

# Consultation Document on Listing Eligibility and Conservation Actions

## *Nannoperca australis* (Southern Pygmy Perch)

You are invited to provide your views and supporting reasons related to:

- 1) the likely non-eligibility of *Nannoperca australis* (Southern Pygmy Perch) for inclusion on the EPBC Act threatened species list; and
- 2) the necessary conservation actions for the above species.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing either by email to:  
[species.consultation@environment.gov.au](mailto:species.consultation@environment.gov.au)

or by mail to:

The Director  
Marine and Freshwater Species Conservation Section  
Biodiversity Conservation Division  
Department of the Environment and Energy  
PO Box 787  
Canberra ACT 2601

**Responses are required to be submitted by Friday 2 August 2019.**

Contents of this information package	Page
General background information about listing threatened species	2
Information about this consultation process	3
Draft information about the common name and its eligibility for listing	4
Conservation actions for the species	14
Collective list of questions – your views	17
References cited	21

## General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/index.html>.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at:

<http://www.environment.gov.au/biodiversity/threatened/pubs/guidelines-species.pdf>.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at:

<http://www.environment.gov.au/biodiversity/threatened/nominations.html>.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at:

<http://www.environment.gov.au/biodiversity/threatened/recovery.html>.

## Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the *Privacy Act 1988* (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the '[common assessment method](#)'. As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: <http://environment.gov.au/privacy-policy>.

### **Information about this consultation process**

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

# *Nannoperca australis*

## Southern Pygmy Perch

### Taxonomy

Species remains accepted as *Nannoperca australis* Günther 1861.

Three subspecies, *Nannoperca australis australis* Günther 1861, *Nannoperca a. tasmaniae* (Johnston 1883) and *Nannoperca a. flindersi* Scott 1971 were previously recognised (Llewellyn 1974; Cadwallader & Backhouse 1983; Unmack et al., 2013). However, the subspecific designations were poorly characterised and are not commonly used (Unmack et al., 2013).

Genetic analysis since has suggested the presence of two species, one occurring in the coastal drainages in Tasmania, King Island, western Victoria, South Australia and the Murray-Darling Basin and the second species occurring in coastal drainages in eastern Victoria, Flinders Island and in one river catchment, the Ansons River, in northeast Tasmania (Unmack et al., 2013). The analysis also identified that there are two evolutionarily significant units within the western species; one within the Murray Darling Basin and one in the coastal drainages, and two within the eastern species; one in eastern Victoria coastal drainages and one in the Ansons River (Unmack et al., 2013).

Given that the suggested taxonomic split has not yet been resolved, the assessment of conservation status below considers the species *Nannoperca australis* across its current, entire national extent.

### **Species/Sub-species Information**

#### **Description**

The Southern Pygmy Perch is a small, laterally compressed fish which grows to a maximum size of 85 mm (Kuitert et al., 1996; Allen et al., 2002; Lintermans 2007). Southern Pygmy Perch differ from the closely related *Nannoperca obscura* (Yarra Pygmy Perch) by having a smooth, non-serrated lower edge of the preorbital bone (Lintermans 2007). Southern Pygmy Perch range in colour from cream to gold-orange to greenish-brown mottling on its back and sides, to a silver white belly (Allen et al., 2002; Lintermans 2007). Fins are generally clear to dusky, but for males turn bright red to black in the breeding season (Allen et al., 2002; Lintermans 2007).

#### **Distribution**

The natural distribution of Southern Pygmy Perch extends across three major regions in south-eastern Australia, including:

1. The southern Murray-Darling Basin, from the lowland to the upland zones (0–580 m a.s.l.) of New South Wales and Victorian catchments (Cadwallader 1979; ALA 2018). In New South Wales the species was once found within the Lachlan, Murrumbidgee and Murray river catchments (ALA 2018). In New South Wales, remnant populations remain in a tributary of the Lachlan River, and two tributaries of the Murray River (Gilligan et al., 2010; Gould & Pearce 2012; Pearce 2015a). In Victoria, the species was once and can still be found in low numbers within the Mitta Mitta, Kiewa, Ovens, Goulburn-Broken, Campaspe, Loddon and Wimmera river catchments (Lintermans 2007; Davies et al., 2008; 2012). The species is also still present in the tributaries draining into the lower Murray River in the Mount Lofty ranges in South Australia and the Lower Lakes (Lintermans 2007).

