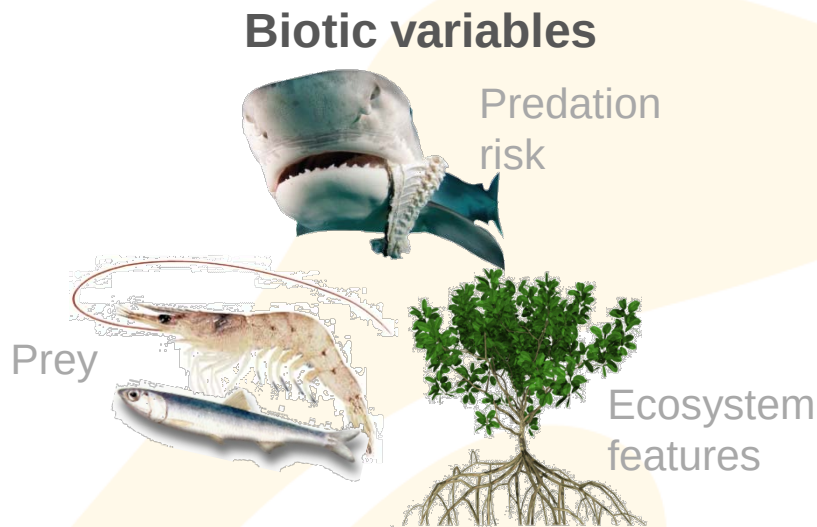
Coastal Shark Nurseries

- Understanding habitat use is important for conservation/management
- Coastal environments often occupied by the young of multiple species
- Shark nursery definition
 1. Abundant young sharks
 2. Site fidelity
 3. Temporally stable use
- A consistent approach to guide the focus of conservation and management
- What about spatial diversity in young shark habitats?



Habitat Diversity

- Most shark nursery research has focused on few species across restricted spatial scales
- Habitat use can vary along environmentally heterogeneous coastal stretches

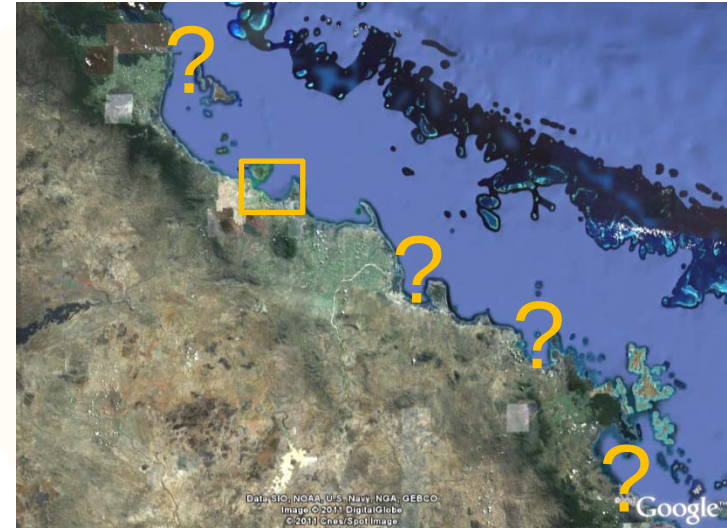


Froeschke et al. (2010)

- **Variability in nursery function is presumed but rarely examined or quantified**

Knowledge Gaps

- Broader spatial variations in...
 - shark community structure?
 - habitat use of individual species?
 - nursery function?
- Factors that influence these variations
- Implications of habitat diversity for young sharks
- Occurrence patterns of the youngest sharks & regional variation in parturition (birth)
- Critical information for assessing ecological role, vulnerability, and the efficacy of conservation and management strategies



Project Objectives

- Characterise spatial and temporal patterns in immature shark community structure and the occurrence of individual species
- Explore the ecological drivers of these variations
- Evaluate the relative importance of tropical coastal environments and the potential population-level implications of heterogeneous space use



Data Collection

- Jan 2012–Mar 2014: 8 rounds of fisheries-independent surveys
 - 183 days
 - Baited longline (n = 504; 413 hours)
 - Gill-net (n = 386; 349 hours)
- Collected environmental data
- Sharks identified, measured, sexed, clasper calcification, umbilical scar, tagged & released



