



National Environmental  
Research Program

TROPICAL ECOSYSTEMS *hub*

# Sharks and marine parks: effectiveness of zoning for mobile predators

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Forum Title: Effectiveness of spatial zoning for fish populations



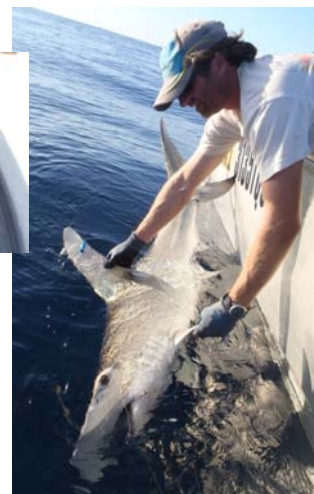
## RELEVANCE OF WORK

- Predatory fish are often some of the most exploited resources within marine communities
- Because little is known about the presence and movement patterns of reef predators it is unclear how effective marine protected areas are for these species
- A clear understanding of presence, movement and efficacy of marine park zoning is required to ensure the sustainability of exploited marine predators



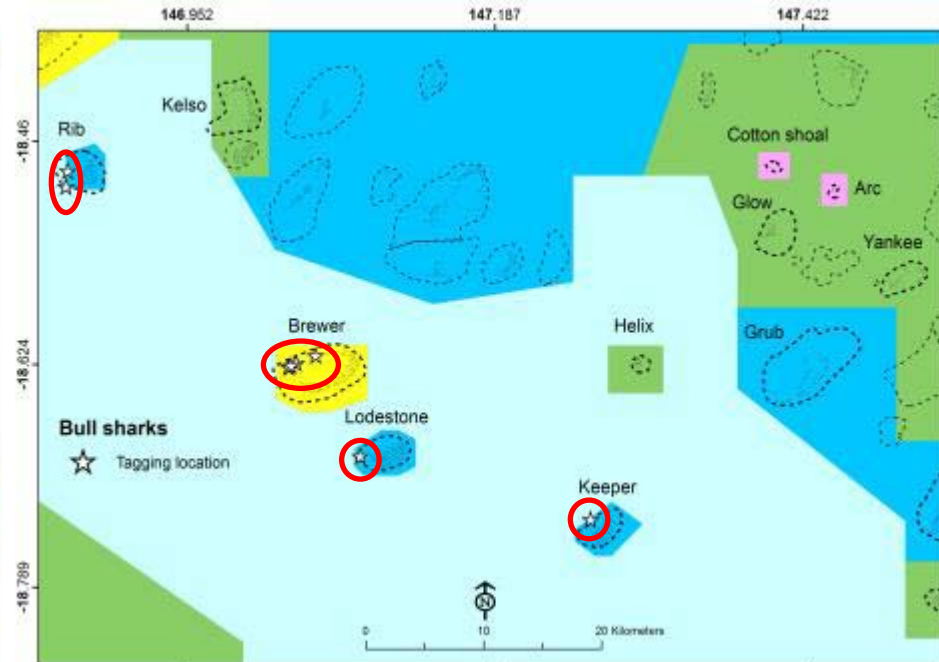
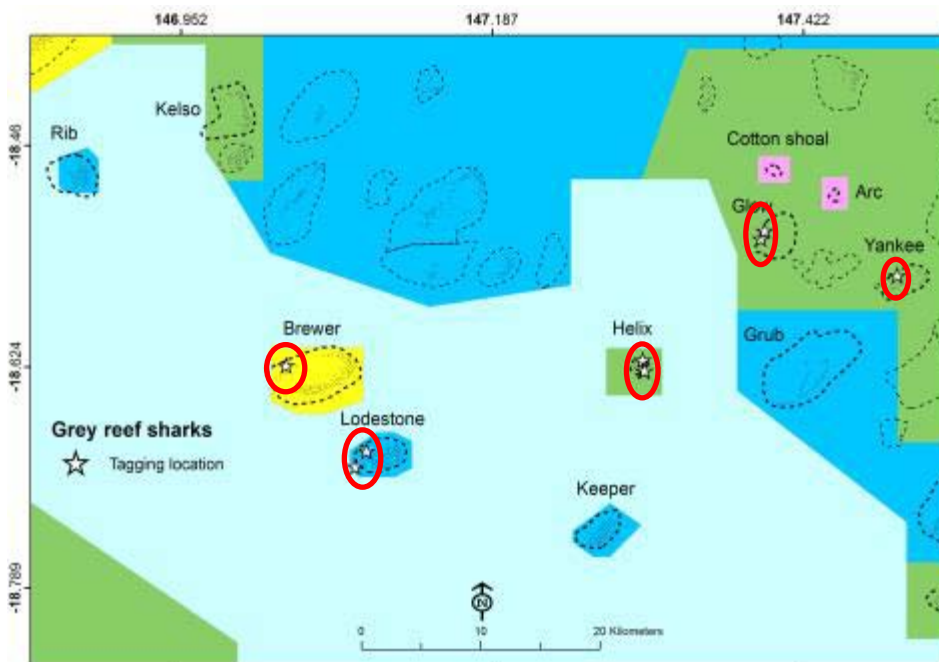
## RESULTS

