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

Epinephelus daemelii

The species is commonly known as black cod or black rock-cod in Australia. It is in the Family Serranidae and the Subfamily Epinephelinae.

2. Reason for Conservation Assessment by the Committee

This species is a Committee nomination. The Committee provides the following assessment of the species' eligibility for inclusion in the EPBC Act list of threatened species.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met the relevant elements of Criterion 1 to make it eligible for listing as **vulnerable**.

The Committee judges that the species has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **vulnerable**.

4. Taxonomy

The species is conventionally accepted as *Epinephelus daemelii* (Günther, 1876).

5. Description

The black cod is a large groper species with colouration that varies from a dark grey-black colour to a more usual blotched or banded black and white pattern (Kuiter, 1993). Individuals can change from the extreme of one colour to the other in just a few seconds, depending on their 'mood' and the colour of the background (Ayling and Cox, 1982).

Young black cod often have a number of distinct black markings that tend to fade as the fish grows. The markings include a distinct black spot or 'saddle' just forward of the tail, and five diagonal sloping dark grey to black bars which generally fade towards the belly (NSW I&I, 2009).

The species is similar in size and appearance to other large groper or 'cod' species such as *Epinephelus coioides* (estuary cod), *Epinephelus lanceolatus* (Queensland groper) and *Epinephelus malabaricus* (Malabar groper) and may sometimes be confused with these species. It may also be confused with *Epinephelus ergastularius* (bar rock-cod), which occurs in much of the black cod's range, albeit in much deeper water.

6. National Context

The black cod was protected under New South Wales (NSW) fisheries legislation in 1983. It is now listed as vulnerable under the NSW *Fisheries Management Act 1994*. The species is not listed under Queensland or Victorian legislation, as these states' waters represent the extremities of the species' Australian range and it is rarely recorded from them.

Black cod are currently not listed under the EPBC Act. However, targeted commercial fishing of black cod is prohibited in Commonwealth waters under section 15 of the Commonwealth *Fisheries Management Act 1991*, which states '*a person must not (otherwise than in accordance with the terms of a scientific permit) in the Australian Fishing Zone, take black cod.*'

Similarly, recreational fishers are not permitted to take black cod from Elizabeth and Middleton Reefs, which comprise a Marine National Nature Reserve. Within this reserve, Middleton Reef is a Sanctuary Zone permanently closed to all fishing. Elizabeth Reef is a Habitat Protection Zone where limited recreational line fishing is currently permitted. However, a permit must be obtained from the Australian Government Department of Sustainability, Environment, Water, Population and Communities before any fishing activity is undertaken, and a ban on targeting or taking black cod applies. Site-specific limits on other fish species also apply. There is concern about the impacts of incidental capture of black cod during legal fishing of the Elizabeth and Middleton Reefs Marine National Nature Reserve (van Herwerden et al., 2009), as well as illegal fishing (Oxley et al., 2004). van Herwerden et al. (2009) recommend the closure of both reefs to recreational fishing to fully protect this important black cod population.

Black cod frequently utilise the same near-shore rocky reef habitats as *Carcharias taurus* (grey nurse shark (eastern Australian population)), which is listed as critically endangered under the EPBC Act.

Black cod are also listed as near-threatened on the IUCN Red List (Shuk Man and Ng Wai, 2006).

7. Relevant Biology/Ecology

In Australia, the distribution of black cod ranges from southern Queensland through NSW to northern Victoria. However, records from Queensland and Victoria are rare, and the single specimen recorded from South Australian waters is considered a vagrant. The NSW coastline forms the species' main range, both in Australia and internationally. Black cod are notable for being the most southerly distributed of the large *Epinephelus* groper/cod species in Australia and represent a unique large predator of inshore marine waters of NSW (Pogonoski et al., 2002; Harasti et al., 2004; NSW I&I, 2009). Black cod are known to occur to some degree in all six NSW Marine Parks – Lord Howe, Cape Byron, Solitary Island, Port Stephens, Jervis Bay and Batemans Bay.