2. Coastal river catchments in South Australia and Victoria, from Inman River (slightly west of the Murray River mouth) east to the Genoa River (eastern Victoria) (Unmack et al., 2013; ALA 2018).
3. Coastal river catchments in northern Tasmania, from Doctor's Creek in the northwest corner, east to Ansons River in the northeast corner (Unmack et al., 2013; ALA 2018). The species has been recorded up to about 300 m a.s.l. in the Macquarie River catchment in Tasmania (ALA 2018).

Southern Pygmy Perch prefer habitats in low-gradient waterways and floodplains with slow-flowing or still water and aquatic macrophyte cover or wood at shallow depths, which may have little or no flow in summer (Cadwallader 1979; Humphries 1995; Woodward & Malone 2002; Unmack et al., 2011; 2013; Price et al., 2016). The species has a limited tolerance of salinity and prefers waters with salinity less than 3.3 ppt (Chessman & Williams 1974), however it can tolerate a broad range of temperatures and extremely low dissolved oxygen levels (McNeil & Closs 2007).

Observations made by J.O. Langtry in his 1949 and 1950 surveys noted that Southern Pygmy Perch "...appear to abound throughout the whole Murray system" (Cadwallader 1977). J.O. Langtry noted in his 1949-50 observations that "pigmy perch (*Southern Pygmy Perch*) are known to exist in the creeks in the Narrandera area" in reference to its presence in the Murrumbidgee River catchment (Cadwallader 1977). The species is still considered locally extinct in the Murrumbidgee River catchment (Wassens et al., 2017), after reports from over a decade ago that this was the case (Gilligan 2005a).

Declines in Southern Pygmy Perch abundance in the lower Murray River in South Australia were being reported as early as the mid-1980s where the species was thought to have disappeared from the main river channel itself (Lloyd & Walker 1986). Records of the species were reported, in sampling occurring over 1982–1984, for two streams flowing into Lake Alexandra at the Murray River's mouth (Lloyd & Walker 1986). Declines in Victorian tributaries of the Murray River were reported by the early-1990s (Unmack 1992).

### **Cultural Significance**

The Southern Pygmy Perch was known as Collundera by the Jari Jari, who lived along the lower Murray River in Victoria (Trueman 2011).

### **Relevant Biology/Ecology**

In the Macquarie River (Tasmania), observations of Southern Pygmy Perch spawning during a 2.5 month period from October to December were made when water temperatures were between 15–18°C, although juveniles were still observed recruiting into populations as late as May (Humphries 1995). In the Murray-Darling Basin, spawning seems to occur at slightly higher temperatures, above 19°C, and may occur earlier in September (Llewellyn 1974), however spawning occurs in the Barmah-Millewa Forest wetland on the Murray River in October (Tonkin et al., 2008).

Spawning likely occurs in macrophyte beds, as running-ripe and spent fish have been found in this habitat (Humphries 1995). Males display courtship behaviour involving rapid vibrations of the body, with fins erect, and nudging and swimming rapidly around the female (Cadwallader & Backhouse 1983). Floodplains appear likely to be utilised by various Pygmy Perch species as nursery grounds (Woodward & Malone 2002).

Eggs are demersal, transparent, spherical and essentially non-adhesive (Llewellyn 1974). Observations on the number of eggs produced by females can range from 78 in a 37 mm fish to 4217 in a 57 mm fish (Llewellyn 1974; Humphries 1995), and like other small fish species, it appears capacity for egg production increases with size with oldest age classes having the highest reproductive output (Todd et al., 2017). Observations on the species also suggest that individuals inhabiting increasingly harsh environments produce more, but smaller, eggs than those in more stable environment (Morrongiello et al., 2012).

Eggs take between 66–79 hours (~3 days) to hatch, with the larvae about 3–4mm long (Llewellyn 1974). Observations on Southern Pygmy Perch in the Macquarie River found that both sexes mature and breed in the first year of life (Humphries 1995), contrary to earlier findings on Murray-Darling Basin individuals that indicated they probably matured in their second year (Llewellyn 1974). There are suggestions that individuals can live to at least five years of age, but populations of the species are dominated by individuals aged between one and three years old (Kuiter et al., 1996; Lintermans 2007), and a study of large sample of otoliths from Southern Pygmy Perch in Tasmania only detected individuals to 3+ years (Humphries 1995). Therefore, using three years as the maximum age, the generation length for Southern Pygmy Perch is estimated to be ~2.5 years.

Southern Pygmy Perch are insectivorous and planktivorous, with diet consisting of crustaceans, such as amphipods and ostracods, that are benthic and/or associated with aquatic plants (Humphries 1995). The species also likely feeds on other crustaceans such as cladocerans and copepods, insects such as larval chironomids and mayflies, and adult hemipterans and other terrestrial insects which fall in water (Kuiter et al., 1996).

