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PROPOSED DETERMINATION

The Smooth Hammerhead – *Sphyrna zygaena* as a Vulnerable Species

The Fisheries Scientific Committee, established under Part 7A of the *Fisheries Management Act 1994* (the Act), is proposing to list the smooth hammerhead shark, *Sphyrna zygaena* as a VULNERABLE SPECIES in Part 1 of Schedule 5 of the Act.

The listing of Vulnerable Species is provided for by Part 7A, Division 2 of the Act.

The Fisheries Scientific Committee, with reference to the criteria relevant to this species, prescribed by Part 16 of the *Fisheries Management (General) Regulation 2010* (the Regulation) has found that:

Background

1) *Sphyrna zygaena* (Linnaeus 1758), the smooth hammerhead, is a valid recognised taxon and is a species as defined in the Act. This species is often confused with *Sphyrna lewini* (the scalloped hammerhead), particularly in the tropics, leading to misidentification. Because of this confusion, information on the stock structure and life history specific to this species is lacking. In NSW however, they are considered to comprise a substantial proportion of individuals in datasets where the data for the three hammerhead species are combined, with Stevens (1984) suggesting that as many as 90% of the sphyrnid sharks in NSW were *Sphyrna zygaena.*

2) *Sphyrna zygaena* is found primarily in temperate seas worldwide, with some in tropical waters. The full range of the species in tropical waters is not known due to the confusion with *Sphyrna lewini*. In Australia, *Sphyrna zygaena* is found from central NSW south to central Western Australia. It is thought to prefer cooler waters than *Sphyrna lewini*, and some stocks have shown migrations in summer months to cooler waters (Bester 2008). The species occurs in NSW between September and May but is most abundant from December to May (Stevens 1984). It is considered semi-pelagic, and occurs over continental shelves, inshore waters, and sometimes in bays and estuaries. The species prefers shallow waters less than 20 m in depth, but has been reported in waters up to 200 m and offshore (Bester 2008).

3) The maximum reported size of *Sphyrna zygaena* is 370-400 cm (Compagno 1984, cited in Caspar *et al*. 2005). In NSW, males are thought to mature at around 250-260 cm TL, while females are thought to mature around 265 cm TL (Stevens 1984). In other locations, males may mature at smaller sizes (210-250 cm TL in Florida) (Bester 2008). The life span of *Sphyrna zygaena* is thought to be 20 years or longer (Bester 2008). Adults usually occur singly or in small groups (Bester 2008).

4) *Sphyrna zygaena* is ovoviviparous, with eggs hatching inside the body and the embryos nourished by a yolk-sac placenta. In eastern Australia, ovulation occurs in March, with parturition occurring between January and March (Stevens 1984). The gestation period is thought be 10-11 months (Stevens 1984), with likely a 2-year breeding cycle (Scandol *et al*. 2008). Litter sizes from 20-49 (average 32) were seen in NSW but could be larger as capture often induces abortion (Stevens 1984). Size at birth is 50- 60 cm (Bass *et al*. 1975, cited in Stevens 1984, Bester 2008). Sex ratio of pups at birth is about 1:1. Pupping may occur in NSW waters, as pregnant and spent females have been caught in NSW recreational fisheries, and

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aggregations of small individuals (50-56 cm TL) have been caught in the beach meshing program (Chan 2001). Juveniles may form large aggregations (Bester 2008). There may be spatial separation of young and adult sharks, as has been suggested in KwaZulu-Natal region (Dudley and Simpfendorfer 2006).

5) The species is listed on Annex I, Highly Migratory Species, of the UN Convention on the Law of the Sea, which urges States to cooperate over the management of these species.