In Commonwealth waters, small populations of black cod are found off both Lord Howe and Norfolk Islands. A relatively abundant population of black cod is found within the Elizabeth and Middleton Reefs Marine National Nature Reserve in the northern Tasman Sea, approximately 600 km due east of the NSW/Queensland border. This National Nature Reserve contains two coral reefs, Elizabeth and Middleton Reefs, which are approximately 61 km apart. The black cod population found on these two reefs offer important insights into the population structures and densities the species may have once had along the NSW coastline. Preliminary research based on small sample sizes suggests the Elizabeth and Middleton Reef black cod population may be of the same genetic stock as NSW populations, which in turn suggests that larval drift may be sufficient to prevent genetic differentiation in black cod populations along and off the NSW coastline (Appleyard and Ward, 2007; van Herwerden et al., 2009).

The black cod's entire range includes warm temperate and subtropical waters of the south-western Pacific, including south-eastern Australia and the North Island, Kermadec Islands and Poor Knights Islands of New Zealand. No breeding or recruitment appears to occur in New Zealand waters, and individuals occurring there are considered to be vagrants (Pogonoski et al., 2002).

Black cod generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m, but are occasionally recorded from deeper waters. In coastal waters adult black cod are found in rock caves, rock gutters and on rock reefs. Black cod are an aggressive, territorial species and individuals may occupy one particular cave for most of their adult lives. Recently settled juvenile black cod (i.e. individuals that have recently completed the pelagic larval stage) are often found in coastal rock pools while slightly older juvenile black cod are often found in estuary systems (Hutchins and Swainston, 1986; Pogonoski et al., 2002; Harasti et al., 2004). The use of estuaries may be an important part of the ecology of juvenile black cod in NSW waters (NSW I&I, 2009; Malcolm and Harasti, 2010), although it is noteworthy that the Elizabeth and Middleton Reef populations have no access to estuarine habitats. Larger juvenile black cod appear to move into adult habitats, but hide in rock structures and remain highly cryptic until at least 40 cm in length (Choat et al., 2006; Malcolm and Harasti, 2010). There is a general progression to deeper waters as black cod increase in size (Malcolm and Harasti, 2010).

Black cod are a large, opportunistic carnivore that preys on smaller fishes and crustaceans (McCulloch, 1922; Pogonoski et al., 2002).

Black cod have been reliably recorded up to 200 cm in length and at least 68 kg in weight, although the majority of larger individuals sighted in recent years are 40–80 cm in length (Pogonoski et al., 2002; Harasti et al., 2004). Similarly, the NSW Marine Park Authority (2009) reported an average size of 70 cm for black cod sighted during surveys of the Port Stephens-Great Lakes Marine Park and Malcolm and Harasti (2010) report a majority of individuals in the 50–100 cm length range and a peak length[*] of 60–70 cm for black cod sighted during surveys at Tweed Heads and South West Rocks. However Choat et al. (2006) reported little evidence of a peak length in visual surveys of the isolated and relatively unimpacted Elizabeth and Middleton Reef populations of black cod, with uniform representation of individuals between 80 and 140 cm total length. The length peak observed in black cod populations along the NSW coastline, but largely absent in the isolated and relatively unimpacted Elizabeth and Middleton Reefs black cod population, likely reflects the loss of most large black cod specimens along the NSW coastline due to heavy spearfishing pressure in the 1960s and 1970s.

Limited ageing work utilising otoliths[†] has been done on black cod. The related Queensland groper has been aged up to 37 years (NSW I&I, 2008) and the related *Epinephelus fuscoguttatus* (flowery cod) has been aged to 40 years (Pears et al., 2006). However available aging data suggest that black cod grow more slowly than their congeners due to their cooler, more southerly distribution and thus display greater ages at sexual maturity and greater longevity. This is supported by the fact that one large black cod (approximately 70 kg) caught at Norfolk Island was estimated to be approximately 58 years of age, based on otoliths (Clifton, 2001, cited in Harasti et al., 2004). Malcolm and Harasti (2010) report unpublished ageing work by Francis on nine black cod specimens from the Kermadec Islands, with the oldest specimen being a 119 cm male estimated at 50 years of age, and the largest specimen being a 122 cm male estimated to be 41 years of age. Malcolm and Harasti (2010) make the point that if the length-age relationship determined from Kermadec Islands specimens are consistent for eastern Australian specimens, with a 120 cm fish being 40 to 50 years old, then at least eight individuals sighted in their black cod visual census between Tweed Heads and South West Rock were over 50 years old.