A genetic study of the species in the has indicated that populations occurring in different creek tributaries of the Goulburn River system in Victoria are isolated from one another, however there is some level of connectivity within streams (Cook et al., 2007). The study proposed that its findings could translate in other lowland streams further across the species range (Cook et al., 2007).

## **Threats**

Suspected primary threats to the species include the removal of riparian and aquatic vegetation (Lloyd & Walker 1986; Belsky et al., 1999) that the species is known to rely upon (Humphries 1995; Woodward & Malone 2002; Unmack et al., 2011; 2013); the loss of connectivity between rivers and floodplains (Lyon et al., 2010; Saddler et al., 2013); and sedimentation of water bodies (Bond & Lake 2005). The introduced fish species, Trout and Redfin, are known predators of Southern Pygmy Perch (Humphries 1995; Woodward & Malone 2002), and eastern gambusia is thought to be a likely predator of eggs and juveniles (Woodward & Malone 2002). Carp destroy submerged macrophytes (Roberts et al., 1995; Roberts & Sainty 1996; Vilizzi et al., 2014), so are likely indirectly impacting upon Southern Pygmy Perch given the species' reliance on aquatic vegetation.

**Table 1** – Threats impacting the Southern Pygmy Perch in approximate order of severity of risk, based on available evidence.

Number	Threat factor	Threat type and status	Evidence base
1.0	Habitat loss and fragmentation		
1.1	Removal of riparian and aquatic vegetation	Suspected past, current and future	Once widespread in the lower Murray River and associated tributaries in South Australia, the Southern Pygmy Perch is considered to have declined due to the removal of shaded, weedy habitats which were often destroyed in “stream improvement” practices (Lloyd & Walker 1986). Clearing and unrestricted stock access to riparian zones has led to a reduction in riparian and aquatic vegetation levels (Belsky et al., 1999). Given stream populations of the species can be isolated from other populations in other streams relatively close by (Cook et al., 2007), even relatively small-scale loss and degradation of riparian and aquatic vegetation may be impacting relict populations.
1.2	Loss of connectivity between rivers and floodplains	Suspected past, current and future	<p>Substantial areas of shallow wetland habitat have been lost in parts of the Murray-Darling Basin and coastal drainages where the Southern Pygmy Perch occur, and reduced wetland connectivity to more permanent waterbodies such as rivers and creeks has occurred (Saddler et al., 2013). Indications are that lateral connectivity is important for the small-bodied fish community in the Murray-Darling Basin (Lyon et al., 2010). Recruitment and dispersal of Southern Pygmy Perch in the Barmah-Millewa Forest on the Murray River has been observed to significantly increase during a floodplain inundation in comparison with other conditions (Tonkin et al., 2008).</p> <p>While recent fishway construction programmes have focussed towards restoring longitudinal connectivity in the temperate south-eastern rivers of Australia, up until 2008 no regulators controlling flow into lateral areas had had fishways installed (Jones &amp; Stuart 2008). The trial of several potential management and engineering solutions has been recommended to improve river floodplain connectivity in lowland rivers (Jones &amp; Stuart 2008). Recent environmental water priorities are focussed on lateral connectivity, including an emphasis that follow-up connections are</p>

			established using water releases for in future years (MDBA 2017). These releases are identified as a key action under moderate and wet to very wet conditions, and are designed at allowing fish to exit off-channel habitats and for offspring to disperse (MDBA 2017).
1.3	Sedimentation	Suspected past, current and future	Human-induced erosion delivering increased sedimentation to streams and rivers (known as sand-slugs) deplete the number of permanent refuge pools in waterways when there are drought conditions (Bond & Lake 2005). It has been proposed that restoration work in streams degraded by sand-slugs may be better directed toward restoring refuge habitat (deep pools and backwaters) rather than focussing on residential habitat (addition of wood/timber structures) to increase the resilience of species such as Southern Pygmy Perch to drought and flood (Bond & Lake 2005).
2.0	Invasive introduced species		
2.1	Competition and predation by introduced fish species	known past, current and future	<p>A number of alien (or introduced) fish species are present in the areas where the Southern Pygmy Perch occurs. For example, in the Macquarie River in Tasmania, the species co-occurs with the introduced species Brown Trout (<i>Salmo trutta</i>), Redfin (<i>Perca fluviatilis</i>) and Tench (<i>Tinca tinca</i>) (Humphries 1995). Examination of gut contents from Brown Trout and Redfin indicated that Southern Pygmy Perch was an important prey item for both these introduced fish species (Humphries unpub. data., cited in Humphries 1995). J.O. Langtry also reported in his observations from 1949-50 that "Brown Trout have been seen feeding voraciously on shoals of Pigmy Perch (<i>Southern Pygmy Perch</i>) in the Yarrawonga area" (Cadwallader 1977). Interestingly, a dedicated Trout fishing book states that Southern Pygmy Perch is the best bait for big Trout (Wedlick 1981), leaving little doubt that Trout predate on the species.</p> <p>Another study in coastal Victorian rivers, which did not sample any Trout species despite being present in the area, found Pygmy Perch in Redfin gut samples (Woodward &amp; Malone 2002). Redfin are now widely distributed throughout the southern half of the Murray-Darling Basin (Lintermans 2007),</p>



