

## Comments on Draft Coral Sea Commonwealth Marine Reserve Management Plan

Dr Cassandra Rigby

email: [crigby@westnet.com.au](mailto:crigby@westnet.com.au)

The proposed Special Purpose Zone (Trawl) that will allow for demersal and midwater trawling and demersal and pelagic longline in the Coral Sea extends along most of the southern third of the Great Barrier Reef Marine Park boundary and covers a large area that is deeper than that mostly currently used by the Queensland Trawl Fishery.

This raises the concern that permitting deepwater trawling and longline in such a large area has the potential to detrimentally impact the habitat and the bycatch of deepwater chondrichthyan species (sharks, rays and ghostsharks). Independent monitoring of the habitat and deepwater chondrichthyan bycatch species is recommended to ensure the proposed fisheries operate in an ecologically sustainable manner prescribed under the 'Guidelines for the ecological sustainable management of Fisheries', that is, does not threaten bycatch species and minimises the impact of the fishing operations on the ecosystem generally<sup>1</sup>.

### Habitat

The proposed Special Purpose Zone (Trawl) area is an area to the north, south and adjacent to the current deepwater trawl eastern king prawn (EKP) fishery area around Swain Reefs. The deepwater habitat in the Swain Reefs area has been identified as at high risk as a precaution partly due to the lack of biological information of the area but also due to the lack of knowledge of the bottom topography and habitat type. Trawling can physically damage the habitat with recovery in deepwater habitat known to be slower than that in shelf habitats<sup>2</sup>. This proposed trawling area is mostly in areas of habitat that has previously experienced little to no trawl effort.

### Recommendations:

1. The bottom topography of the proposed Special Purpose Zone (Trawl) area is defined and characterised to determine if any vulnerable deepwater habitats such as sponge and coral communities are present.
2. The capture during trawl operations of any deepwater corals or sponges is recorded, along with their location and depth and samples are retained to provide for taxonomic identification.
3. Resources are allocated to both habitat mapping and taxonomic identification.

### Deepwater chondrichthyans

Deepwater chondrichthyans are inherently more vulnerable to fishing pressure than chondrichthyans from shelf habitats. They grow more slowly, mature later and live longer which are traits associated with a reduced capacity to recover from fishing pressure<sup>3</sup>. With increasing depth down the continental slope the

---

<sup>1</sup> These comments are my personal views.

<sup>2</sup> Pears, R. J., Morison, A. K., Jebreen, E. J., Dunning, M. C., Pitcher, C. R., Courtney, A. J., Houlden, B. & Jacobsen, I. P. (2012). Ecological risk assessment of the East Coast Otter Trawl Fishery in the Great Barrier Reef Marine Park: Summary report. In *Great Barrier Reef Marine Park Authority*. Townsville.

1. <sup>3</sup> Rigby, C. & Simpfendorfer, C. A. (2015). Patterns in life history traits of deep-water chondrichthyans. *Deep Sea Research Part II: Topical Studies in Oceanography* **115**, 30-40. doi: 10.1016/j.dsr2.2013.09.004

chondrichthyan species mature even later, live even longer, have smaller litters and breed less frequently. This results in their vulnerability to fishing pressure increasing with increasing depth<sup>4</sup>. There are concerns for the ability of deepwater chondrichthyans to sustain fishing pressure with estimates that the fishing mortality that would drive these deepwater species to extinction is 58% of that of shelf species<sup>5</sup>. Large declines in the biomass of deepwater chondrichthyans that are taken within fisheries have been documented globally<sup>6</sup> and within Australia<sup>7</sup>.

Recent studies of the chondrichthyans bycatch of the deepwater EKP fishery around Swain Reefs identified a total of 11 species of deepwater chondrichthyans<sup>8</sup>. This included an additional four species to that previously recorded. All of the 11 chondrichthyans species will potentially be encountered within the proposed Special Purpose Zone (Trawl) area. Of the 11 species, ten are endemic to Australia and five are endemic to waters offshore of Qld with restricted distributions. This high level of endemism and restricted distribution is common among deepwater chondrichthyans and potentially reduces their resilience to fishing pressure<sup>9</sup>. Deepwater line fisheries also interact with chondrichthyans and concerns have been raised about the current Queensland line fisheries interaction with deepwater sharks and the issues with species identification, logbook records, improved fishing technology and increasing effort that all lead to increased pressure on vulnerable species<sup>10</sup>.

