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FINAL DETERMINATION
***Sphyrna zygaena* - The Smooth Hammerhead Shark**

The Fisheries Scientific Committee, established under Part 7A of the *Fisheries Management Act 1994* (the Act), has made a final determination to **not 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 characteristics 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 this 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 inhabit cooler waters than *Sphyrna lewini*, and some studies 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 has been reported in continental shelf waters up to 200 m and offshore in Australia (Last & Stevens 2009, Macbeth *et al.* 2009).

3) The maximum reported size of *Sphyrna zygaena* is 370-400 cm (Compagno 1984, cited in Casper *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 viviparous (Bester 2008). In eastern Australia, ovulation occurs in March, with parturition occurring between January and March (Stevens 1984). The gestation period is approximately 10 -11 months (Stevens 1984), with a likely 2-year breeding cycle (Scandol *et al*. 2008). Litter sizes of 20-49 (average 32) have been observed 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 (Chan 2001).

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5) Aggregations of small individuals (50-56 cm TL) have been caught in the beach meshing program (Chan 2001), and aggregations of immature individuals (>195 cm TL) in the NSW Ocean Trap and Line Fishery (Macbeth *et al.* 2009). There may be spatial separation of young and adult sharks, as has been suggested in KwaZulu-Natal region (Dudley and Simpfendorfer 2006).

6) 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 271)

1) Catch-per-unit-effort (CPUE) data from the NSW Shark Meshing (Bather Protection) Program (SMP) collected between 1972 and 2013/14 indicate that hammerhead sharks (*Sphyrna zygaena*, *Sphyrna mokarran* and *Sphyrna lewini*) have declined substantially in NSW (Reid & Krogh 1992; Green *et al.* 2009). This represents a decline in CPUE of ~85% over the past 35 years (Reid *et al*. 2011). Hammerhead sharks 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 species of hammerhead sharks. However, SMP data from 2008/09 onwards show that 98% of hammerhead sharks identified to species level were *Sphyrna zygaena*. Changes in methods and the level of effort of the SMP since 1972/73 have further complicated analyses of long-term trends, making comparison of pre-1972 versus post-1972 changes difficult.

2) Recent SMP data continue to show a decline in *Sphyrna zygaena*, however, it is unclear whether the population in NSW has declined to a level that renders it vulnerable to extinction. This taxon-appropriate index of abundance is based on a time series in which no significant operational changes have been recorded in the published literature. The number of hammerhead sharks caught in NSW per year has steadily declined from > 300 individuals per annum in 1972/73 when the new method-effort regime was initiated, to 22 in 2013/14.

3) Although the three species of hammerhead sharks (*Sphyrna zygaena*, *Sphyrna mokarran* and *Sphyrna lewini*) were not separately identified in commercial catches prior to 2008/09, landings reached a peak in 1993/94, with an estimated whole weight catch of 15.7 tonnes, then declined to an average of 3.5 tonnes per year between 2004/05 and 2007/08 (Scandol *et al*. 2008). From 2008/09 to 2013/14, estimated whole weight landings of *Sphyrna zygaena* have averaged 1.2 tonnes per year (NSW DPI data base query December 2014).

4) Catches of hammerhead sharks by members of recreational gamefish clubs increased from an annual average of ~50 per year in the 1970s to a high of more than 250 per year in the 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. Historically, individuals were landed, but since the 1990s the majority have been tagged and released (Chan 2001). There is no estimate of the effort expended in the fishery, and no estimate of catches in other recreational fisheries.

5) The Charter Fishing Logbook Monitoring Program returns submitted by charter boat operators from 2000/01 to the present indicate that 210 hammerhead sharks were caught (145 retained and 65 released, noting that prior to 2008/09 only data on retained hammerheads was recorded under the game fish charter boat logbooks). 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.).

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

7) In light of the above, the Fisheries Scientific Committee has found that although *Sphyrna zygaena* has undergone an apparent decline in abundance, there are not enough species-specific data to show that it is facing a high risk of extinction in NSW in the medium-term future, and therefore does not meet criteria of Vulnerable.

8) 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 viviparity, 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 smooth hammerhead) 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 fishing period 1 February to 31 January each year, 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 89.5 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."

Criteria – threatening processes (Regulation clause 272)

1) Internationally, this species, like most elasmobranch fisheries, is susceptible to overfishing (Casper *et al*. 2005). It is caught in commercial and/or recreational fisheries in the US, Brazil, Spain, Taiwan, the Philippines, and Africa. The fins of all hammerhead sharks are in high demand worldwide due to their high fin ray count (Casper *et al*. 2005). 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, potential threatening processes include recreation and commercial fishing, and the Shark Meshing (Bather Protection) Program. There is a recreational bag limit of one *Sphyrna zygaena* per person per fishing trip. The total allowable commercial catch for large sharks (which includes hammerhead sharks) is 89.5 tonnes per annum in the OTL fishery and there are

no catch limits for sharks in the Ocean Trawl, Estuary General and Ocean Haul fisheries. Since 2008/09, > 99% of hammerhead sharks (n=129) were dead when retrieved (NSW SMP annual reports).

2) In light of the above, the Fisheries Scientific Committee has found that while the above threatening processes continue to operate within the geographic distribution of the species, there is continuing uncertainty surrounding species-specific data and the cause of the large documented increase in catch in the early 1970s. Therefore, the species cannot be proven to be facing a high risk of extinction in New South Wales in the medium-term future at this time.

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

In the opinion of the Fisheries Scientific Committee, *Sphyrna zygaena*, the Smooth Hammerhead Shark is not facing a high risk of extinction in New South Wales in the medium-term future, as determined in accordance with criteria prescribed by the Regulation as discussed above.

The species is **not eligible** to be listed as a VULNERABLE SPECIES.

Sources and Links

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