Black cod are a protogynous hermaphrodite, with individuals starting as females and changing to males at a very advanced age and size (Heemstra and Randall, 1993; Francis, 2001, Pogonoski et al., 2002). Pears et al. (2006) inferred that the related, protogynous flowery cod does not reach female sexual maturity until 9–10 years of age. As black cod likely grow more slowly due to their cooler, more southerly distribution, it is likely that female

[*] i.e. modal length
[†] 'ear bones' of bony fish

sexual maturity in black cod is reached at an even greater age. Male sexual maturity in black cod is reached at a reported 100–110 cm in length (Francis, 2001), based on Francis' nine Kermadec Island specimens, and Francis found age at transition to male sexual maturity to be approximately 29 years (Francis, unpublished data, 2011). Based on this evidence, an age estimate of 29 years is assumed for male sexual maturity in black cod. This age estimate is also supported by Allsop and West (2003), who reviewed published life history parameters of 52 hermaphroditic fish species including four *Epinephelus* species. Despite a 60 fold and 25 fold difference respectively in maximum size and age at sex change across the species reviewed, Allsop and West found protogynous fish species consistently reach male sexual maturity at 2.5 times age at first (female) sexual maturity. For the purpose of this advice, generation length for black cod (i.e. average age of spawning males) is therefore calculated as maximum reliably recorded age (50) plus estimated age at male sexual maturity (29) divided by two. This yields a conservative estimated generation length of 39.5 years. This estimate of generation length therefore suggests recovery of the species will take many decades.

Black cod have been known to form small spawning aggregations. Before the species' decline these spawning aggregations may have been sizeable (Pogonoski et al., 2002; DEH, unpublished expert comment, 2004; Harasti et al., 2004). *Epinephelus* species lay pelagic eggs in a number of spawning bouts. *Epinephelus* species have a pelagic larval stage of up to 40 days (Richardson and Gold, 1997), during which time larvae can drift long distances in ocean currents. This is consistent with the suggested lack of broad scale genetic structuring in black cod (Appleyard and Ward, 2007; van Herwerden et al., 2009).

8. Description of Threats

Historical Threats

Due to the black cod's inshore distribution, they were frequently encountered by recreational and commercial line fishers around Sydney during the city's early development. Black cod were a staple species in the Sydney fish markets in the 1800s and early 1900s and became a very popular food fish, as attested in numerous newspaper articles (NLA, 2011):

> 'Except when tempestuous weather prevails along the coast, and puts a stop to deep-sea fishing, and also from the drawback on the beaches caused thereby interferes with seine [net] fishing in the harbour, there are to be seen in the Sydney market each morning the following kinds of fish among others, viz., schnapper, bream, and whiting, of more than one species, teraglin, red rock-cod, and, at times, black rock-cod (than which there is no finer sea fish in the world), mullet, flounders, sergeant-baker, nannygai, flathead, John Dory, garfish, the red mullet of the Mediterranean and the silver jewfish.'
>
> Letter to the Editor — 'Our Fish Supply'. *The Sydney Morning Herald*, Saturday 18 January 1879.
>
> 'The black rock-cod, considered one of the best of Australian fish, is also a deep-water fish, never captured by the net. It is found more abundantly in the northern waters of the colony, where, as a rule, it attains larger proportion than to the south of Sydney. It grows to a great size, specimens from 35 to 40 lbs. being not uncommon'.
>
> 'Australian Edible Fishes'. *Morning Bulletin*, Rockhampton, Tuesday 29 October 1895.

> ‘Some fine specimens of black rock-cod were brought into Sydney markets last week, and found ready purchasers. A few years ago large fish of this species almost went begging… Then a couple of the best buyers in Sydney found that the fish had high quality as food and that whenever they placed it in their bills-of-fare it was eagerly sought by connoisseurs. Now black rock-cod are amongst the fish first sold when they appear in the markets, and the price is rarely under 6d per pound wholesale. For a carnivorous fish the flesh of the black rock-cod is surprisingly good. It easily ranks with those of the schnapper, black bream, whiting, gar and flathead.’
>
> ‘ANGLING — TRAWLING EXPERIMENTS’. *The Sydney Morning Herald*, Wednesday 16 August 1911.