Age, growth and reproductive studies of three of the deepwater chondrichthyans known to occur in the deepwater EKP trawl fishery indicated that they are long lived and slow growing with small litters, the only exception being the skate *Dipturus polyommata* that had a faster growth<sup>11,12</sup>. However, this skate also had low ovarian fecundity and all life stages (juveniles to mature adults) were captured in the deepwater EKP fishery which reduces their resilience to fishing. A risk assessment of one of these species, *Squalus megalops* that also occurs outside Queensland waters, found it to be potentially highly susceptible and vulnerable to the effects of fishing<sup>13</sup>. The chondrichthyans captured by the deepwater EKP fishery around Swain Reefs all have life history traits typical of deepwater chondrichthyans and indicative of low biological productivity. However, there was some variability in their life history traits and distributions that would

- 
2. <sup>4</sup> Simpfendorfer, C. & Kyne, P. M. (2009). Limited potential to recover from overfishing raises concerns for deep-sea sharks, rays and chimaeras. *Environmental Conservation* **36**, 97-103. doi: 10.1017/S0376892909990191.

<sup>5</sup>García, V.B., Lucifora, L.O., and Myers, R.A. (2008) The importance of habitat and life history to extinction risk in sharks, skates, rays and chimaeras. *Proceedings of the Royal Society B: Biological Sciences* **275**(1630), 83-89. doi: 10.1098/rspb.2007.1295

<sup>6</sup> Devine, J.A., Baker, K.D., and Haedrich, R.L. (2006) Deep-sea fishes qualify as endangered. *Nature* 439(7072), 29-29. doi: 10.1038/439029a

<sup>7</sup> Graham, K.J., Andrew, N.L., and Hodgson, K.E. (2001) Changes in relative abundance of sharks and rays on Australian South East Fishery trawl grounds after twenty years of fishing. *Marine and Freshwater Research* **52**(4), 549-561. doi: 10.1071/MF99174

<sup>8</sup> Rigby CL, White WT, Simpfendorfer CA (2016) Deepwater chondrichthyan bycatch of the Eastern King Prawn Fishery in the southern Great Barrier Reef, Australia. *PLoS ONE* 11(5):e0156036. doi:10.1371/journal.pone.0156036.

<sup>9</sup> Kyne, P. M. & Simpfendorfer, C. A. (2010). Deepwater chondrichthyans. In *Sharks and their relatives II. Biodiversity, adaptive physiology, and conservation*. (Carrier, J. C., Musick, J. A. & Heithaus, M. R., eds.), pp. 37-113. Boca Raton, Florida: CRC Press.

<sup>10</sup> Sumpton W, McLennan M, Campbell M, Kerrigan B (2013) Assessing technology changes and risks to the sustainable management of deepwater line fisheries in southern Queensland. Department of Agriculture, Fisheries and Forestry. FRDC Project 2010/053., p 71.

<sup>11</sup> Rigby CL, White WT, Smart JJ, Simpfendorfer CA (2016) Life histories of two deep-water Australian endemic elasmobranchs: Argus skate *Dipturus polyommata* and eastern spotted gummy shark *Mustelus walkeri*. *Journal Fish Biology* 88:1149–1174. doi:10.1111/jfb.12891

<sup>12</sup> Rigby CL, Daley RK, Simpfendorfer CA (2016) Comparison of life histories of two deepwater sharks from eastern Australia: the piked spurdog and the Philippine spurdog. *Marine Freshwater Research* 67(10):1546-1561. doi:10.071/MF15176.

<sup>13</sup> Braccini, J.M., Gillanders, B.M., and Walker, T.I. (2006) Hierarchical approach to the assessment of fishing effects on non-target chondrichthyans: case study of *Squalus megalops* in southeastern Australia. *Canadian Journal of Fisheries and Aquatic Sciences* **63**(11), 2456-2466. doi: 10.1139/f06-14.

result in different degrees of resilience to fishing pressure<sup>8</sup>. This highlights the need for each species to be individually assessed for risk from the proposed Special Purpose Zone (Trawl) area.

There are at least an additional 19 species of deepwater chondrichthyans that this proposed Special Purpose Zone (Trawl) area may encounter as they are known to occur in deepwater habitat off Qld in the region of the proposed Special Purpose Zone (Trawl) area<sup>14</sup>. One of these species, *Squalus montalbani*, has recently been found to be also long lived, late maturing and slow growing<sup>11</sup> and due to trawling declined by over 90% in relative abundance over two decades in southern New South Wales<sup>7</sup>. Management arrangements have since been instigated to aid recovery of this species and a suite of other deepwater chondrichthyan species impacted by that trawl fishery, although their recovery is expected to take multiple decades<sup>15</sup>.

