

**Advice to the Minister for Sustainability, Environment, Water, Population and Communities from the Threatened Species Scientific Committee (the Committee) on Amendment to the list of Threatened Species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

**1. Name**

*Centrophorus moluccensis*

The species is commonly known as Endeavour Dogfish. It is also known as Smallfin Gulper Shark. It is in the Family Centrophoridae.

**2. Reason for Conservation Assessment by the Committee**

The Endeavour Dogfish was nominated for assessment by the Committee. The Committee provides the following assessment of the species' eligibility for inclusion in the EPBC Act list of threatened species.

This is the Committee's first consideration of the species under the EPBC Act.

**3. Summary of Conclusion**

The Committee judges that the Endeavour Dogfish is **not eligible** for listing under the EPBC Act at this time.

**4. Taxonomy**

The species is conventionally accepted as *Centrophorus moluccensis* Bleeker, 1860 (Endeavour Dogfish).

**5. Description**

The Endeavour Dogfish belongs to the Family Centrophoridae, the species of which are collectively known as the 'gulper sharks'. The common name of 'dogfish' is used to describe shark species from a number of different families. For the purposes of this listing advice, when referring to species of Family Centrophoridae exclusively, the name 'gulper shark' will be used.

The Endeavour Dogfish is a relatively small, deepwater shark that is uniformly light greyish or brownish in colour, although may be darker along the dorsal surface and paler on the belly. They grow to a maximum length of 100 cm. Unlike the closely related Harrison's Dogfish and Southern Dogfish, the second dorsal fin of the Endeavour Dogfish is much smaller than the first dorsal fin. It has greenish eyes and a relatively short snout when compared to other species of gulper shark (Last and Stevens, 2009).

**6. National Context**

In Australian waters, the Endeavour Dogfish is found in habitats on the upper-slope (200–650 m) of the continental shelf in waters offshore of the coast of Western Australia and eastern Australia, extending from the Kimberley to Albany in the west and from Ingham (Queensland) to Lakes Entrance (Victoria) in the east. There are no confirmed reports of the species in waters offshore from Tasmania and the Great Australian Bight (Daley et al., 2002; Last and Stevens, 2009).

Internationally, the Endeavour Dogfish is known to occur in the western Indian Ocean and in the western Pacific Ocean. The species has been recorded in waters offshore from southern Africa, the Philippines, Indonesia, Taiwan and Japan.

The Endeavour Dogfish is not listed under any Australian, or state/territory government legislation.

### **National fisheries context**

The Endeavour Dogfish is taken in commercial fisheries targeting the upper-slope on the east and west coasts of Australia. However, accurate species-specific data on the historical take of the Endeavour Dogfish in these fisheries are not available. The species is caught as incidental byproduct in Southern and Eastern Scalefish and Shark Fishery (SESSF), which is managed by the Commonwealth agency, the Australian Fisheries Management Authority (AFMA). There are four principal sectors within the SESSF:

- Commonwealth Trawl Sector (CTS) – located offshore from coastline between Sydney in New South Wales, around Tasmania to Cape Jervis in South Australia (near Adelaide). The main gear types used are demersal otter trawl and Danish seine, with some midwater trawl.
- East Coast Deepwater Trawl (ECDWT) sector – located in the Australian Exclusive Economic Zone (EEZ) surrounding Lord Howe Island. A 25 nautical mile exclusion zone exists around Lord Howe Island and nearby Balls Pyramid. The main gear types are demersal and midwater trawl.
- Gillnet, Hook and Trap (GHAT) sector – located offshore from coastline between Fraser Island in Queensland, around Tasmania including Bass Strait, to the SA-WA border. The main gear types are scalefish hook and shark hook, shark gillnets and fish traps. Only the scalefish hook method interacts with the upper-slope, shark gillnets and shark hook methods were banned from use in depths below 183 m in 2007.
- Great Australian Bight Trawl (GABT) sector – located offshore from coastline between Cape Jervis in South Australia, westwards to Cape Leeuwin in Western Australia. Main gear types are demersal otter and midwater trawl (Wilson et al., 2009; AFMA, 2010).