Rockingham



Townsville

Bowling Green

Upstart

Edgecumbe

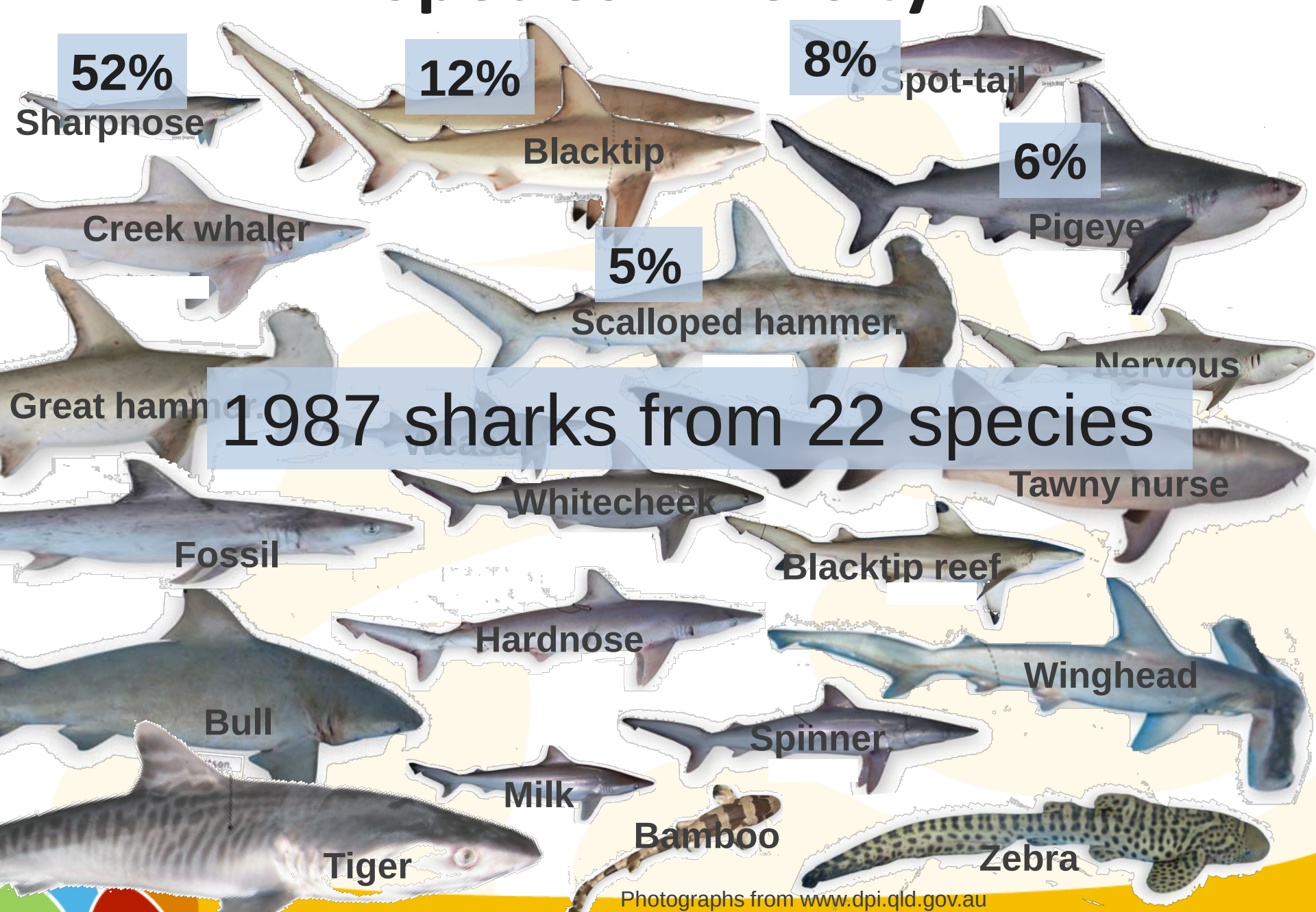
Repulse



Image Landsat

Google earth

Species Diversity



1987 sharks from 22 species

% Immature	0-20	21-40	41-60	61-80	81-100
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Sharnnose

Blacktip

Spot-tail

Creek

whaler

Pigeye

Scalloped hammer.