Criteria – reduction in abundance, geographic distribution or genetic diversity (Regulation clause 274)

1) Catch-per-unit-effort (CPUE) data from the NSW Shark Meshing Program collected between 1950 and 2007/08 indicate that hammerhead sharks (*Sphyrna zygaena*, *Sphyrna mokarran* and *Sphyrna lewini*) have declined substantially in NSW (Reid & Krogh 1992; Green *et al.* 2009). Hammerheads comprised 29% of the animals caught by the shark meshing program between 1950 and 2007/08 and were the most numerous group of species caught (Green *et al.* 2009). Because species identity was not recorded, we cannot gauge the change in *Sphyrna zygaena* relative to that of the other two hammerhead species. As previously stated, however, we can assume that a majority of the NSW hammerhead catch was likely to be *Sphyrna zygaena* (as per Stevens 1984, Reid and Krogh 1992, Chan 2001). Further complicating analysis of long-term trends are changes in methods and the level of effort of the shark meshing program in 1972/73, making comparison of pre-1972 versus post-1972 changes difficult. Despite these limitations, the shark meshing program has documented major declines in hammerhead sharks since 1972/73. The number of hammerheads caught per year has steadily declined from > 300 individuals per annum in 1972/73 when the new method-effort regime was initiated to < 30 in 2007/08. This represents a decline in CPUE of ~85% over the past 35 years (Reid *et al*. 2011). The majority of the hammerheads caught are immature (< 260 cm TL or 100 kg) (Stevens 1984, Chan 2001).

2) Although the three species of hammerhead sharks (*Sphyrna zygaena*, *Sphyrna mokarran* and *Sphyrna lewini*) are not separately identified in the commercial catches, landings reached a peak in 1993/94, with an estimated whole weight catch of 15.7 tonnes, then declined through 2004/05 to an average of 3.5 tonnes per year between 2004/05 and 2007/08 (Scandol *et al*. 2008). Estimated whole weight landings of hammerhead sharks (all three species) in NSW commercial fisheries increased to 7.3 tonnes in 2008/09 and 7.6 tonnes in 2009/10 and was 4.8 tonnes in 2010/11 (NSW DPI data base query March 2012). *Sphyrna zygaena* made up 4.3% of the Ocean Trap and Line (OTL) fishery in 2008-09 based on onboard observations of the fishery, and 53% of the hammerheads caught were *Sphyrna zygaena* (71 smooth hammerheads compared to 53 scalloped hammerheads and 9 great hammerheads). All of the *Sphyrna zygaena* observed caught were retained (Macbeth *et al*. 2009).

3) Catches of hammerhead sharks by members of recreational gamefish clubs ramped up from annual average of ~50 per year in the 1970s to a high of more than 250 per year in early 1990s, then declined to approximately 120 per year in the late 1990s (Chan 2001). The range of sizes of hammerhead sharks caught by gamefishers declined steadily over time from a large range of sizes caught (10-270 kg) in the 1960s to early 1970s, to the majority of fish ranging from 10-80 kg from the mid-1970s to the present. Individuals were historically landed but the majority have been tagged and released since the 1990s (Chan 2001). There is no estimate of the effort expended in the fishery, and no estimate of catches in other recreational fisheries.

4) The Charter Fishing Logbook Monitoring Program returns submitted by charter boat operators from November 2000 to the present indicate that 181 hammerhead sharks were caught (132 retained and 49 released). These data include all hammerhead species i.e. there is no separation

of species such as scalloped, great and smooth. Operators are required to record hammerhead species on the Charter Fishing Logbooks under the code HHED (Bill Talbot, DPI, pers. comm.).

5) The IUCN global assessment dated for the Red List has determined *Sphyrna zygaena* to be Vulnerable under criteria A2bd+3bd+4bd ver 3.1 (Caspar *et al.* 2005).

6) In light of the above, the Fisheries Scientific Committee has found that it is inferred or reasonably suspected that the species has undergone, or is likely to undergo, a large reduction in an index of abundance within a time frame appropriate to the life cycle and habitat characteristics of the taxon, meeting the criteria of Vulnerable.

