

Thesis abstract

Behavioural and Trophic Ecology of Reef Sharks at Ningaloo Reef, Western Australia

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The focus of my project was to quantify the long-term movements, environmental associations, and trophic role of reef sharks at Ningaloo Reef, and relate findings to management. I reviewed 50 years of research on coastal shark movement and behaviour. A number of common horizontal and vertical patterns exist, and I relate these to habitat specificity, site fidelity, habitat partitioning and management (Speed et al. 2010).

I monitored long-term (> 2 yrs) behaviour of four species of reef sharks (*Carcharhinus melanopterus*, *Carcharhinus amblyrhynchos*, *Triaenodon obesus* and *Negaprion acutidens*) at Ningaloo Reef using a combination of visual censuses, acoustic monitoring, and stable isotope techniques. All species showed site fidelity to inshore areas, one of which was an aggregation site (Skeleton Bay). Temporal and spatial overlap within Skeleton Bay was high for all species (Speed et al. 2011).

Examination of environmental influences showed that sharks were more affected by water temperature than other variables, such as tide height and moon phase. Furthermore, adult female *C. melanopterus* maintained average body temperature above average water temperature, which provides evidence for behavioural thermoregulation (Speed et al. 2012b).

I assessed the trophic ecology of reef sharks using a combination of stable isotope analysis and acoustic monitoring. Trophic level estimates were comparable to previous estimates based on traditional dietary studies, and high $\delta^{13}\text{C}$ in muscle tissue suggests a dependency on coastal food webs. There was support for an increase of $\delta^{15}\text{N}$ with body size, which suggests that larger animals feed higher in the food-web (Speed et al. 2012a).

Movement patterns around a sanctuary zone (Mangrove Bay) indicate that individuals were detected < 40 % of monitoring time. Adults had larger home ranges than juveniles, and activity hot spots for adults were outside of the sanctuary zone. Some adults made long-distance movements (> 10 km); the longest being > 260 km (round trip). Management of reef sharks at Ningaloo should incorporate the use of MPA zoning with other measures such as migration corridors, as well as size and bag limits.

Future research should adopt an interdisciplinary approach of biotelemetry and molecular techniques. This would provide further detail on dispersal and interconnectivity of populations at Ningaloo Reef and increase the resolution of habitat use and behaviour of these elusive predators.

References

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