The Endeavour Dogfish are most prominently recorded in catches from the CTS and by the automatic longline component of the GHAT sector (AFMA, 2010). Historically, there may have been some very limited take of the species in the ECDWT, but in 2008 there was no fishing effort in this sector. The sector has fewer than five vessels and only a small area of the sector is actually fished (Morison et al., 2009).

There may be some limited take of the Endeavour Dogfish in the Commonwealth-managed the Coral Sea Fishery (CSF) and the Western Deepwater Trawl Fishery (WDWTF). However, given the small number of operators and low, sporadic effort in these fisheries, the impact on this species is considered low (AFMA, 2010).

The Endeavour Dogfish is also likely to be caught within two NSW commercial fisheries, the Ocean Trap and Line and Ocean Trawl fisheries. Distinguishing between species of *Centrophorus* can be difficult, and therefore much of the fishery logbook data on *Centrophorus* catches are not recorded to species level. It is reasonable to assume that a proportion of the *Centrophorus* species caught by NSW managed fisheries includes the Endeavour Dogfish.

The Endeavour Dogfish are likely to be taken in the Southern Demersal Gillnet and Longline Fishery and the Northern Shark Fishery, which are jointly managed between the Commonwealth and the Western Australian state government (AFMA, 2010).

AFMA has developed a management strategy that outlines management steps aimed at halting decline and supporting recovery of upper-slope 'dogfish', including the Endeavour Dogfish, within Commonwealth-managed fisheries. There are currently management arrangements in place in state fisheries aimed at minimising interactions with gulper sharks, but at this stage there are no specific management strategies in place aimed at halting decline and supporting recovery.

## 7. Relevant Biology/Ecology

The maximum size recorded for the Endeavour Dogfish is 100 cm. The species is ovoviviparous (young are born live, however there is no placental connection between the mother and young) and is known to have a relatively low reproduction rate. Females produce two pups per pregnancy, and pups are born at approximately 33 cm in size (Last and Stevens, 2009). Reproduction is considered to be continuous and non-seasonal (Daley et al., 2002; Graham and Daley in-prep., 2010). A closely related *Centrophorus* species from Jamaica gives birth to a maximum of two pups every three years (McLaughlin and Morrissey, 2005). The Endeavour Dogfish is likely to have a similar fecundity rate, which is among the lowest for all sharks.

It is likely the Endeavour Dogfish reaches maturity at lengths close to its maximum size (Daley et al., 2002). The length of first sexual maturity for the Endeavour Dogfish varies between sexes, with maturity in males occurring at approximately 71 cm, and in females at approximately 88 cm in total length (Daley et al., 2002; Last and Stevens, 2009).

Specimens of the closely related Southern Dogfish (*Centrophorus zeehaani*) up to 81 cm in total length have been aged as being up to 46 years old (Fenton, 2001). The Endeavour Dogfish is likely to live to at least 46 years, but this is yet to be confirmed by scientific research (Daley et al., 2002). There are no published ageing studies of Endeavour Dogfish from Australian waters, but estimates of generation length can be based on the closely related Harrison's Dogfish, which are given at 20–40 years (Whitely, 2007). Overseas age estimates for another gulper shark species, *Centrophorus squamosus*, were as high as 70 years (Clarke et al., 2002).

The diet of the Endeavour Dogfish consists mainly of fish and invertebrates. Research investigating the stomach contents of captured specimens identified crustaceans, cephalopods (such as squid), lanternfish (Family Myctophidae) and other demersal fishes as their primary prey items (Daley et al., 2002).

The distances that the Endeavour Dogfish can travel are not known. A study using acoustic tags recorded a related species, the Greeneye Dogfish (*Squalus chloroculus*), travelling up to 480 km from where it was first captured (Daley et al., 2009b).