			<p>restricted to waterways where temperatures remain less than 31°C (Weatherley 1963a; b; 1977). Redfin are known to prey on many small and juvenile native species (Clunie et al., 2002). There has been a decline in Southern Pygmy Perch numbers in Blakney Creek in New South Wales with the invasion of Redfin and Carp (<i>Cyprinus carpio</i>) (Pearce 2015a).</p> <p>Carp now dominate freshwater systems across the Murray-Darling Basin and have become the most abundant large-bodied freshwater fish in south-eastern Australia (Koehn 2005; Davies et al., 2012). Carp disturb native fish habitats by raising turbidity and destroying submerged macrophytes (Roberts et al., 1995; Roberts &amp; Sainty 1996; Vilizzi et al., 2014) in areas which may be habitats for Southern Pygmy Perch.</p> <p>Eastern Gambusia (<i>Gambusia holbrooki</i>) are found widely across Australia, including throughout the Murray-Darling Basin and in Victorian coastal drainages (Woodward &amp; Malone 2002; Lintermans 2007). Eastern Gambusia are known to eat fish eggs and juveniles of other fish species and aggressively attack fish by nipping fins (Koehn &amp; O'Connor 1990a; b; Arthington &amp; McKenzie 1997). Woodward &amp; Malone (2002) suggested that Gambusia are likely predators of Pygmy Perch eggs and larvae. Direct observations are reported of fin nipping by Eastern Gambusia on juvenile Southern Pygmy Perch (Tonkin et al., 2011).</p>
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## Assessment of available information in relation to the EPBC Act Criteria and Regulations

<b>Criterion 1. Population size reduction (reduction in total numbers)</b>			
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	<b>Critically Endangered Very severe reduction</b>	<b>Endangered Severe reduction</b>	<b>Vulnerable Substantial reduction</b>
<b>A1</b>	<b>≥ 90%</b>	<b>≥ 70%</b>	<b>≥ 50%</b>
<b>A2, A3, A4</b>	<b>≥ 80%</b>	<b>≥ 50%</b>	<b>≥ 30%</b>
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p> <p><i>based on any of the following</i></p>			

### **Evidence:**

It should be noted that population size reduction has been assessed over the past 10 years rather than past three generations (7.5 years).

### *Murray-Darling Basin*

Only three remnant populations of Southern Pygmy Perch are currently known to exist in New South Wales excluding the Murray River. One exists in Blakney Creek, a tributary in the upper Lachlan River catchment, near Yass (Gilligan et al., 2010; Gould & Pearce 2012). A remnant population of Southern Pygmy Perch also occurs in Coppabella Creek, a small tributary (38 km long) of the Jingellic Creek which joins the upper Murray River, near Jingellic upstream of Lake Hume (Gilligan et al., 2010). Another remnant population occurs in upper Billabong Creek, a tributary of the Murray River (Billabong Creek eventually joins the Edward River at Moulamein in New South Wales) (Gilligan et al., 2010).

The population of Southern Pygmy Perch within Blakney Creek contracted by 51 percent in distribution (stream length) from 2007 to 2013 (Pearce 2015a). Follow up monitoring in 2018 recorded very low abundances of Southern Pygmy Perch and an increasing distribution of Redfin (Lintermans 2018). Both Carp and Redfin are present in Blakney Creek (Pearce 2015a), it is uncertain whether Brown or Rainbow Trout are also present. No salmonid stockings have been reported in Blakney Creek since 2009, but Trout are stocked in close-by tributaries of the Lachlan River such Grabben Gullen and Humes creeks (NSW DPI 2019).