Strong localised declines in black cod stocks around Sydney due to fishing pressure were first noted in the early 1900s. In 1916 Australian fisheries scientist TC Roughley stated the species was ‘*at one time … fairly plentiful in the vicinity of Port Jackson, but has become very scarce in recent years, owing to the havoc wrought by fishermen, and the increased shipping*’ (Roughley, 1916). However, black cod were a standard listing in Sydney fish market price reports in the Sydney Morning Herald in 1922, 1923 and also 1930, suggesting that while the impacts of localised overfishing were accumulating, reasonable numbers of black cod were still found in less fished areas and supplied to markets (NLA, 2011), e.g.:

> ‘Supplies of fish at the municipal market yesterday were light, coming from Port Stephens and from north and south by rail. Demand for good fish was keen, though, with the exception of schnapper and sole, prices were slightly lower than on Monday. The rise in schnapper amounted to /8 per lb, and that in sole to 1/ per dozen.
>
> **Black cod**, /5 to /6; teraglin, /6 to /8; schnapper, 1/ to 1/3; jewfish, /5 to /9; kingfish, /3 to /4; raw prawns, /6 to /10 per lb. Whiting, 30/ to 60/; tarwhine, 20/ to 25/; bream, 30/ to 45/; flathead, 30/ to 42/6; garfish, 20/ to 30/; mullet, 10/ to 15/; blackfish, 10/ to 14/; tailer, 10/ to 20/; trevally, 12/ to 15/; mixed fish, 20/ to 30/; leatherjacket, 10/ to 12/ per basket; flounder, 3/ to 7/; crabs, blue swimming 2/ to 4/6, mangrove 6/ to 14/; lobster, 20/ to 30/; sole, 4/ to 7/ per dozen; oysters, 45/ to 80/ per bag. State trawler fish, flathead 25/; leatherjacket, 10/ per lb.’
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> ‘FISH MARKETS. MUNICIPAL.’ *The Sydney Morning Herald*, Wednesday 6 December 1922.

Similarly, in 1922 Australian ichthyologist AR McCulloch stated black cod were ‘*a valuable food fish*’ (McCulloch, 1922).

In the late 1950s and even more so in the 1960s and 1970s, black cod populations experienced a substantial decline due to the rise in popularity of recreational spearfishing (Du Cros, 1960; Andrewartha and Kemp, 1968; Lincoln-Smith et al., 1989; Pogonoski et al., 2002; AUF, 2011; FathomOz, 2011). The species was caught in large quantities, with Lincoln-Smith et al. (1989) reporting 137 individuals averaging 2.4 kg each were speared in 1976 in NSW spearfishing competitions. Similarly, for the same year there is a spearfishing record of 81.6 kg of black cod speared by one spearfisherman in one day at one location (AUF, 2011). These decades of sustained spearfishing led to the fragmentation and relative rarity of black cod populations along the NSW coastline as seen today. Sustained recreational line fishing pressure contributed secondarily to the black cod’s decline during this timeframe. Spearfishing pressure leading to severe declines and near-collapses respectively of populations of vulnerable large temperate reef species is reported for southern Australia (Nevill, 2006), the Mediterranean (Lloret et al., 2008) and the west coast of South America (Godoy et al., 2010). Fishing for or take of black cod became illegal in 1983 in all NSW waters under NSW Fisheries legislation (Pogonoski et al., 2002; Harasti et al., 2004; NSW I&I, 2009).

While substantial historic declines are evident for the black cod, it is unknown whether the species is still in decline in Australian waters. It is likely that the species’ decline has largely

halted in NSW since the prohibition of targeted fishing for the species in 1983. However, further localised depletions of black cod populations at South West Rocks and in waters around Sydney over the last 20 years have been reported by recreational divers (DEH, unpublished expert comment, 2004). As large fish (100 cm+) were preferentially targeted by spearfishers, sex ratios of remnant populations may also have become skewed towards females to some degree, possibly resulting in impaired breeding (e.g. Coleman et al., 1996).