Nervous

**Great
hammer.**

Weasel

Tawny nurse

Whitecheek

Fossil

Blacktip reef

Hardnose

Winghead

Bull

Spinner

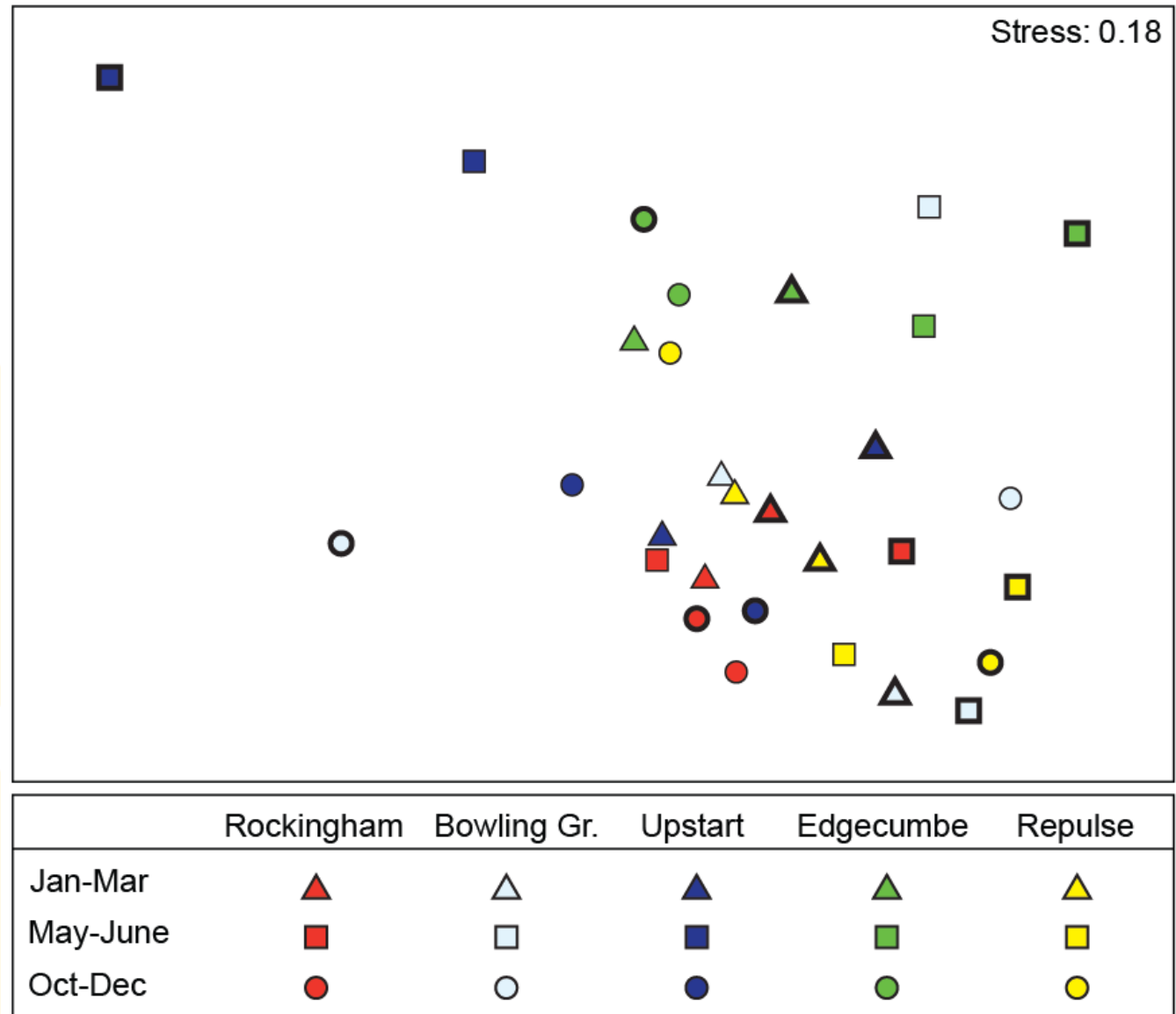
Milk

Bamboo

Zebra

Tiger

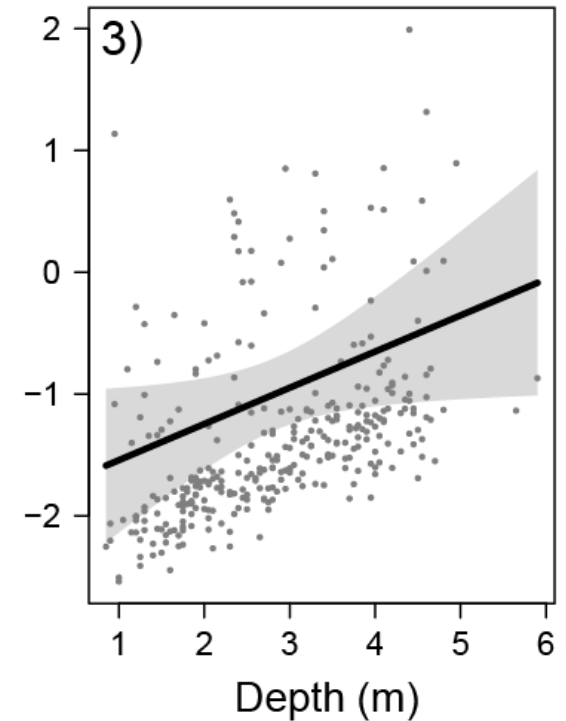
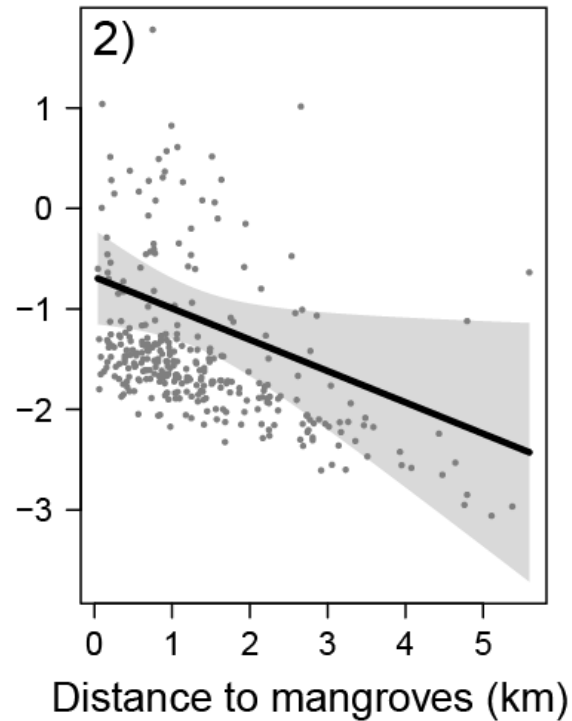
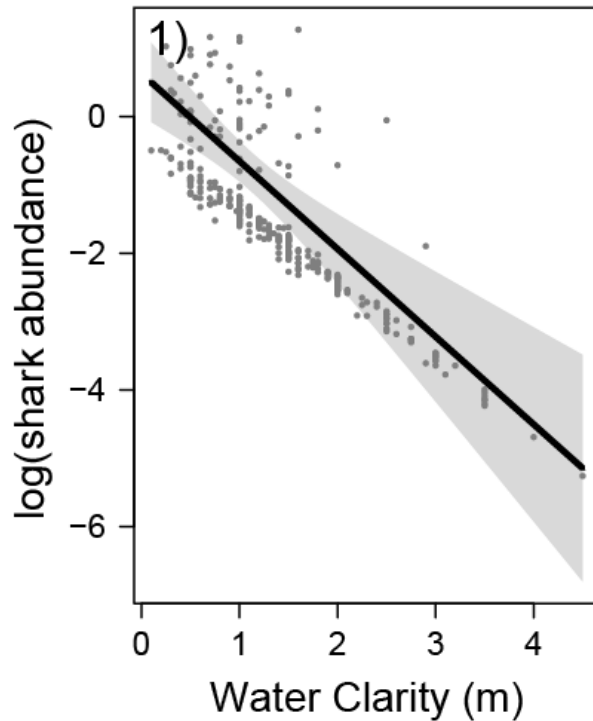
Immature Shark Community Structure