A translocated population of Southern Pygmy Perch has been created in Pudman Creek in the upper Lachlan River catchment using fish sourced from Blakney Creek (Gilligan et al., 2010; Gould & Pearce 2012). Pudman Creek was chosen given its high abundance and diversity of aquatic vegetation, one of the habitat requirements for Southern Pygmy Perch (Gould & Pearce 2012). Surveys conducted in 2013 found that the species was surviving and recruiting in

Pudman Creek (Gould & Pearce 2012; Pearce 2015a). However, an extensive surveying of Pudman Creek in 2013 revealed that, while fish persisted at the stocking location, they had not spread (Pearce 2015a; b).

The remnant population of Southern Pygmy Perch occurring in Coppabella Creek was reported to have been decimated by the flooding between 2010 and 2012 which ended the Millennium Drought (Pearce 2015b). The remnant population which occurs in the upper Billabong Creek catchment has declined in abundance and geographic distribution to now only occur in Ten Mile Creek, a small tributary of Billabong Creek near Holbrook in New South Wales (NSW DPI unpub. data. cited in NSW FSC pers. comm., 2019).

Southern Pygmy Perch has not been recorded in recent monitoring for the Edward-Wakool system in the middle Murray River region (Watts et al., 2017). Surveys in 2004 failed to detect the species in the lower Murray River in New South Wales, in the river stretch between the Murrumbidgee River confluence downstream to the South Australian border (Gilligan 2005b). Surveys which detected Southern Pygmy Perch in the Barmah-Millewa Forest wetland on the Murray River up until 2007, failed to detect any individuals of the species in late-2007/early-2008 primarily due to the majority of wetland sites being completely dry (Tonkin et al., 2008), near the end of the millennium drought. Populations which existed at Normans Lagoon and Barmah-Millewa Forest are likely locally extinct given that recent extensive targeted surveys at these locations failed to detect the species (Sharpe & Wilson 2012; Sharpe et al., 2012, both cited in Pearce 2015a).

A survey undertaken in 2009 and 2010 focussing on sites in the lower Ovens River in Victoria found only low numbers of Southern Pygmy Perch (Macdonald et al., 2012). The survey did not detect the species from sites further afield at Barmah-Millewa or Gunbower forests or Albury along the Murray River, or in the Goulburn River (Macdonald et al., 2012).

Populations of the species in the lower Murray River in South Australia 10 years ago, at the height of the Millennium Drought conditions, were probably the lowest to date (SA DEW pers. comm., 2019). Monitoring since then has detected gradual increases in abundance and geographic distribution (SA DEW pers. comm., 2019).

The “Sustainable Rivers Audit” (SRA) assessments, using data across the 23 river valleys of the Murray-Darling Basin collected between 2004 and 2010 (SRA1 and 2), recorded Southern Pygmy Perch across 10 of the 23 river valleys (Davies et al., 2008; 2012). 1403 Southern Pygmy Perch individuals were caught during the first audit, SRA1 (between 2004-07) in nine river valleys (Davies et al., 2008) and only 157 individuals were caught during the second audit, SRA2 (between 2008-10) in seven river valleys (Davies et al., 2012). This represents a greater than 90 percent reduction in the numbers of sampled individuals between the years of 2004-07 and 2008-10. The SRA2 analysis did not provide an explanation for the reduced numbers recorded of Southern Pygmy Perch. However, it is likely indicative of a severe decline in abundance in the Murray-Darling Basin population of the species over that time.

#### *Coastal South Australia, Victoria, Bass Strait islands and Tasmania*

Recent records and reports of Southern Pygmy Perch in coastal drainages on the mainland (Victoria and south-eastern South Australia), on King and Flinders islands (Bass Strait), and in northern Tasmania indicate that the species persists in its historical range in these zones. Coastal populations in Victoria are reported to remain relatively robust (SA DEW pers. comm., 2019). Existing data for the species in these areas are insufficient to determine whether populations have declined.

## Conclusion

The data presented above appear to **be insufficient to demonstrate if the species is eligible for listing under this criterion**. While it is highly likely that, overall, the Murray-Darling population of Southern Pygmy Perch has experienced a severe decline in abundance in the past 10 years, there are no data to suggest that the coastal populations occurring in South Australia, Victoria, King and Flinders Islands and Tasmania have experienced decline in abundance in the same period. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions indicating distribution is precarious for survival:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

## Evidence:

The extent of occurrence (EOO) is estimated to be 509 108 km<sup>2</sup>, and the area of occupancy (AOO) is estimated to be 2740 km<sup>2</sup> (unpublished report, DoEE 2017). The EOO was calculated using a minimum convex hull while the AOO was based on the mapping records of the Southern Pygmy Perch since 1997, obtained from state governments, museums and CSIRO (unpublished report, DoEE 2017). Therefore, neither EOO nor AOO classifies as limited, restricted or very restricted.

