

Diving with Raggies: A Harmful Hobby?



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The ragged-tooth shark (*Carcharias taurus*)

- ❖ The ragged-tooth shark is considered to be **vulnerable** by the IUCN red list but is a frequent visitor to the coast of KwaZulu-Natal.
- ❖ Known for its **docile behavior** underwater, the ragged-tooth shark is known to use reefs such as **Aliwal Shoal** for **refugia whilst breeding**.
- ❖ The ragged-tooth sharks migrate from further south, where they pup, to the east coast in order to commence with their **breeding season**, which occurs in the **winter/spring months (May- November)**. From there they move north to Sodwana reefs for their gestation period^{2,3} (Fig.1).
- ❖ Raggies are unique in how they behave. They are unique in **swallowing air and storing it in their stomach**, therefore allowing for it to drift motionless with the surge. This helps with hunting at night.

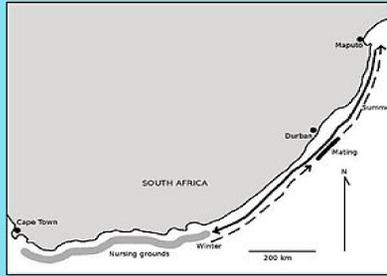


Fig.1. The distribution of the ragged-tooth shark along the South African coastline.

Aims of the research

1. Examine whether the recreational **SCUBA divers** adhere to “**raggie protocols**” at Cathedral dive site on the Aliwal Shoal marine protected area (MPA), and **whether these protocols are efficient**.
2. Collect recreational SCUBA diver “**shark protocol**”, connectedness to nature and **demographic knowledge** via pre and post dive questionnaires.
3. Analyse **historical sighting data and video** of ragged-tooth sharks at the Aliwal Shoal MPA.

Study 1 methodology, expected results and current findings

Australian research:

Methodology:

- ❖ Similar methodology as an Australian study¹.
- ❖ **Grid pattern in order to observe diver and ragged-tooth shark interactions** (Fig.2)
- ❖ Tested for **shark and diver grid position** and numbers preference in correlation with diver group size and position.

Findings:

- ❖ Preliminary and site-specific in nature
- ❖ Study shows that **recreational divers do temporarily affect the behavior of the ragged-tooth shark at this site.**

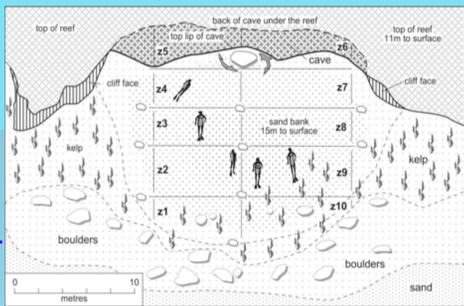


Fig.2. The main shark cave, showing locations of important structures including the sand bank, kelp, rocks and boulders used in delineating the ten zones to determine shark and diver distributions during the study.

Aliwal Shoal MPA research:

Methodology:

- ❖ **Altered methodology** due to diver safety.
- ❖ **Cathedral dive site** allows for easy shark number evaluation and safe observational research diving.
- ❖ **Shark numbers** recorded before and after divers.
- ❖ **Diver positions in relevance to cave** (cathedral) entrance observed (Fig.3)

Observing whether:

- ❖ Divers adhere to **protocol that no divers are allowed in a cave or overhang if sharks are inside.**
- ❖ Shark numbers are different in numbers **before the SCUBA divers arrive and after they leave.**

Current findings:

- ❖ Footage has been scarce due to unforeseen natural factors.
- ❖ However, a few successful dives have shown **divers correctly adhering to diving protocol.**
- ❖ Certain dives show **shark-diver comfort** and other dives show **sharks being pushed back into the cave** as they move further away from divers.

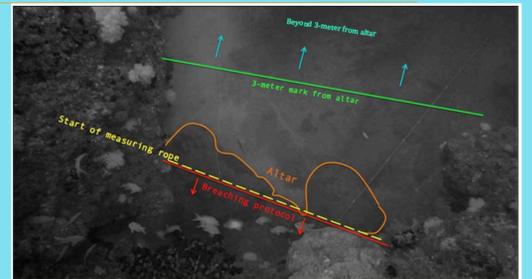


Fig.3. Showing the entrance of Cathedral dive site (from above) from research diver position. If the red line is crossed, a breaching of protocol has occurred. The marked anchor ropes (1m intervals) allow for distance away from entrance to be measured. The middle of the “altar” indicates the start of the Cathedral cave.

Study 2

Questionnaire data:

- ❖ “Shark protocol” is tested (i.e. **no diver is allowed within 3 meters of a ragged-tooth shark**).
- ❖ Connectedness to nature (CNS). **CNS is a common questionnaire-based tool used to measure an individuals “closeness” to nature⁴.**
- ❖ **Demographic information** of divers will be included as well as their reason for choosing Aliwal Shoal as a diving destination.

This data is unique and will create an important foundation to better understand the recreational SCUBA diver at Aliwal.

Study 3

Historical data:

- ❖ Ragged-tooth shark **population data** was collected from **1996-2004**. The data consists of **sightings per dive including shark sex, and length as well as any unusual occurrences during the dive.**
- ❖ This data will be used to compare to 2015 and 2016 sighting data.
- ❖ **Historical video (live cam) from 2000** will be analysed. The footage consists of **ragged-tooth shark and SCUBA diver sightings** at the Cathedral dive site on Aliwal Shoal. This research is inline with Study 1 and can therefore be compared to analyse possible differences in ragged-tooth shark behavior.

Contribution to conservation

- ❖ **An appropriate and effective code of conduct** is needed to minimize the influence of recreational diving. Should the code of conduct need improving, recommendations will be made to that effect.
- ❖ The study site is known as a **shark refuge and possibly a mating site** and consequently may be an important habitat for the **survival of the population.**
- ❖ The combination of Australia’s Grey Nurse Shark studies on diving behavior with *C.taurus* and a similar *C.taurus* study in South Africa will **broaden the understanding of the influence of SCUBA divers on C.taurus** at refuge sites.
- ❖ Organizations such as **PADI** will be made aware of the research and can incorporate the results in their training of “**shark aware**” SCUBA divers.

References: ¹ Barker SM, Peddemors VM and Williamson JE. 2010. Recreational SCUBA diver interactions with the critically endangered Grey Nurse Shark *Carcharias taurus*. *Pacific Conservation Biology* 16: 261-269

² Dicken ML. 2006. Population dynamics of the raggedtooth shark (*Carcharias taurus*) along the east coast of South Africa. Rhodes University. Grahamstown, South Africa. Available on the internet at: eprints.ru.ac.za/247/01/Dicken-Phd thesis.pdf.

³ Dicken ML, Booth AJ, Smale MJ, Cliff G. 2007. Spatial and seasonal distribution patterns of juvenile and adult ragged-tooth sharks (*Carcharias taurus*) tagged off the east coast of South Africa. *Marine and Freshwater Research*. 58: 127

⁴ Mayer FS and Frantz CM. 2004. The connectedness to nature scale: A measure of individuals’ feeling in community with nature. *J. Environ. Psychol.* 24: 503-515.