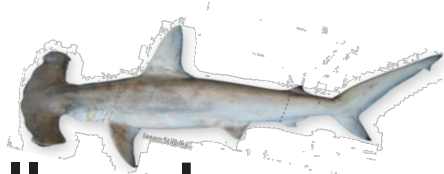
Influential environmental variables (gill-net)



- 1) Water clarity
- 2) Distance to mangroves
- 3) Depth

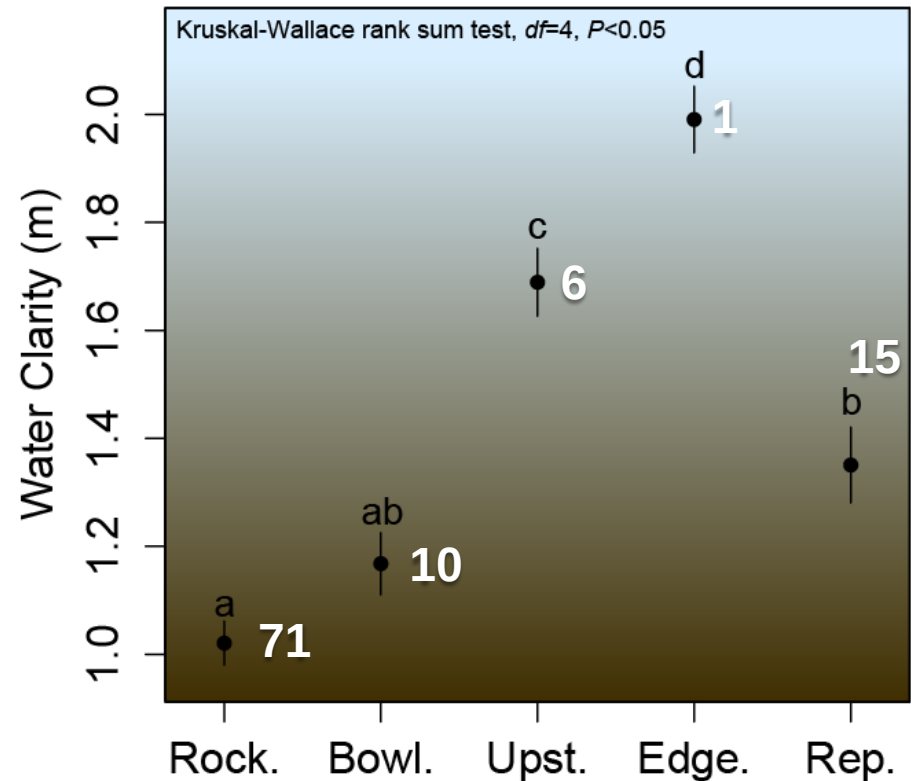
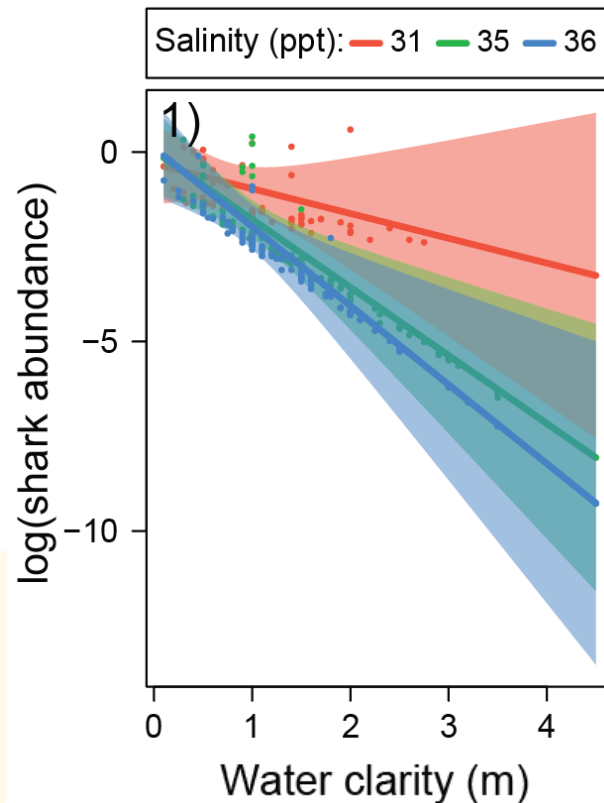