Following assessment of the data, the Committee has determined that neither the species' extent of occurrence or area of occupancy classify to meet the required elements of this criterion. The data presented above appear to demonstrate the species is **not eligible for listing under this criterion**.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3. Population size and decline			
	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	Very high rate 25% in 3 years or 1 generation (whichever is longer)	High rate 20% in 5 years or 2 generation (whichever is longer)	Substantial rate 10% in 10 years or 3 generations (whichever is longer)
C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

#### Evidence:

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion, however, given the densities of this small fish species recorded in recent surveys it is highly likely that the number of mature individuals in the wild is greater than 10 000. Therefore it is also likely that the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4. Number of mature individuals			
	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
Number of mature individuals	< 50	< 250	< 1,000

#### Evidence:

The data presented above appear to be insufficient to demonstrate if the species is eligible for listing under this criterion however, given the densities of this small fish species recorded in recent surveys it is highly likely that the number of mature individuals in the wild is greater than 1000. Therefore it is also likely that the species is not eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better

understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 5. Quantitative Analysis			
	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

#### Evidence:

No published population viability analysis has been undertaken, therefore there are insufficient data to demonstrate if the species is eligible for listing under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

### **Conservation Actions (included for consultation purposes)**

#### **Recovery Plan**

A decision about whether there should be a recovery plan for this species has not yet been made. The purpose of this consultation document is to elicit additional information to help inform this decision.

#### **Primary Conservation Action**

Halt decline and stabilise populations in the immediate term, especially in the Murray-Darling Basin, then recover the range of the Southern Pygmy Perch to its historical extent and rebuild populations.

### **Conservation Actions**

#### **Conservation and Management Priorities**

- Habitat loss and fragmentation
  - Revegetate and protect riparian vegetation in river catchments where Southern Pygmy Perch are found, or have been known to occur. Focussed, small-scale restoration projects may prove useful given that populations may be isolated.
  - Implement, or supplement existing programs to include a seeding program of native aquatic plants (such as *Vallisneria* spp.) in waterbodies known to contain Southern Pygmy Perch. Focussed, small-scale restoration projects may prove useful given that populations may be isolated.
  - Improve river floodplain to channel lateral connectivity by investigating and trialing management and engineering solutions to establish the best methods.

- Implement management and engineering solutions to physical barriers, such as dams, weirs, levees, culverts, to improve river-floodplain connectivity, targeting areas where Southern Pygmy Perch are found, or have been known to occur.
- Explore the use of larger environmental flow events to improve lateral connectivity, particularly the use of environmental water to “top-up” natural flood events, so that off-channel billabongs, lagoons and wetlands receive sufficient watering at appropriate times to encourage Southern Pygmy Perch to breed/spawn, move and recruit.
- Restore habitat to provide refugia, including the re-establishment of deep pools and backwaters in degraded waterbodies, to increase the resilience of Southern Pygmy Perch to drought and flood.
- Introduced species
  - Implement, or supplement existing programs to include a targeted control program for introduced fish species, including Trout (Family Salmonidae), Redfin (*Perca fluviatilis*), Carp (*Cyprinus carpio*) and Eastern Gambusia (*Gambusia holbrooki*), in areas known to contain Southern Pygmy Perch.

