

SUPPLEMENT 1

Table S1. Results for generalized additive models testing the predictive relationship of day of year (DOY) and *in situ* water temperature (Temp) on the MaxN counts of *Carcharias taurus* at Shark Cave, Rottnest Island, 2006–2021.

| Model 1 | Estimate | SE | z-value | <i>p</i> |
|----------------|----------|---------|----------|----------|
| (Intercept) | 1.80 | 0.04 | 44.89 | < 0.001 |
| | edf | ref. df | χ^2 | <i>p</i> |
| s(DOY) | 3.33 | 4 | 38.90 | < 0.001 |
| s(Year) | 4.35 | 5 | 36.73 | < 0.001 |
| Model 2 | Estimate | SE | z-value | <i>p</i> |
| (Intercept) | 1.80 | 0.04 | 45.12 | < 0.001 |
| | edf | ref. df | χ^2 | <i>p</i> |
| s(DOY) | 4.63 | 5 | 27.25 | < 0.001 |
| s(Year) | 4.52 | 5 | 51.29 | < 0.001 |

Table S2. All *C. taurus* sightings and captures compiled in this study from Shark Bay and further north in Western Australia (excluding Exmouth Navy Pier).

| Data Source | Location in Western Australia | Number of <i>Carcharias taurus</i> | Dates caught or observed |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------|
| Fisheries Bycatch data 2006 to 2017 | Northernmost graticule block just south of the fisheries exclusion zone at Shark Bay (Fig. 8) | 4 | May to July (between 2006 and 2017) |
| Photographs from Shark Bay Dive and Ocean Park Management, Denham | Caves around Steep Point in Shark Bay | Usually 2 | October to December (2014, 2017, 2019, 2021) |
| Spearfishers pers. comm. | 40km NW of Carnarvon | 6 to 10 mature females | Late July to early August |
| Photographs from divers | The Canyon, Coral Bay | 1 photo-tagged female | May 2011, July to October 2012, May and June 2013 |
| Photographs from divers | The Canyon, Coral Bay | 2 immature males | July 2012; July 2014 |
| Department of Fisheries (Jakobs & Braccini, 2019) | Acoustic receivers off Coral Bay | 1 acoustically tagged male shark | October 2012 |
| Department of Fisheries Research Capture data | Between Exmouth and Barrow Island | 7 | June, November, December (2001–2004) |
| WA Underwater Explorers Club, pers. comm | Wreck off Port Hedland | 2 | August 2002 |
| Indonesian fishers (Momigliano & Jaiteh 2015) | Browse Island | 4 | June to November 2013 |

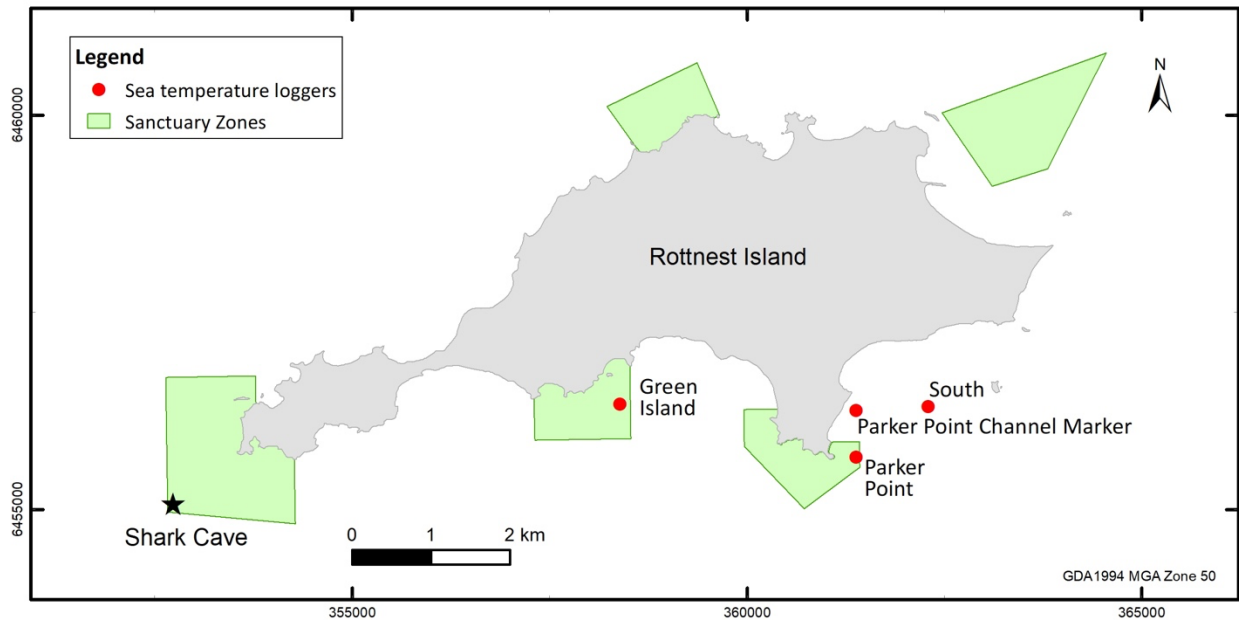


Fig. S1. Locations of temperature loggers deployed off Rottneest Island to measure subsurface ocean temperatures between 2010-2021.

