

Assessing the impacts of berleying from shark cage-diving operators on the fine-scale movements of the white shark (*Carcharodon carcharias*)



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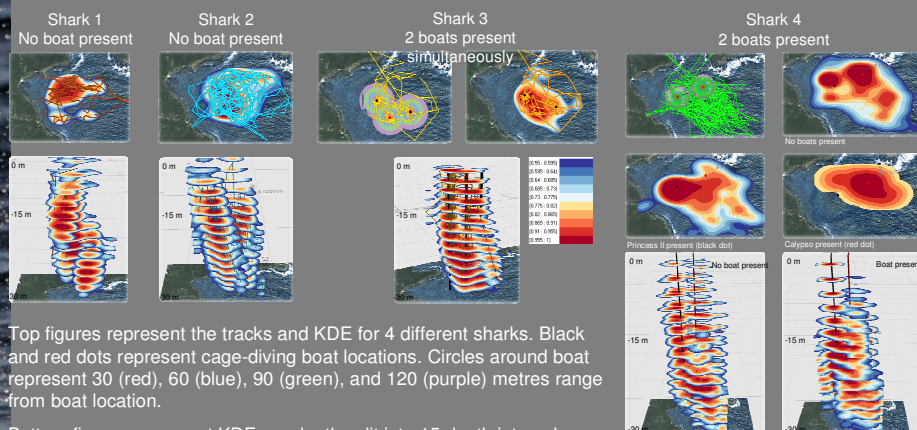


Background

- White sharks are protected nationally and internationally (CITES, CMS, EPBC Act, and State legislation). The Australian Recovery Plan identified cage-diving tourism as a potential threat to the recovery of white shark populations.
- In South Australia, there are currently 2 cage-diving licenses. Three additional applications for licenses have been received and are being considered.
- This increased interest in cage-diving tourism led to a review of industry policy and the need for a better understanding of the impacts of berleying.

Results

- 10 sharks were detected. Four of them provided < 10 position estimates
- 6 sharks provided a total of 35 days of monitoring and 1,642 position estimates
- There was an observed decrease of KDE size when boats were present
- Sharks also increased the amount of time they spent at the surface when boats were present



Top figures represent the tracks and KDE for 4 different sharks. Black and red dots represent cage-diving boat locations. Circles around boat represent 30 (red), 60 (blue), 90 (green), and 120 (purple) metres range from boat location.

Bottom figures represent KDE per depth split into 15 depth intervals.

Shark 1 and 2 did not have any boat present during the tracking period (2 and 8 days, respectively);

Shark 3 was monitored for 1 day during which the two cage-diving operators were present. One of the cage-diving vessels moved position during the day;

Shark 4 was monitored for 13 days. Cage-diving operators were present on different days for one day each.

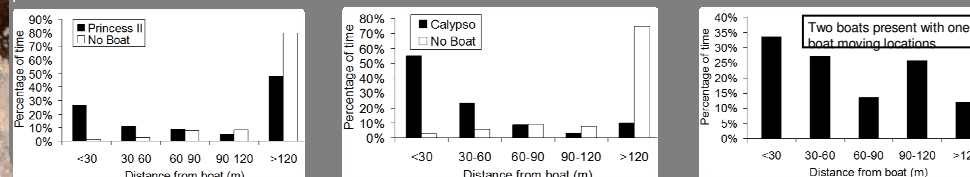
Methods

- Two complementary studies:
 - Presence/absence to determine impact on periodicity and length of visitation (lead by B. Bruce, CSIRO)
 - Fine-scale positioning of white sharks to investigate swimming behaviour and time partitioning (this poster)
- A Vemco Radio Acoustic Positioning (VRAP) System was deployed at North Neptune Island
- 12 white sharks were tagged with continuous acoustic tags
- Resolve location and depth with an accuracy up to 1 m
- Movement data analysed using Kernel Density Estimation



Results (continued)

White shark were within 60 m of boat 50% of the time vs. 6% of the time in the same area when no boats were present



Discussion

- Preliminary results from this study show that fine-scale movements of white shark at North Neptune Island vary in response to the presence of berleying vessels;
- Sharks spent more time in the proximity of the vessels rather than 'patrolling' the study area where natural prey occurs;
- When two vessels were present simultaneously, the shark visited both vessels and partitioned its time between them, suggesting that competition between operators and related berleying could be reduced;
- Considering sample size thus far, additional tagging is being undertaken to improve our understanding of shark time partitioning and influences of berleying.

Acknowledgements

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