- Transmitters have been deployed in several reef predators species. This talk focuses on two examples: grey reef and bull sharks
- Deployed transmitters:
  - Bluespot coral trout – 10
  - Common coral trout – 60
  - Red throat emperor – 19
  - Giant trevally – 14
  - Grey reef shark – 26
  - Blacktip reef shark – 2
  - Whitetip reef shark – 1
  - Bull shark – 18
  - Australian blacktip shark – 2
  - Pigeye shark – 4
  - Sliteye shark – 5
  - Silvertip shark – 7
  - Great hammerhead shark – 1





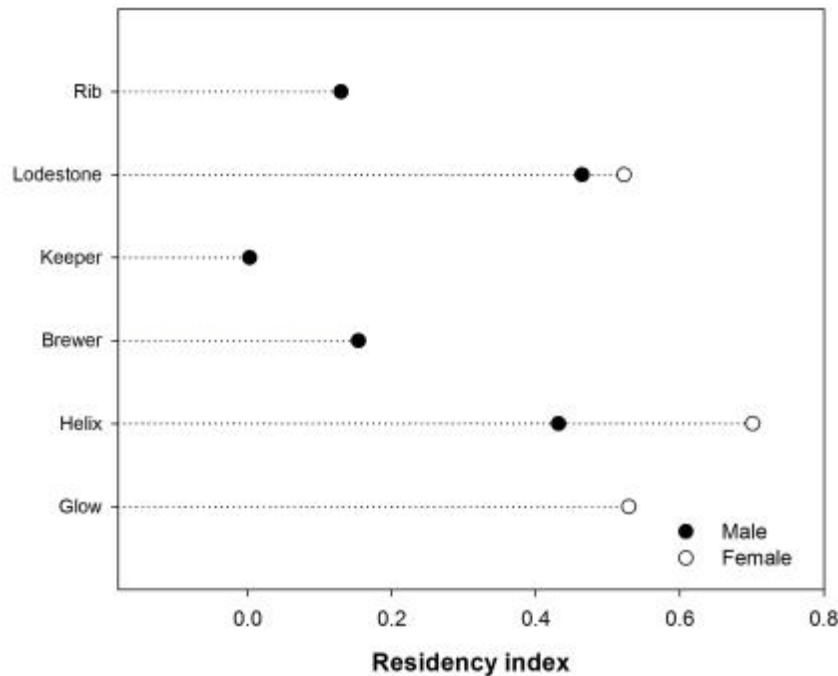
# Tagging location of grey reef and bull sharks