Influential environmental variables (gill-net)



**Scalloped
hammerhead**

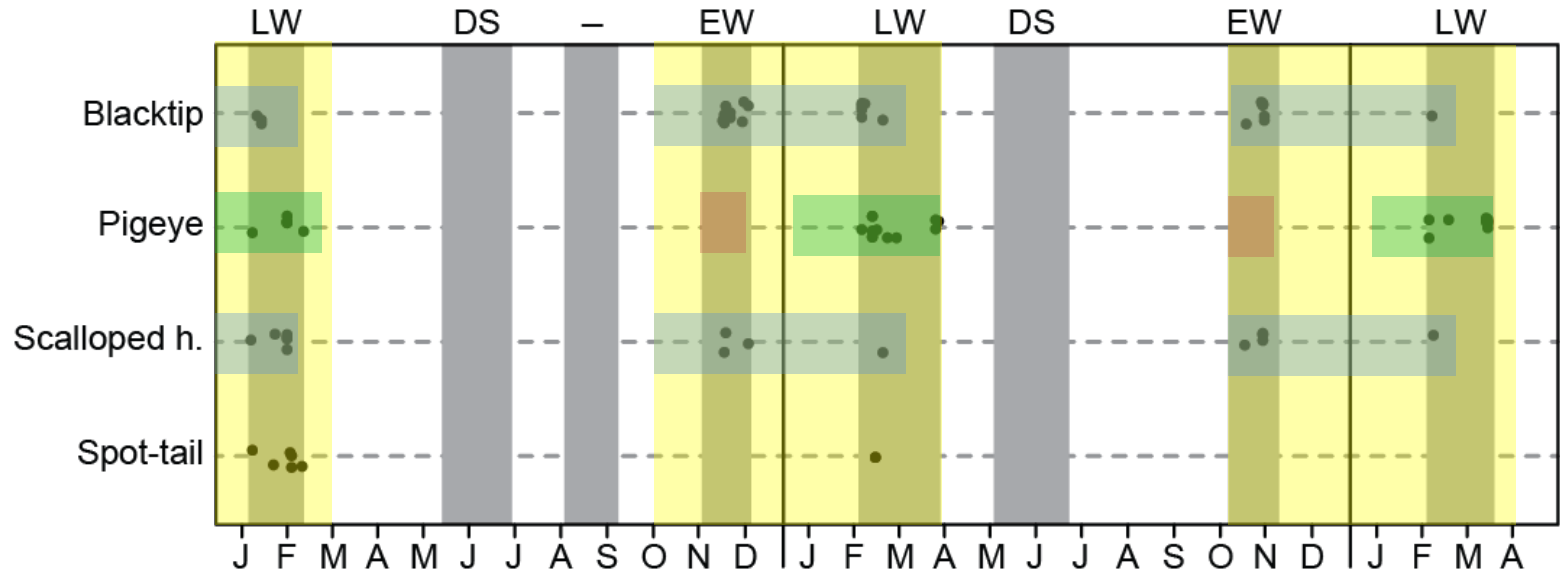
- 1) Water clarity*Salinity
- 2) Temperature