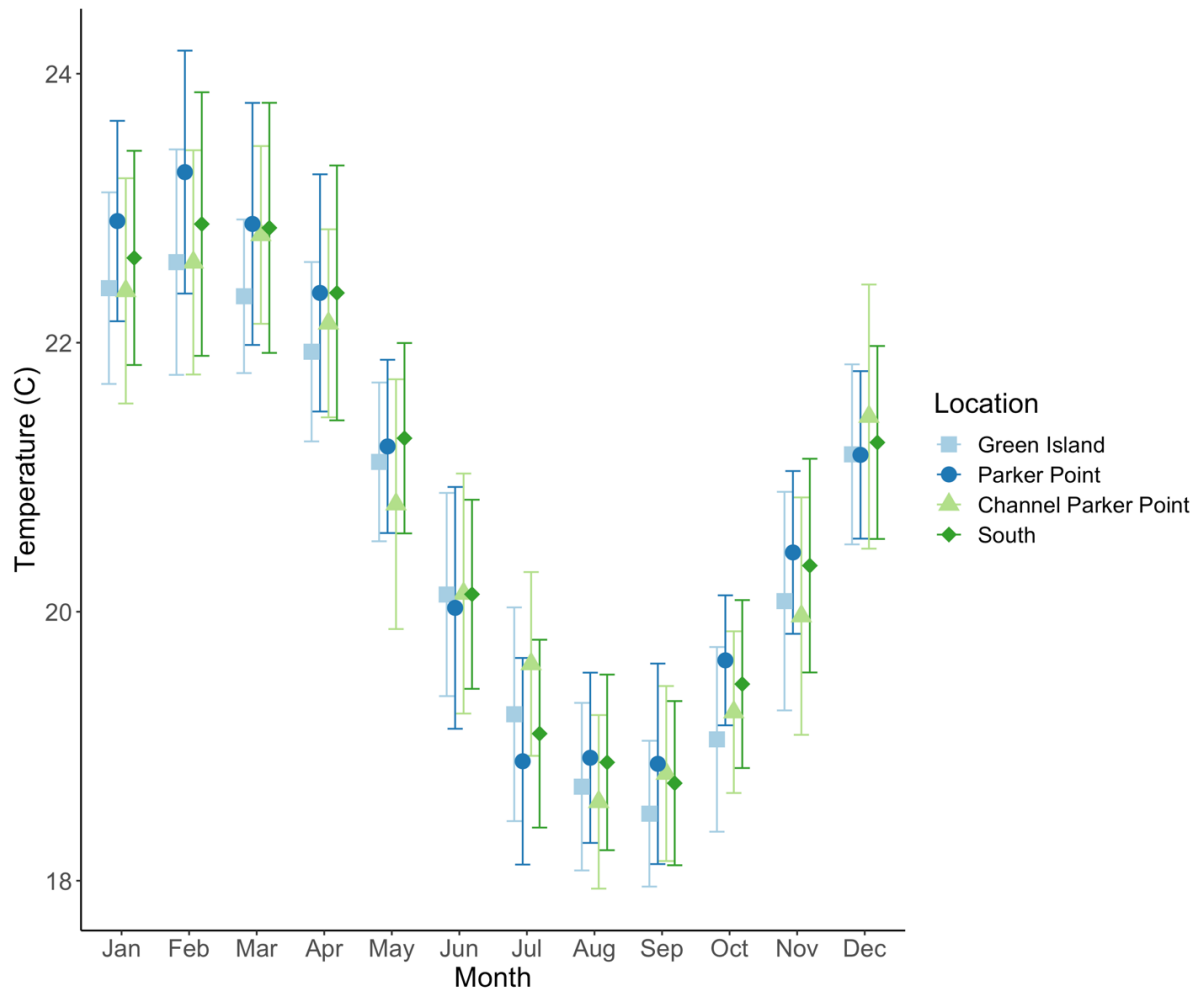


Fig. S2. Annual sub-surface ocean temperature (mean \pm SD) measured by temperature loggers deployed around Rottneest Island between 2010-2021.