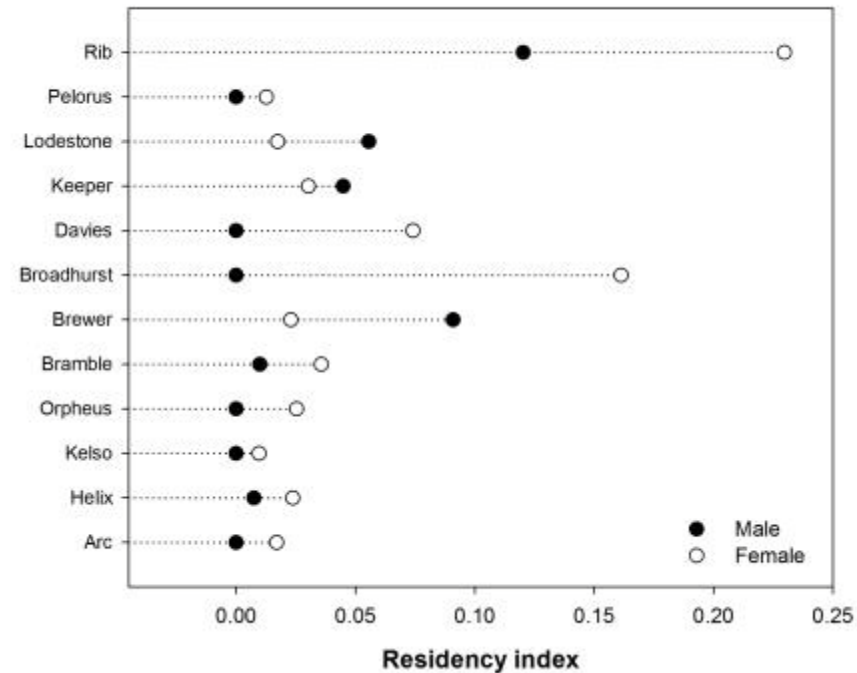


# Residency patterns of grey reef and bull sharks by reef

Mean residency index / grey reef sharks



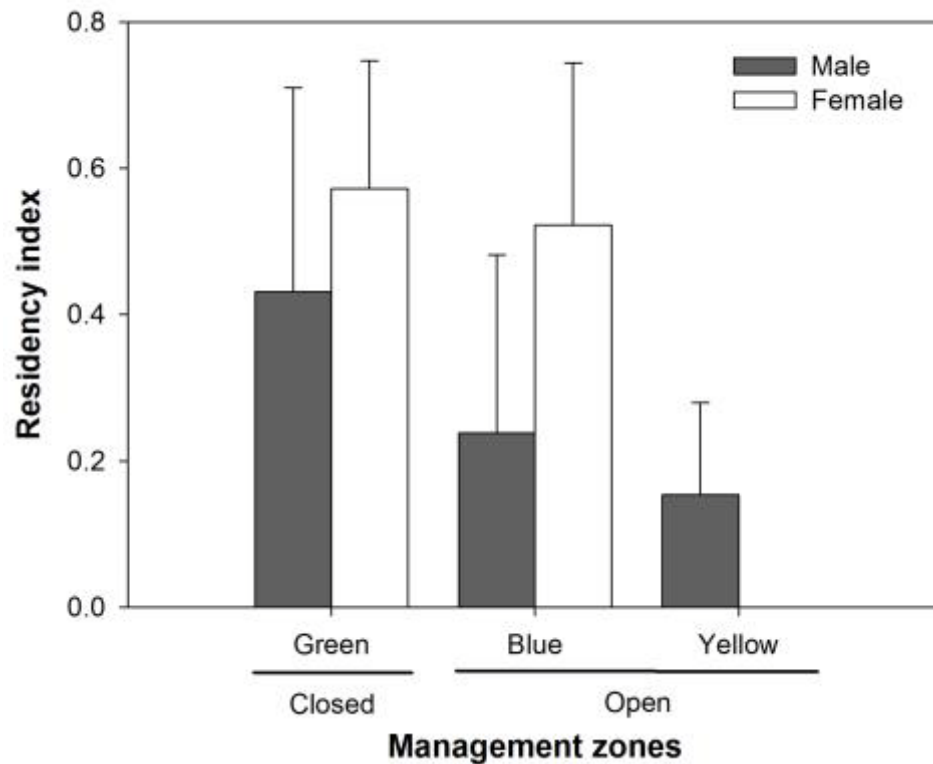
Mean residency index / bull sharks



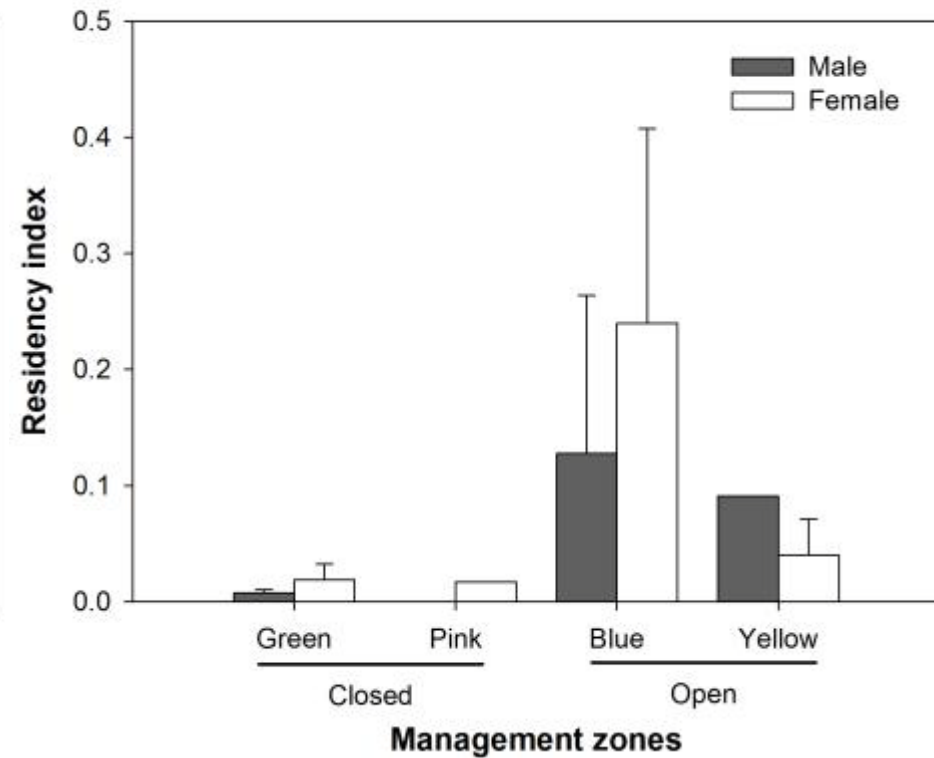