### **Survey and Monitoring priorities**

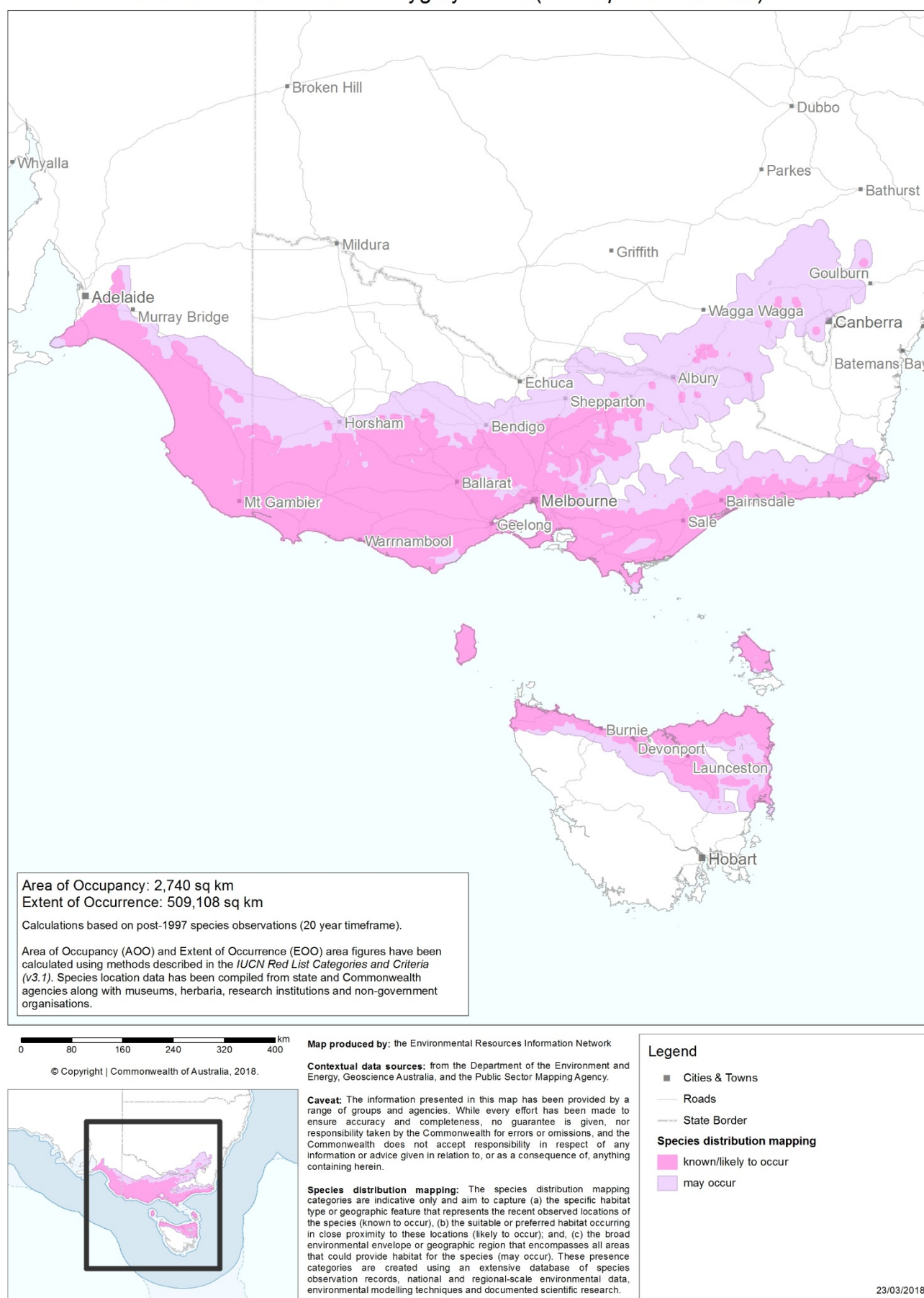
- Implement a targeted monitoring program for Southern Pygmy Perch across the entire range, to assess the current extent of occurrence, area of occupancy and population abundance and to detect population trend/trajectory. Best outcomes would be achieved if this monitoring program was compatible with the methods used in the Sustainable Rivers Audit, so that comparisons over time can be made.
- Explore the use of eDNA techniques to detect presence of the species.

### **Information and Research priorities**

- Resolve and publish taxonomy of the Southern Pygmy Perch species complex.
- Once taxonomy is resolved, develop a strategic captive breeding program which maintains, where appropriate, the genetic distinctions between the major population groups of the species. Hatchery-bred individuals could be then used for conservation stocking activities.



## Indicative distribution of the Southern Pygmy Perch (*Nannoperca australis*)



**Figure 1:** Current distribution (EOO and AOO) of *Nannoperca australis* (Southern Pygmy Perch) based on records between 1997–2017.



**Collective list of questions for Southern Pygmy Perch (*Nannoperca australis*) – your views**

**SECTION A GENERAL**

1. Provide a general summary of your views of the assessment finding of Southern Pygmy Perch across its entire national extent as data deficient and not eligible for inclusion in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) threatened species list. If you consider the species to be eligible for threatened species listing, provide detailed evidence against the listing criteria for its entire national extent or whether there is strong evidence for the Murray-Darling population to be listed.
2. Can you provide any other additional data or information relevant to the assessment, especially any collected in the past 10 years (since 2009) for the species?

**PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT**

**SECTION B DO YOU HAVE ADDITIONAL INFORMATION ON THE ECOLOGY OR BIOLOGY OF THE SPECIES?**

**Biological and taxonomic information**

3. Are you able to provide any further information on the taxonomy of the Southern Pygmy Perch, given the historical description of three subspecies, and more recent genetic analysis suggesting there are two separate species, which are yet to be formally described? How distinct is the Murray-Darling Basin population from other populations?
4. Can you provide any additional or alternative information or estimates for the Southern Pygmy Perch's longevity (3+ years), age-at-maturity (1 year) and generation length (2.5 years) with supporting references?
5. Do you have any additional information regarding the ecology or biology of the species not in the current assessment?

**SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL POPULATION OF THE SPECIES?**

**Population size**

6. Can you provide estimates of the current population size of mature adults for the 1.) national extent, and 2.) Murray-Darling Basin? *Importantly, for the purposes of the assessment against the listing criteria, is it likely that the population is greater or less than 10 000 individuals? Please provide any supporting justification or other information.*

## SECTION D ARE YOU AWARE OF TRENDS IN THE OVERALL POPULATION OF THE SPECIES?

### Evidence of total population size change

7. a. Are you able to provide an estimate of decline in the Southern Pygmy Perch's total population size over the last 10 years for the 1.) national extent 2.) Murray-Darling Basin? *Please provide justification and data for your response.*

b. Are you able to provide an estimate of decline in one and/or more of the other Southern Pygmy Perch populations (e.g. Tasmanian or Victorian coastline populations)? *Please provide justification and data for your response.*

*If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range (see table below). If so, please choose one of the ranges suggested, and also choose the level of confidence you have in this estimated range.*

Decline estimated to be in the range of:

☐ 1–30% ☐ 31–50% ☐ 51–80% ☐ 81–100% ☐ 90–100%

Level of your confidence in this estimated decline:

☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, suggests this range of decline

☐ 95–100% - high level of certainty, information indicates a decline within this range

☐ 99–100% - very high level of certainty, data are accurate within this range

8. Please provide (if known) any additional evidence which shows any population is stable, increasing or declining.

## SECTION E ARE YOU AWARE OF INFORMATION ON THE TOTAL RANGE OF THE SPECIES?

### Current Distribution/range/extent of occurrence, area of occupancy

9. Has the survey effort for the Southern Pygmy Perch been adequate to determine its national distribution? *If not, please provide justification for your response.*
10. Do you agree with the estimates of the current extent of occurrence (EOO) and area of occupancy (AOO) in the advice (see under Criterion 2 (page 11) and Figure 1 (page 15))? *If not, can you provide an alternative estimate with supporting information?*

## SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES?

### Past Distribution/range/extent of occurrence, area of occupancy

11. Do you consider that the way the historic distribution of the Southern Pygmy Perch has been estimated is appropriate? *Please provide justification for your response.*
12. Can you provide estimates of historic EOO and AOO for Southern Pygmy Perch across its former range for the 1.) national extent, and 2. Murray-Darling Basin? *Please provide justification for your response.*

## **PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS**

### **SECTION G DO YOU HAVE INFORMATION ON THREATS TO THE SURVIVAL OF THE SPECIES?**

13. Do you consider that all threats to Southern Pygmy Perch have been identified and described adequately?

- a. Removal of riparian and aquatic vegetation.
- b. Loss of connectivity between rivers and floodplains.
- c. Sedimentation.
- d. Competition and predation by introduced fish species including:
  - i. Trout (Family Salmonidae).
  - ii. Redfin (*Perca fluviatilis*).
  - iii. Carp (*Cyprinus carpio*).
  - iv. Eastern Gambusia (*Gambusia holbrooki*).

14. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect Southern Pygmy Perch at any stage of its life cycle, with supporting references?

### **SECTION H DO YOU HAVE INFORMATION ON CURRENT OR FUTURE MANAGEMENT FOR THE RECOVERY OF THE SPECIES?**

15. a. What planning, management and recovery actions are currently in place supporting protection and recovery of Southern Pygmy Perch?

b. To what extent have they been effective?

16. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of Southern Pygmy Perch?

17. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation action for Southern Pygmy Perch?

### **SECTION I DO YOU HAVE INFORMATION ON STAKEHOLDERS IN THE RECOVERY OF THE SPECIES?**

18. a. Are you aware of other knowledge (e.g. traditional ecological knowledge) or individuals/groups with knowledge that may help better understand population trends/fluctuations, or critical areas of habitat for Southern Pygmy Perch?

b. Are you aware of any cultural or social importance or use that Southern Pygmy Perch has?

19. What individuals or organisations are currently, or potentially could be, involved in management and recovery of Southern Pygmy Perch?

20. How aware of the Southern Pygmy Perch are land managers where it is found?

### **PART 3 – ANY OTHER INFORMATION**

21. Do you have comments on any other matters relevant to the assessment of this species?

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