The Endeavour Dogfish is mainly demersal (bottom-dwelling) and is most commonly recorded in water depths between 200–650 m (Last and Stevens, 2009), but has been sporadically captured from a wider range of depths between 125–825 m (Daley et al., 2002).

## 8. Description of Threats

The main threat to the Endeavour Dogfish in Australian waters is historic and ongoing fishing pressure in both state and Commonwealth-managed commercial fisheries operating on the upper-slope (Wilson et al., 2009; AFMA, 2010).

Before the late 1960s, trawling activities in the SESSF (then known as the South East Fishery (SEF)) were generally confined to shelf waters shallower than 200 m depth (Tilzey and Rowling, 2001). At that stage, the SEF was confined to the New South Wales coastline between Crowdy Head (just north of Forster) in New South Wales to Gabo Island offshore of Victoria (Tilzey and Rowling, 2001). Trawling on the upper-slope began in 1968 (Graham et al., 2001). In the 1970s, the fishery expanded activity onto the upper-slope to depths of 600 m, and progressively expanded spatially into waters surrounding Tasmania and into western Bass Strait (Tilzey and Rowling, 2001).

The few records of dogfish catch prior to the 1990s are considered unreliable, as substantial quantities of dogfish, including *Centrophorus* species, are likely to have been discarded in preference for more marketable fish species (Graham et al., 2001). During the 1990s, the value of *Centrophorus* species products increased, and they were targeted by some operators in the SESSF for their livers. The liver oil of *Centrophorus* species have the highest squalene oil content (67–89%) of any dogfish, which is extracted for use in health products (Graham et al., 2001; Daley et al., 2002; AFMA, 2010). Catches were recorded under the

generic category of 'dogfish', which included *Centrophorus* and *Squalus* (Family Squalidae) species. The annual catch of 'dogfish' in the SESSF peaked at approximately 500 t in 1992 (AFMA, 2010). Catch rates declined markedly during the 1990s and targeting of these species ceased. Significant catches of *Centrophorus* species, likely to include the Endeavour Dogfish, have been taken in the two New South Wales fisheries; Ocean Trap and Line Fishery and Ocean Trawl Fishery. The annual NSW commercial catch of 'dogfish' (including *Centrophorus* and *Deania* species (Centrophoridae), *Squalus* species (Squalidae) and *Centroscymnus* species (Somniosidae)) peaked above 250 t in the 1992–93 season (Scandol et al., 2008).

More recently, gulper sharks are generally only taken as incidental byproduct in the SESSF, mainly by the CTS and the autoline sector of the GHAT (Daley et al., 2002; AFMA, 2010). The shark fishery of the GHAT is now largely restricted to waters shallower than 183 m (AFMA, 2010). A combined trip limit of 150 kg for gulper sharks (Endeavour Dogfish, Harrison's Dogfish and Southern Dogfish) has been implemented in the SESSF since the 2002–03 season (AFMA, 2010). In 2008, the total catch from the CTS and GHAT of these three species was 5 t (Morison et al., 2009). The most recent reported catch of *Centrophorus* species in the two NSW-managed fisheries was 4 t in the 2008–09 season (Source: NSW logbook data). In February 2010, the NSW government implemented a new combined trip limit of 65 kg for upper-slope dogfish, including the Endeavour Dogfish. As these catches are not identified to species level, they are likely to include species other than the Endeavour Dogfish.

The implementation of AFMA's *Upper-Slope Dogfish Management Strategy* in 2010 is expected to mitigate the ecological risk fishing activities pose to the viability of these species in Commonwealth-managed fisheries.