## Residency patterns of grey reef and bull sharks by zone

Residency index - Grey reef sharks



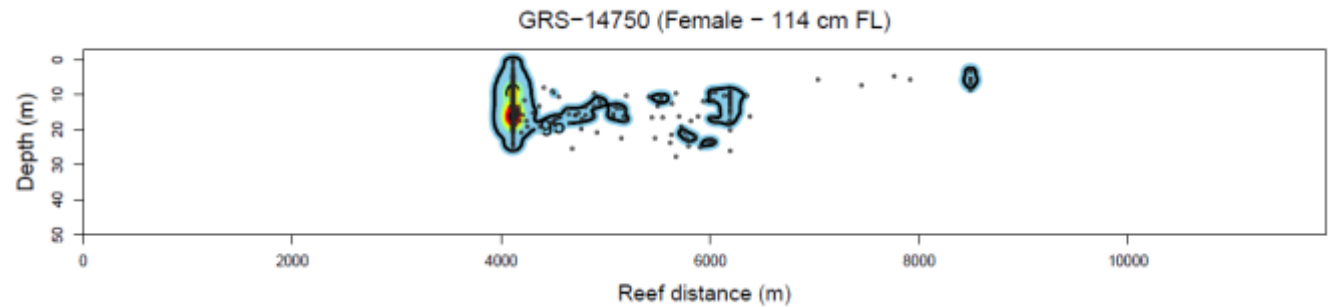
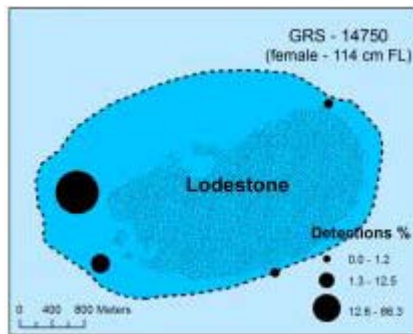
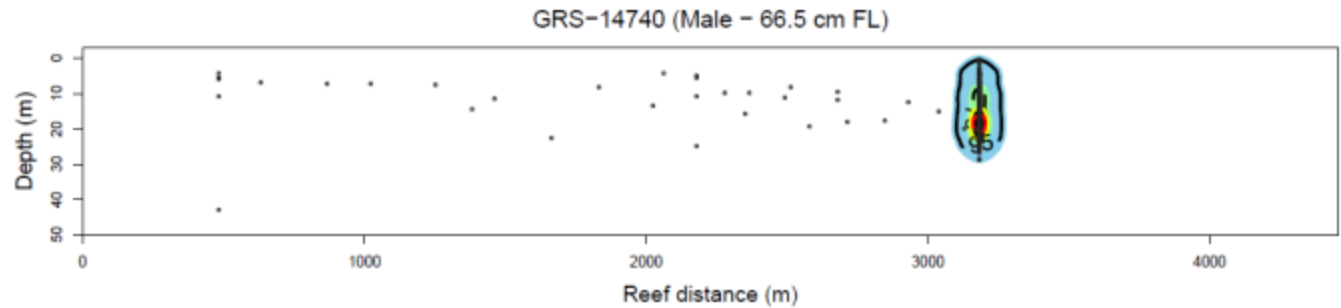
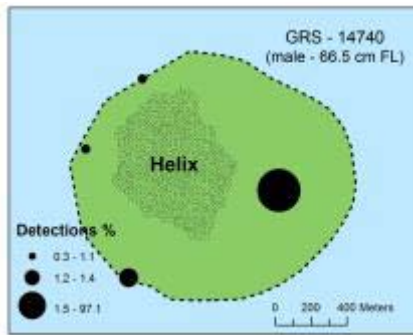
Residency index - Bull sharks