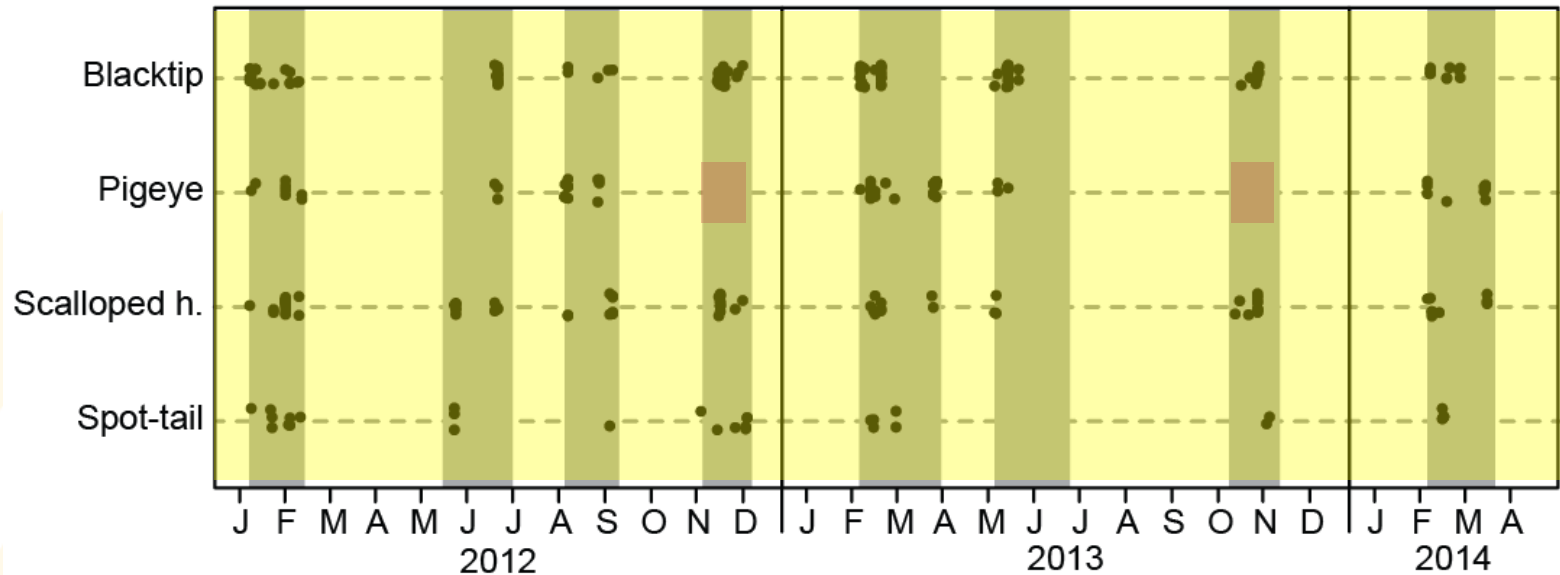
Spatio-temporal Variations



Neonate
n = 91



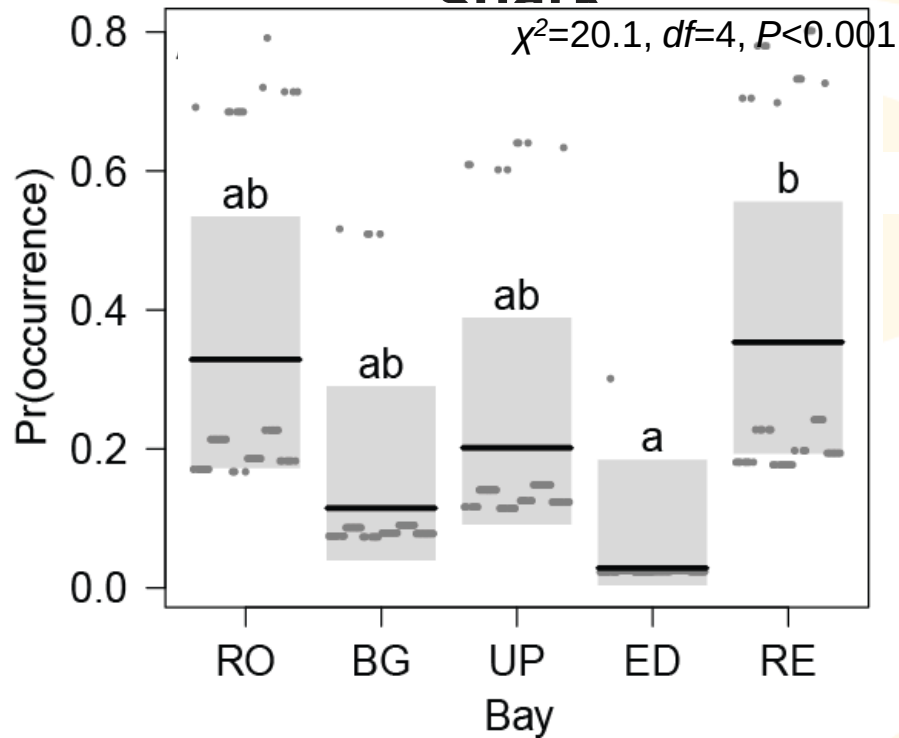
YOY
n = 383



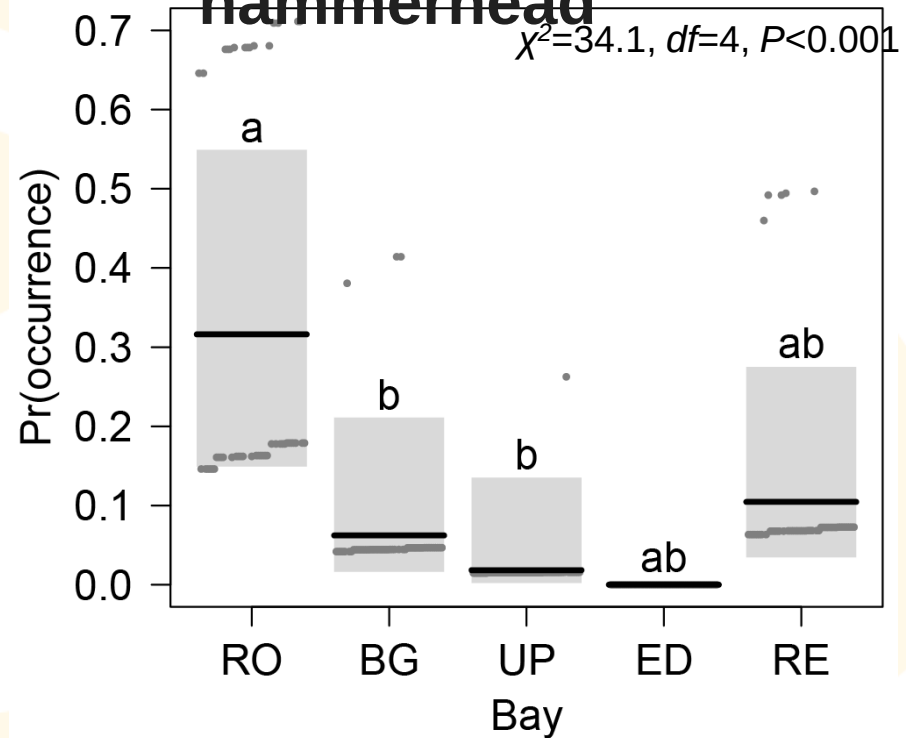
Spatial Variation (YOY)