## 9. Public Consultation

There was no public nomination for this species. The Threatened Species Scientific Committee nominated the Endeavour Dogfish (*Centrophorus moluccensis*) for assessment on the basis that two other nominated species of gulper shark, Harrison's Dogfish (*C. harrissoni*) and Southern Dogfish (*C. zeehaani*), have been recorded in the past in fishery logbook data as the Endeavour Dogfish. The Committee sought public comment regarding the conservation status of this species for 30 days in October and November 2009. No comments were received.

## 10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **not eligible** for listing in any category under the EPBC Act at this time. The assessment against the criteria is as follows:

### **Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers**

The Endeavour Dogfish is widely distributed along the upper continental shelf along the eastern and western coasts of Australia. The primary threat for the species is fishing pressure, as the species' late maturity and extremely low reproductive rate render it unable to withstand even low levels of fishing mortality (Wilson et al., 2009).

Within the western part of the species' range in Australia, there is no information available on the abundance of the Endeavour Dogfish. However, this part of the species' range has not been subject to intense fishing pressure and the species has never been targeted in the west. Therefore, decline caused by fishing is unlikely to have led to significant declines in numbers in the western part of its range.

Within the southern half of the eastern part of its range, the Endeavour Dogfish was subject to intense fishing pressure in the 1990s, when all *Centrophorus* species in the SESSF were targeted for their livers. The species appears to have undergone a severe reduction in numbers during this period, as evidenced by fishery-independent data (Andrew et al., 1997; Graham et al., 2001; Wilson et al., 2009). The primary source of this data is from two surveys conducted aboard the NSW Government's Fisheries Research Vessel (FRV) *Kapala* (Graham et al., 2001).

The results from the FRV *Kapala* surveys show that the relative abundance of gulper sharks greatly declined on the southern NSW upper-slope between the late 1970s and the late 1990s. In 1976–77, a total of 246 tows yielded over 3000 kg of the Endeavour Dogfish from the three survey grounds. In contrast, only 24 kg were caught from 165 tows on the same grounds in 1996–97 (Graham et al., 1997, Wilson et al., 2009). The mean catch rate of the Endeavour Dogfish declined from 12.3 kg per trawl hour in 1976–77 to 0.2 kg per trawl hour in 1996–97 on the upper-slope (Graham et al., 2001; Wilson et al., 2009). This equates to a decline in relative abundance on these three trawl grounds of greater than 98%. There is some argument that the higher numbers of deepwater sharks caught in the 1976–77 surveys were because 15% of tows were conducted at night, while night tows were not replicated in the 1996–97 surveys (Graham et al., 2001). However, preliminary analysis has indicated that the difference between day and night catch rates is likely to be relatively minor (AFMA, 2010). The impact, if any, of lunar phases has not been assessed (AFMA, 2010).

An automatic longline survey was conducted in September and October 2009 to more accurately determine the distribution of gulper sharks offshore of eastern Australia. Surveys were conducted at 23 sites offshore of the east coast between the Qld–NSW border south to Freycinet Peninsula (Tasmania). Of these sites, 16 had previous records of Endeavour Dogfish. The six sites south of the Gippsland Closure (close to the NSW–Vic border) and the Taupo Seamount site had no prior evidence of the species, and the species was not recorded at these sites in the 2009 surveys, indicating that the NSW–Vic border may be the southern limit of the species' distribution.

Results of this 2009 survey were divided into sites with 'higher abundance' where catch rates were above 1% (1 shark per 100 hooks set), and sites with 'low abundance' where catch rates were below 1%.

Eleven sites were surveyed in waters north of Sydney. Endeavour Dogfish were recorded at all of these sites except at Taupo Seamount, and five of these sites recorded the species in higher abundance. Four sites were surveyed in waters south of Sydney to the Victorian border and Endeavour Dogfish were recorded at two of these sites in low abundance. There were no Endeavour Dogfish recorded in the eight sites surveyed south of the Victorian border (Daley et al., 2009a). However, the Committee notes that four of these sites off Tasmania are outside the known range of the species. These surveys indicate that the Endeavour Dogfish remains depleted in the south-eastern part of its range where historic fishing pressure was greatest, compared to areas where fishing pressure has been less.