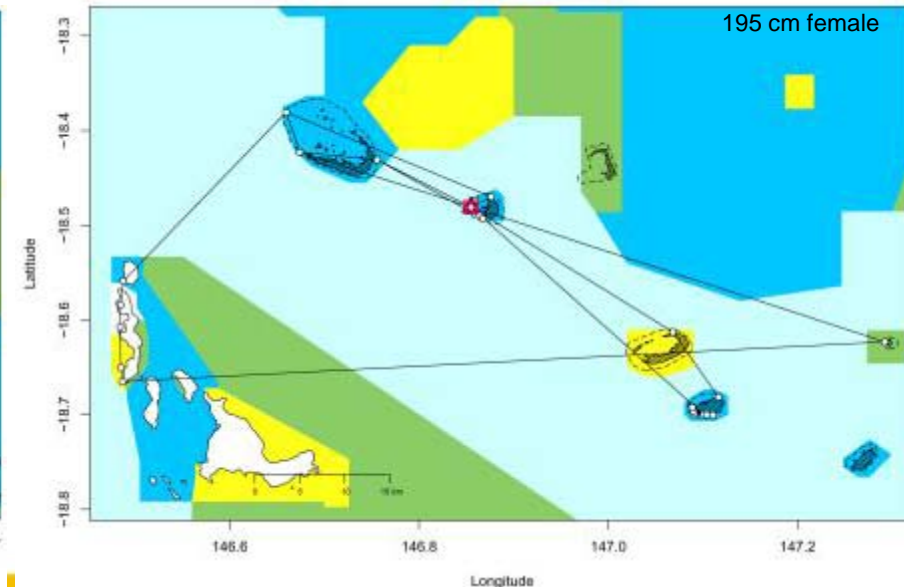
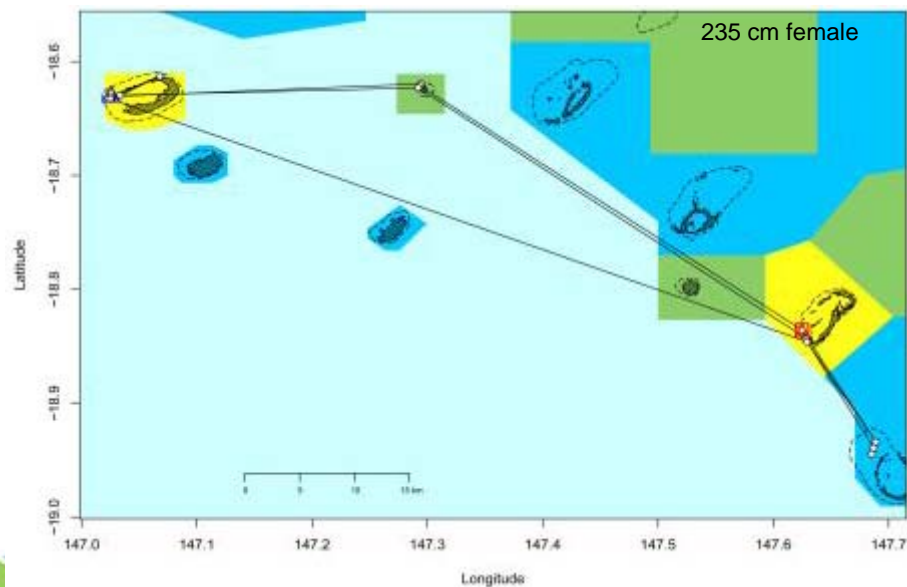
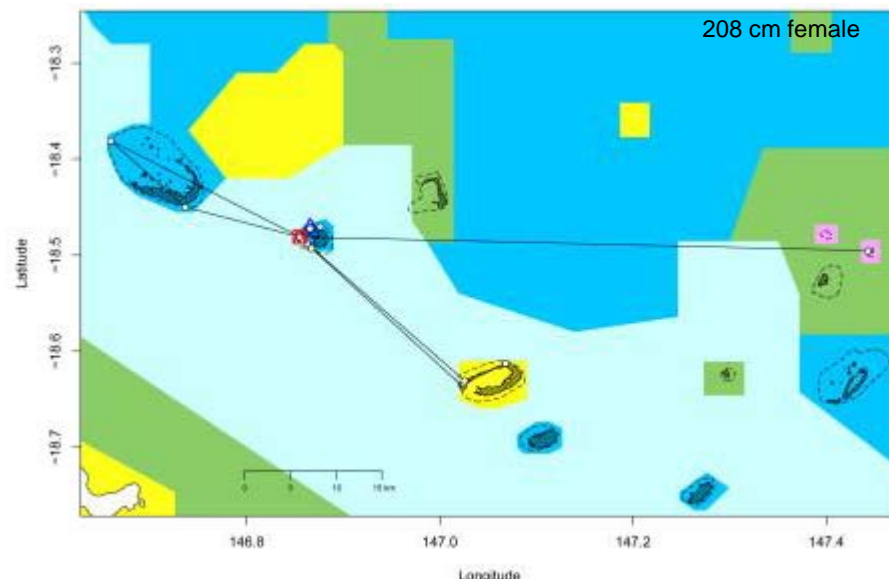
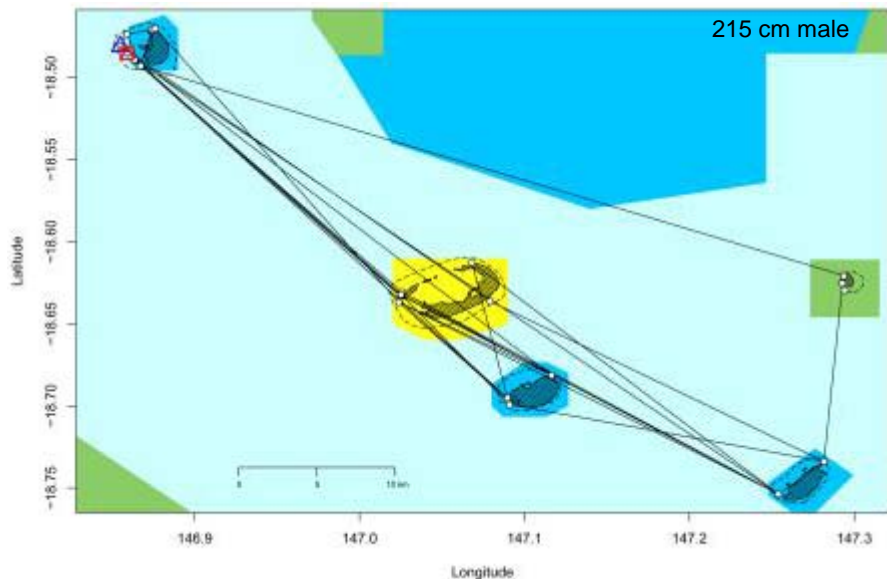