   The Fisheries Scientific Committee has had regard to the following in determining the extent of the reduction referred to above:

   (a) Evidence of declining populations in other places worldwide for this species: - IUCN report (and references therein) for the northwestern and central Atlantic, and Mediterranean Sea.
   (b) The status of the species outside the State as appropriate for the taxon: - IUCN global assessment of the species as Vulnerable.
   (c) The ability of the species to recover rapidly from low numbers, which is unlikely based on life history parameters common amongst other hammerhead species (Smith *et al.* 1988).
   (d) The reproductive potential of the species in relation to its reproductive ecology and behaviour and the relationship of these to any threatening process or processes: - Restricted reproductive potential due to ovoviviparity, small litter sizes and females breeding once every 2 years.
   (e) The current management strategies in relation to life history and reproductive ecology: - The existing management of the large shark fishery (including hammerhead sharks) in NSW only includes commercial catch limits in the Ocean Trap and Line Fishery (OTLF), while sharks harvested in other NSW fisheries (Ocean Trawl, Estuary General and Ocean Haul fisheries) are not subject to any catch limit. For the current fishing period (1 February 2012 to 31 January 2013), a total allowable commercial catch of 89.5 tonnes [processed weight – i.e., weight after being headed and gutted] applies to all shark species. There is also a weekly catch limit of 500 kg processed weight or 750 kg whole weight for any shark species or combination of species. The weekly catch limit applies throughout the fishing period until the total shark catch reaches approx. 70 tonnes. At that point, there is a landing restriction, called a bycatch limit, of two carcasses per week until the maximum catch limit of 85.9 tonnes is reached. After that, no landings of sharks are permitted (but bycatch may still occur). Shark finning at sea by any commercial or recreational fisher is prohibited.
   (f) The precautionary principle, namely, that if there are threats of serious or irreversible damage to the species, lack of full scientific certainty should not be used as a reason for postponing measures to prevent that damage.

Criteria – threatening processes (Regulation clause 272)

1) The threatening processes for this species are continued harvest in recreational, commercial and bather protection fisheries. It is also caught as bycatch in non-shark fisheries.

2) Internationally this species, like most elasmobranch fisheries, is susceptible to overfishing (Caspar *et al.* 2005). It is caught in commercial and/or recreational fisheries in the US, Brazil, Spain, Taiwan, the Philippines, and Africa. Shark finning bans are currently being adopted and implemented in a range of situations by fishing states (USA, Australia), regional entities (EU) and regional fisheries organisations (ICCAT).

In NSW there is a recreational bag limit of one hammerhead shark per person per fishing trip.

In NSW the total allowable commercial catch for large sharks (which includes hammerhead sharks) is 89.5 t per annum in the OTL fishery and there are no catch limits for sharks in the Ocean Trawl, Estuary General and Ocean Haul fisheries.

Between January 19 and May 1, 2012, the NSW Shark Meshing (Bather Protection) Program in NSW captured 23 smooth hammerheads, all dead when retrieved (NSW SMP monthly reports).

3) The fins of all hammerhead sharks are in high demand worldwide due to their high fin ray count (Caspar *et al*. 2005).

4) For *Sphyrna zygaena*, there is observed, inferred or reasonably suspected to be, historical, current and potential threatening process, or threatening processes affecting the species.

The Fisheries Scientific Committee has had regard to the following in determining the relevant extent of the effect of the threatening process or processes:
(a) The number and nature of the threatening processes,
(b) The potential for synergistic effects between threatening processes,
(c) The extent of the threatening processes relative to the geographic distribution of the species,
(d) The level of protection offered to the species within existing reserve systems, other forms of refuge or by current management strategies.

5) In light of the above, the Fisheries Scientific Committee has found that these threatening processes continue to operate within the geographic distribution of the species and that existing reserve systems or other forms of refuge do not protect the species.

Conclusion pursuant to section 220F(4) of the Act

In the opinion of the Fisheries Scientific Committee:
(a) *Sphyrna zygaena* the smooth hammerhead shark, is facing a high risk of extinction in New South Wales in the medium-term future, as determined in accordance with the criteria prescribed by the Regulation as discussed above, and
(b) it is not eligible to be listed as an endangered or critically endangered species.

The species is eligible to be listed as a VULNERABLE SPECIES.

Sources and Links

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