While the declines of the Endeavour Dogfish in waters offshore of southern NSW were severe and the species does not appear to have recovered in this area since targeted fishing ceased in the late 1990s, this area only represents a small proportion of the species' entire Australian distribution. Given the fishing effort in the remainder of the species' Australian distribution has been low, the impact of fishing is not likely to have caused at least substantial declines across the entire range of the Endeavour Dogfish.

## **Conclusion**

The Committee accepts that there has been a decline in the abundance of the Endeavour Dogfish on upper-slope habitats offshore of southern New South Wales of over 90% within the last three generations of the species. However, this area only represents a small proportion of the species' distribution within Australian waters. Given that there were a number of higher abundance populations discovered in the 2009 survey in waters offshore of

northern NSW, and that fishing effort has been limited across the broader range of the species, the declines recorded offshore of southern NSW are not considered representative across the species' entire Australian distribution.

There are insufficient data available to judge whether the species has undergone, is suspected to have undergone or is likely to undergo a reduction in numbers across its entire Australian distribution that is at least substantial. Therefore, the Committee considers that the species has not been demonstrated to have met the required elements of Criterion 1 and it is **not eligible** for listing in any category under this criterion.

**Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited**

In Australian waters, Endeavour Dogfish are known to occur on upper-continental slopes in waters offshore from the Lakes Entrance in Victoria, to Ingham in Queensland, and from Albany to the Kimberley region in Western Australia (Last and Stevens, 2009). The range and habitat available to the Endeavour Dogfish is not considered to be precarious for the survival of the species, nor is it limited.

The Committee does not consider that the species' geographic distribution is both precarious for the survival of the species, and very restricted, restricted or limited. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 2, it is **not eligible** for listing in any category under this criterion.

**Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either**  
**(a) evidence suggests that the number will continue to decline at a particular rate; or**  
**(b) the number is likely to continue to decline and its geographic distribution is precarious for its survival**

There are insufficient data available to estimate whether the total number of mature individuals of the Endeavour Dogfish is very low, low, limited, or not limited. As the Endeavour Dogfish is not currently a target species in any fishery, there are no current fishery stock assessments for the species. Therefore, as the species has not been demonstrated to have met this required element of Criterion 3, it is **not eligible** for listing in any category under this criterion.

**Criterion 4: The estimated total number of mature individuals is extremely low, very low or low**

There are insufficient data available to estimate whether or not the total number of mature individuals is extremely low, very low, or low. As the Endeavour Dogfish is not currently a target species in any fishery, there are no current fishery stock assessments for the species. Therefore, as the species has not been demonstrated to have met this required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

**Criterion 5: Probability of extinction in the wild that is at least**

**(a) 50% in the immediate future; or**

**(b) 20% in the near future; or**

**(c) 10% in the medium-term future**

There are insufficient data available to estimate a probability of extinction of the Endeavour Dogfish in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

## **11. CONCLUSION**

### **Conservation Status**

*Centrophorus moluccensis* (Endeavour Dogfish) was nominated for inclusion in the list of threatened species referred to in section 178 of the EPBC Act.

The Committee accepts that there has been a suspected decline of over 90% in populations of the Endeavour Dogfish offshore of the coast of southern NSW. However, this represents only a small proportion of the species' distribution within Australian waters. There are insufficient data to estimate the abundance of the species throughout the rest of its Australian distribution. Given that fishing pressure is considered the main threat to this species and fishing effort has been limited in many parts of its Australian range, the Committee considers the species is **not eligible** for listing in any category.

## **12. Recommendations**

- (i) The Committee recommends that ***Centrophorus moluccensis*** is **not eligible** for inclusion in the list referred to in section 178 of the EPBC Act.

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Chair

Threatened Species Scientific Committee

### 13. References cited in the advice

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