# Detection patterns of grey reef sharks and depth usage





# Movement trajectories of bull sharks







## RESULTS

- Observed movements span marine park zones, inshore and reef habitats and may include cross-jurisdictional movements (see poster)
- Broad-scale movement of sharks do occur, including small reef species (e.g. blacktip reef, grey reef)
- Movement patterns are variable and difficult to predict
- Broad movement patterns leave sharks exposed to a number of fishing fleets as they transit through areas
- “Non-reef” sharks are moving between and spending considerable amounts of time in reef habitats, their influence in these systems is unknown



## APPLICATION OF WORK

- Given the variation in movement patterns among reef predators it is evident a single management strategy will not be equally effective for all species
- Shark species are exposed to a range of fishing activities based on their movement through differing marine park zones and habitat regions
- Future management needs to consider the broader movements of these species and possibility of cross-jurisdictional management issues
- Marine park zoning alone will not provide adequate protection to exploited shark stocks, additional management measures and cooperation among agencies is likely required to ensure the stability of populations



## FUTURE DIRECTIONS

- Continue to deploy transmitters in additional reef predators
- Continue to collect long-term movement data to define longer term patterns or trends in presence and movement
- Advance analytical approaches to defining predator movement patterns
- Examine broader movement patterns of species of conservation concern via satellite telemetry of hammerhead sharks



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**THANK YOU**



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IMOS Integrated Marine Observing System  
Australian Acoustic Tagging and Monitoring System