The species recorded from the deepwater EKP fishery around Swain Reefs all currently have a refuge outside the existing deepwater EKP fishery. For those species that are endemic to waters offshore from Qld, this is the case as there are currently no other active trawl fisheries within their distributional ranges. However, the proposed Special Purpose Zone (Trawl) area has the potential to capture all these Qld endemics along with all the other species recorded from the deepwater EKP fishery around Swain Reefs, and place them under additional fishing pressure. While the sustainability of all deepwater chondrichthyans potentially captured by proposed trawling and longline in the proposed Special Purpose Zone is of concern due to their life history traits that render them vulnerable to fishing pressure, those species with the more limited distributional ranges are likely to be of the greatest concern.

The trawl fishery deploys turtle excluder and bycatch reduction devices in the nets that generally exclude larger elasmobranchs (sharks and rays greater than about one metre in length). However, these have a minimal effect on reducing the catch of the smaller sharks and rays less than about one metre in length<sup>16</sup>. These devices have been demonstrated to have no impact on the catch of the small *Dipturusendeavouri* which is the closest relative of *D. polyommata*<sup>17</sup>. The majority of deepwater chondrichthyans recorded from the deepwater EKP fishery around Swain Reefs are less than one metre in total length or disc width and are likely to be retained in the trawl nets used within the proposed Special Purpose Zone (Trawl) area.

Consideration should be given to the maximum allowable depth to which the proposed Special Purpose Zone (Trawl) operates. The European Union has recently passed legislation to meet the needs of an ecosystem approach to management that prohibits bottom below 800 metres, mandates observer coverage of 20% onboard vessels, protects vulnerable marine ecosystems and requires environmental impact assessments for fishing outside of the historic footprint<sup>18</sup>. A recent analysis of trawl data in the northeast Atlantic from 1978-2013 indicated that below 600 metres, the commercial catch became increasingly

---

<sup>14</sup>Last, P. R. & Stevens, J. D. (2009). *Sharks and rays of Australia*. Melbourne: CSIRO Publishing.

<sup>15</sup> AFMA (2012) Upper-slope dogfish management strategy. AFMA-managed Fisheries. Australian Fisheries Management Authority. Australian Government.

3. <sup>16</sup> Brewer, D., Heales, D., Milton, D., Dell, Q., Fry, G., Venables, B. & Jones, P. (2006). The impact of turtle excluder devices and bycatch reduction devices on diverse tropical marine communities in Australia's northern prawn trawl fishery. *Fisheries Research* **81**, 176-188. doi: 10.1016/j.fishres.2006.07.009

4. <sup>17</sup> Courtney, A. J., Campbell, M. J., Tonks, M. L., Roy, D. P., Gaddes, S. W., Haddy, J. A., Kyne, P. M., Mayer, D. G. & Chilcott, K. E. (2014). Effects of bycatch reduction devices in Queensland's (Australia) deepwater eastern king prawn (*Melicertus plebejus*) trawl fishery. *Fisheries Research* **157**, 113-123. doi: 10.1016/j.fishres.2014.03.021

<sup>18</sup> Regulation (EU) 2016/2336 of the European Parliament and of the Council of 14 December 2016 establishing specific conditions for fishing for deep-sea stocks. <http://data.europa.eu/eli/reg/2016/2336/oj>

economic inefficient while the ratio of vulnerable deepwater sharks and ray bycatch significantly increased and the proportion of all non-target species increased<sup>19</sup>. It is recognised that the study is not directly transferrable to Australian waters, however the methodology could be applied to the Special Purpose Zone (Trawl) to provide an informed scientific approach to consideration of the maximum allowable trawl depth.

***Recommendations:***

1. Independently monitor the species composition and abundance of deepwater chondrichthyan bycatch species taken in the proposed Special Purpose Zone (Trawl). A high level of observer coverage is recommended to ensure an accurate species composition is obtained.
2. Collect appropriate and sufficient biological information from the deepwater chondrichthyan bycatch species to ascertain their life history traits and assess their resilience to fishing pressure to ensure the deepwater chondrichthyan bycatch species are sustainable and are not threatened by the proposed Special Purpose Zone (Trawl). It is recommended that each deepwater chondrichthyan bycatch species is assessed individually due to variability in life history traits and distributions.
3. Consider the depth to which the proposed Special Purpose Zone (Trawl) operates using a scientifically sound methodology to ensure the fishery is conducted in a manner that minimises the impact of the fishing operations on the ecosystem generally.
4. Maintain all current Coral Sea Fishery demersal line sector management measures for the permitted longline fishery in both Special Purpose Zone (Trawl) and Habitat Protection Zone, do not permit any increase in the allowable number of hooks per line and monitor deepwater chondrichthyan catches.

---

<sup>19</sup> Clarke, J., Milligan, R.J., Bailey, D.M., Neat, F.C (2015). A scientific basis for regulating deep-sea fishing by depth. *Current Biology* 25, 1-5.