**Blacktip
shark**



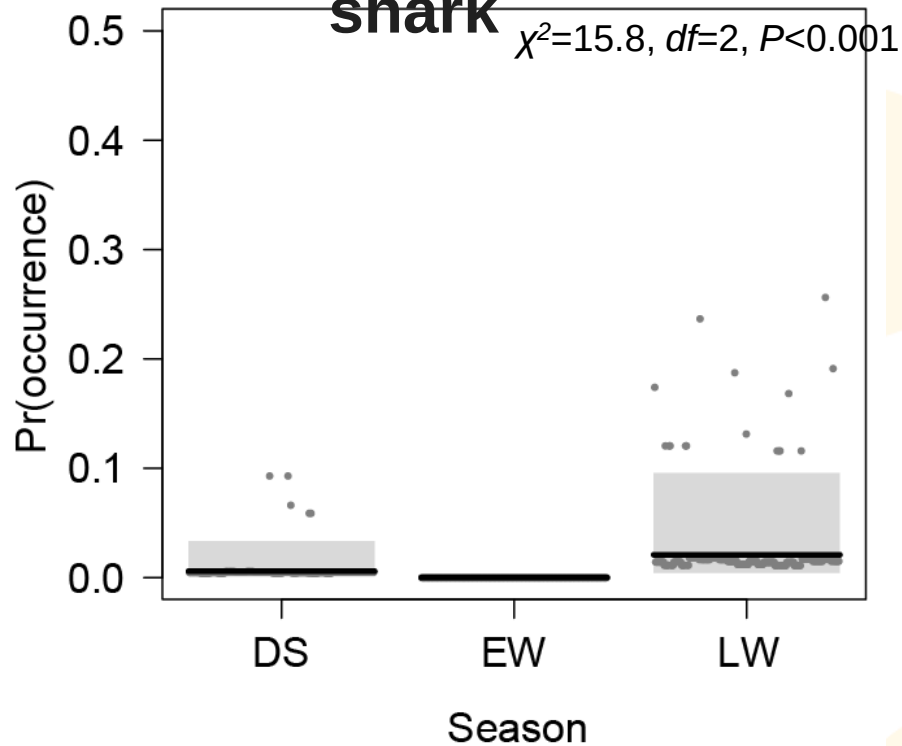
**Scalloped
hammerhead**



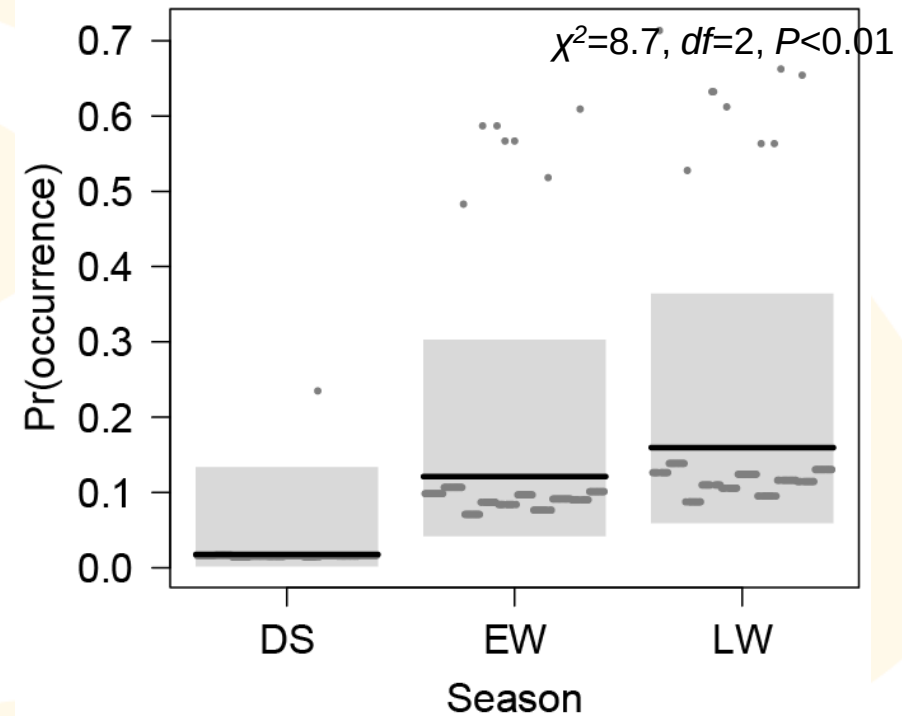
Temporal Variation (YOY)