The species remains absent from many of the locations along the NSW coastline where it was once abundant (Pogonoski et al., 2002; Harasti et al., 2004; NSW I&I, 2009; NSW MPA, 2009; Cardno Ecology Lab, 2010, cited in Malcolm and Harasti, 2010; Malcolm and Harasti, 2010).

Current Threats

Current threats to the black cod are by-catch by recreational and commercial fishers and illegal fishing activities.

By-catch of black cod by recreational (line) fishers is known to occur. There are concerns that not all black cod that are incidentally captured are recognised and released. New fishing technologies in the form of very thin, strong gelspun polyethylene lines, soft plastic lures and Global Positioning Systems (GPS) have also increased the effectiveness of recreational fishing, particularly in deeper waters, and may increase the risk of recreational by-catch of the species.

By-catch of black cod by commercial fishers is also known to occur. Commercial fishing by-catch is thought to be limited, however the NSW Ocean Trap and Line Fishery has been assessed as posing a moderately-high risk to the species (NSW I&I, 2009). Commercial fishers are not allowed to retain black cod in either state or Commonwealth waters.

There is evidence that black cod caught in deeper water (50–100 m) by commercial or recreational fishers do not survive after being released at the surface, as they suffer severely from ‘barotrauma’ or swim-bladder decompression. The swim-bladder regulates buoyancy and this organ is damaged by the rapid pressure change caused by the fast ascent to the surface following capture (Pogonoski et al., 2002; NSW I&I, 2009).

Instances of illegal take of black cod by recreational spear and line fishers along the NSW coastline are occasionally reported (e.g. Narooma News, 2010; Macleay Argus, 2011). Other forms of illegal fishing also remain a concern. NSW Fisheries’ 2003 draft recovery plan for black cod reports anecdotal evidence of large catches of black cod in the early 1980s from Elizabeth and Middleton Reefs, and reports that a commercial fishing boat crew was found guilty of taking 24 black cod from Elizabeth and Middleton Reefs over a four-day period in 1993 (NSW Fisheries, 2003, cited in Oxley et al., 2004).

Modification of estuarine habitats is considered a potential threat to juvenile black cod.

9. Public Consultation

The information used in this assessment was made available for public exhibition and comment for 30 business days from late October to early December. 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 **eligible** for listing as **vulnerable** under the EPBC Act. 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

Historical evidence over the period of the 1880s to the 1920s, particularly weekly fish market price reports in newspapers, show that black cod were abundant and a standard catch along the NSW coastline. Historical evidence including newspaper accounts as well as books, photos and club records pertaining to spearfishing, document the heavy take of spearfishing on black cod stocks in the 1960s and 1970s along the NSW coastline (Du Cros, 1960; Andrewartha and Kemp, 1968; Lincoln-Smith et al., 1989; Pogonoski et al., 2002; AUF, 2011; FathomOz, 2011). Recent surveys indicate the species now has a patchy distribution and is rare or absent from much of its former range along the NSW coastline, and has made little discernible recovery (FSC, 1999; Pogonoski et al., 2002; Harasti et al., 2004; NSW I&I, 2009; NSW MPA, 2009; Cardno Ecology Lab, 2010, cited in Malcolm and Harasti, 2010; Malcolm and Harasti, 2010).

On the basis of this diverse historical evidence, the Committee infers that black cod underwent a substantial reduction in numbers during the 1960s and 1970s due to heavy spearfishing pressure. The entirety of the spear-fishing driven decline of the species has occurred within the relevant assessment timeframe of 100 years, with generation length being estimated at 39.5 years. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 and is **eligible** for listing as **vulnerable**.

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

The main range of the black cod encompasses the heavily-settled and heavily fished NSW coastline. Further, the black cod is largely an inshore species, inhabiting rocky shorelines and estuaries as juveniles and rock reefs up to 50 metres in depth as adults. Such an inshore distribution means frequent encounters between individual black cod and fishers (spear, recreational line and commercial) are unavoidable. The distribution of the black cod along the NSW coastline is now severely fragmented, with the species absent from many areas of its former range (FSC, 1999; Pogonoski et al., 2002; Harasti et al., 2004; NSW I&I, 2009; NSW MPA, 2009; Cardno Ecology Lab, 2010, cited in Malcolm and Harasti, 2010; Malcolm and Harasti, 2010). Consequently, the Committee judges the black cod's distribution to be precarious.

