

Whale Shark movement and population status – summary of progress

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Ningaloo Outlook is a BHP-CSIRO Industry-Science Marine Research Partnership investing A\$5.4 million over five years to gather new knowledge on the Ningaloo reef and its important ecological values

Background

- Largest fish in the ocean, reach up to 16 m Endangered (IUCN).
- Highly migratory & no genetic difference between sharks from opposite side of Indian Ocean or between Indian and Pacific Ocean.
- Aggregate seasonally at Ningaloo ~ \$11.5 million for local economy.
- Ningaloo dominated by juvenile male sharks where are adults?
- Tagging shows movement away from Ningaloo highly variable but not

at scales to support lack of population structure.

Objectives

When, where and why do they go – Tagging?

- Are there sex & size specific differences?
- Environment correlates?
- Dive data to understand behaviour

How many are there – Genetics/CKMR?

- tissue collection, photo ID and length estimates
- genetics to evaluate sibling pairs

Methods – tissue sampling, ID and length



Tagging and tissue sampling procedure

Length measurements – stereo DOV



Samples to date

- 186 tissue samples to date
- ID (Wildbook), length and sex for most samples



Close Kin Mark Recapture – Whale Sharks



Q Search analysis, research, academics...

Academic rigour, journalistic flair

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Chance two animals siblings ↓ as adult popn size ↑
Chance two animals siblings ↑ adult survival rate ↑

World-first genetic analysis reveals Aussie white shark numbers

February 8, 2018 9.02pm AEDT

Close Kin Mark Recapture – Whale Sharks



Q Search analysis, research, academics...



World first genetic analysis reveals Aussie whale shark numbers.....

Satellite tagging

- 40 tags deplo
- Equal sex ration
- Focus on large





Summary of movement – satellite tags



Seasonal movement



Longitude

L

Males and females



Longitude

Large males any different?



Longitude

Environmental correlates – SST?

Environmental correlates - Chlorophyll-a?



Fine scale vertical movement



Recovered tags

• Big Mumma (7m ♀) – 211 day, 7000+ km track

• Kim (6 m ♂) – 300 day, 1942 km track





Suzie (7 m \circ) – **160 day, 6334 km track**



Longitude



Depth & temperature profile (Suzie)



Different depth use at Shark Bay vs Ningaloo

Suzie at Dirk Hartog (20 Oct – 4 Nov 2018)

Suzie at Ningaloo (10 – 25 Aug 2018)



Relative frequency

Significant differences in depth use within individuals



Relative frequency

Deep at night, shallow during the day



Day vs night depth use (Big Mumma)



Rate of vertical movement – insight into behaviour



Whale shark depth and vertical speed (tag 57824)



Time (WST)

Vertical movement more frequent and slower at night

NIGHT

DAY



Relevance

- Timing, distance and routes of Whale Shark movement and migration relevant to national & International Whale Shark management.
- No obvious difference between males and females (timing and routes).
- No closer to understanding reproductive movements.
- Recovered tags provided long term data on diving behaviour of Whale Sharks.
- Detailed, long term dive behaviour challenges some theories on dive behaviour & reveals multiple feeding strategies.

Future directions

• Tissue samples, photo identification and accurate length measurements on 186 individuals.

• Focus on obtaining data required for robust estimates of Whale Shark population size and status over the next four years.

• Aim to develop a global CKMR project to help refine connectivity, adult movement and population size.

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