**Pigeye
shark**



Spot-tail

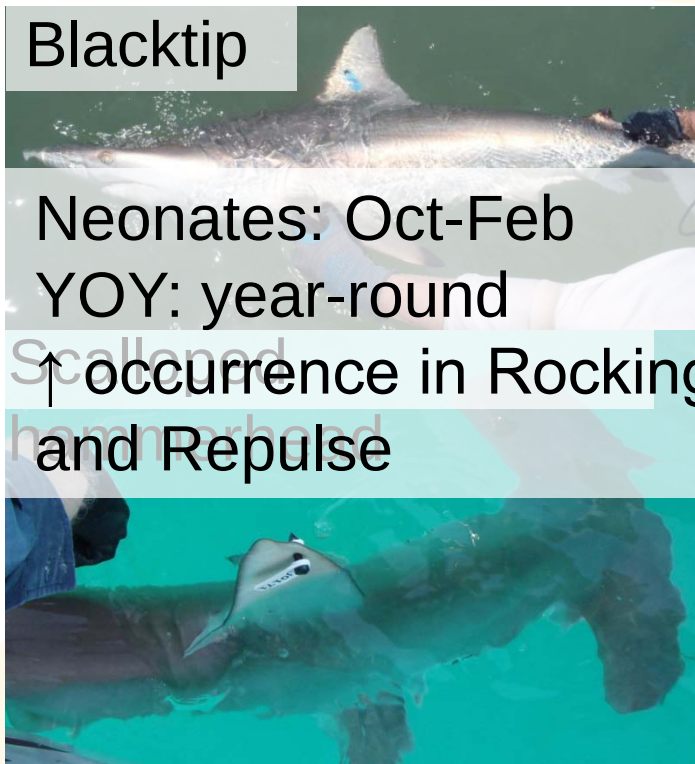


Occurrence Summary

Spatial ✓
Seasonal ✗
Inter-annual ✗

Blacktip

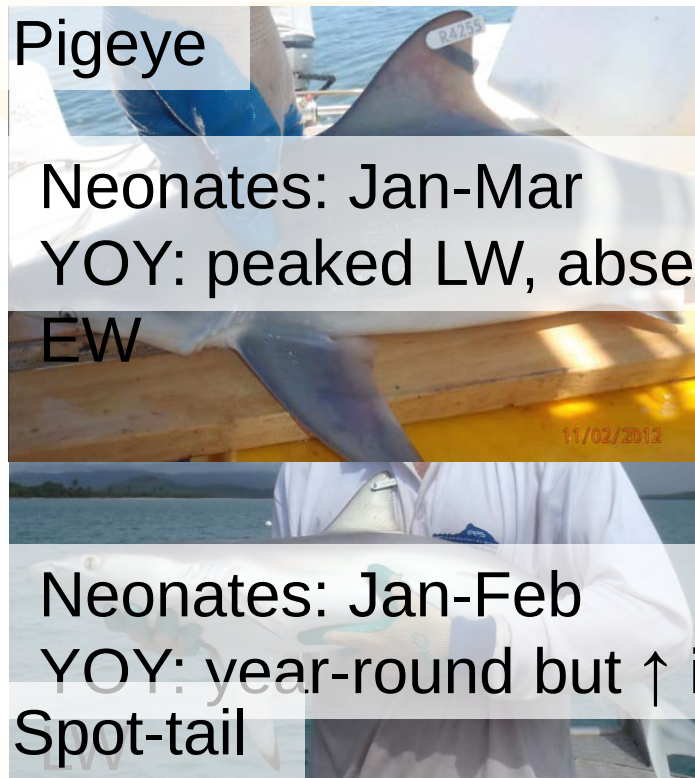
- Neonates: Oct-Feb
- YOY: year-round
- ↑ occurrence in Rocking.
and Repulse



Spatial ✗
Seasonal ✓
Inter-annual ✗

Pigeye

- Neonates: Jan-Mar
- YOY: peaked LW, absent
EW
- Neonates: Jan-Feb
- YOY: year-round but ↑ in
Spot-tail



Synopsis

- Immature shark community structure varied between bays
- Spatio-temporal occurrence patterns varied between species
Bays were not utilised equally (by some species)
- These differences were linked with spatial heterogeneity in environmental conditions

Bigger picture

- Risks to sharks in the GBR are managed through a combination of fisheries management & spatial zoning.
- In concert, these two measures appear to be sustaining a healthy population of inshore sharks in the GBRWHA.
- Wide ranging species, such as the scalloped hammerhead do need more attention as some portions of the population may stray into international waters and other jurisdictions.



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