An estimate of area of occupancy is not possible for black cod due to a lack of comprehensive spatial data on rock reef habitat along the eastern Australian coastline. Consequently only an estimate of extent of occurrence can be compiled. The extent of occurrence is based on the eastern Australian coastline, encompassing the 0–50 metre depth band and extending from significant rocky headlands in the vicinity of the species' historical range boundaries (Gabo Island in Victoria to Double Island Point in Queensland) and amounts to approximately 14,100 km^2. The extent of occurrence for island habitats, based on the 0–50 metre depth band around each of Elizabeth and Middleton Reefs, Lord Howe Island, Ball's Pyramid and Norfolk Island, amounts to an additional 820 km^2. The extent of occurrence for this coastline together with the disparate islands and reefs, but excluding connecting expanses of ocean which represent unsuitable post-larval habitat, amounts to approximately 14,900 km^2 (DSEWPAC, 2011), which is below the relevant threshold of 20,000 km^2.

The Committee judges that the black cod's geographic distribution is severely fragmented and precarious for its survival. The Committee judges that the species' extent of occurrence is limited. The species has therefore been demonstrated to have met the relevant elements of Criterion 2, and is **eligible** for listing as **vulnerable**.

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

Black cod are known to be rare or absent from most parts of their former range along the NSW coastline. Surveys of areas where remnant black cod populations are known to occur indicate numbers are limited. For instance, a visual census undertaken by two divers conducting 45 minute swims at 34 different sites in the Port Stephens–Great Lakes Marine Park sighted only 24 black cod at nine sites. At only two sites were five or more black cod sighted (NSW MPA, 2009). A visual census using the same methodology at 20 sites between Tweed Heads and South West Rocks sighted 75 black cod at 15 sites, but at only six sites were five or more black cod sighted (Malcolm and Harasti, 2010). At Elizabeth and Middleton Reefs, representing two sites with relatively unimpacted populations, formal surveys using similar methodology recorded 65 black cod (Choat et al., 2006). On this basis, the Committee considers that the total number of mature black cod are likely to be limited to a particular degree. However, there are no estimates for total numbers of mature black cod in NSW. There is also little evidence to suggest that black cod numbers are still in broad decline. Therefore, the species has not been demonstrated to have met all of the relevant elements of Criterion 3, and 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

No estimates are available for the total number of mature black cod in NSW. Nevertheless, considering the large potential extent of occurrence for the species, the known population estimates for specific remnant populations (NSW MPA, 2009; Malcolm and Harasti, 2010) and the Elizabeth and Middleton Reef populations, the number of mature individuals is certain to be greater than 1000. Therefore the Committee does not consider that the total number of mature individuals of the species is extremely low, very low or low. Therefore, as the species has not been demonstrated to have met 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 no data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the relevant elements of Criterion 5, it is **not eligible** for listing in any category under this Criterion.

11. Conclusion

Conservation Status

Epinephelus daemelii (black cod) was nominated by the Committee for inclusion in the list of threatened species referred to in section 178 of the EPBC Act. The Committee provides the following assessment of the species' eligibility.

On the basis of historical evidence, the Committee infers that black cod underwent a substantial reduction in numbers during the 1960s and 1970s due to heavy spearfishing pressure. This decline was within the relevant assessment timeframe of 100 years. Recent surveys indicate the species now has a patchy distribution and is rare or absent from much

of its former range along the NSW coastline, and has made little discernible recovery. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 and is **eligible** for listing as **vulnerable**.

The Committee accepts that the black cod's geographic distribution along inshore areas of the NSW coastline is precarious for the species' survival. The Committee further judges that the species' estimated extent of occurrence of 14,900 km^2 is limited. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 and is **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **vulnerable**.

Recovery Plan

There should not be a recovery plan for black cod as the approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats. In addition, the species' main range is the NSW coastline, and the NSW Department of Primary Industries are in the process of finalising a state recovery plan for the species.

12. Recommendations

(i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the **vulnerable** category:

Epinephelus daemelii

(ii) The Committee notes that a recovery plan is in preparation for most of the species' range and agrees that no additional recovery plan is required.

Threatened Species Scientific Committee
29 August 2011

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