



## Consultation Document on Listing Eligibility and Conservation Actions

### *Trachystoma petardi* (pinkeye mullet)

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

- 1) the eligibility of *Trachystoma petardi* (pinkeye mullet) for inclusion on the EPBC Act threatened species list in the **Vulnerable** category; 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 and Energy.

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  
Wildlife, Heritage and Marine Division  
Department of the Environment and Energy  
PO Box 787  
Canberra ACT 2601

**Responses are required to be submitted by Friday 4 August 2017.**

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## **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>.

## **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.



# *Trachystoma petardi*

pinkeye mullet

## **Taxonomy**

Conventionally accepted as *Trachystoma petardi* (Castelnau 1875).

Synonym of *Myxus petardi* (Castelnau 1875).

The species has been referred to as both *Myxus petardi* and *Trachystoma petardi* (Durand et al., 2012a, 2012b). Analysis of mitochondrial-DNA found that the species *Trachystoma petardi* (found only on the east coast of Australia) was clearly distinct from mullet in the genus *Myxus* (Durand et al., 2012a; 2012b). It is the only species in its genus (Durand et al., 2012a).

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

### **Description**

Pinkeye mullet are medium, stout, diadromous fish (migrate between fresh and salt water habitats) which grow to a maximum length of 40 cm (Thomson 1996; Allen et al., 2002). Pinkeye mullet differ from another mullet species which often co-inhabits the same areas, *Mugil cephalus* Linnaeus 1758 (sea mullet), by having a small, more slender and pointed snout. The species is dark olive-green in colour on the back with a silvery belly (Thomson 1996; Allen et al., 2002). Fins are pale-yellow and the eye is gold to pinkish (Thomson 1996; Allen et al., 2002). The species exhibits sexual dimorphism in a number of physical characters such as the positioning of dorsal and anal fins along the main body axis (Grant et al., 1977).

### **Distribution**

Pinkeye mullet once inhabited the freshwater and estuarine reaches of eastern draining river systems from the Burnett River in Queensland south to the Clyde River in New South Wales (Thomson 1996; Allen et al., 2002; Miles 2007). While it is suspected that the species has become locally extinct at the northern end of its range, in the Burnett and Isis/Burrum river catchments (Qld DNR 2014), there is a record of the species in Water Park Creek near Byfield taken in Queensland Museum surveys in 2011 (QM 2017). This individual record indicates that previous accepted notions of the species' distribution may not have correctly defined its northern extent, which may include areas north of the Burnett River to Water Park Creek. Another individual record of the species is known from Neerkol Creek in 1982, on the floodplain of the Fitzroy River near Rockhampton (QWD 2017).

In 1999, 21 individuals were collected for Museum Victoria from Millingandi Creek, a creek within the Merimbula Lake catchment in southern New South Wales (MV 2017). In 2006, an individual was collected by NSW Fisheries from the Brogo River which is part of the Bega River catchment to the north of Merimbula Lake but south of the Clyde River (AM 2017). Another record which raises questions about the species distribution, is an individual collected by electrofishing in the Retreat River in 1999, which is an upland river of the Lachlan River catchment in the Murray Darling Basin (AM 2017).

Pinkeye mullet prefer the deep pools and gently flowing sections of rivers, often occurring in small shoals (Thomson 1996). Mature adults move into estuaries and ocean habitats in late summer and early autumn months (Thomson 1996). Analyses of otolith chemistry indicate that early life is spent in higher salinity waters and the remainder of life is primarily spent in



freshwater (Miles 2007). It is thought that the species migrates regularly in both directions between freshwater and estuarine/marine habitats (Miles 2007). The species is tolerant of water temperatures between 9 and 27°C (Allen et al., 2002).

### Cultural Significance

Mullet in the Mary River catchment are regarded as being culturally significant by Indigenous groups. One elder of the Kabi Kabi group has reported that the mullet is a totem of the area around Gympie (Bargo pers. comm., 2012).

### Relevant Biology/Ecology

While it was previously assumed that pinkeye mullet spawn mostly during February in estuaries and the sea (Thomson 1996; Allen et al., 2002), studies on otolith chemistry indicate an amphidromous life cycle where spawning occurs in freshwater and larvae move to estuarine and marine environments to develop before moving back to the freshwater as adults (Miles et al., 2009). The species appears to reach maturity at four years with fecundity very high, with larger females producing between 1 000 000 – 3 000 000 eggs (Thomson 1996; Allen et al., 2002). Maximum life span is approximately 14 years (Allen et al., 2002). Based on these estimates, generation length is estimated to be nine years.

Pinkeye mullet feed on microscopic algae and other plant material, detritus and benthic invertebrates (Allen et al., 2002).

### Threats

There has been little directed research into the threats impacting upon pinkeye mullet. There are indications that riparian vegetation degradation has “significantly” decreased abundances of the species (Gowns et al., 1998). It is uncertain what level other threats are impacting on the species.

Table 1 – Threats impacting the pinkeye mullet in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Habitat loss, disturbance and modification		
Riparian vegetation degradation	known past, current  suspected future	A study of fish assemblages in two reaches of the Hawkesbury-Nepean river system in New South Wales found that pinkeye mullet abundances were affected by riparian vegetation degradation (Gowns et al., 1998). The mean abundance of the species was higher near vegetated banks than along degraded banks in both river reaches (Gowns et al., 1998).
Barriers to movement	suspected past, current, future	Ensuring that pinkeye mullet have access to both freshwater and estuarine habitats is important (Anon 2014). Pinkeye mullet appear not to migrate via the ocean unlike sea mullet, and it appears that they cannot recolonise river systems once local extinctions occur (Anon 2014). In the Burnett River, the



		<p>Ben Anderson Barrage is a 4m high tidal barrier dividing fresh and estuarine waters. At the time of construction in 1974 it had a pool-and-weir fishway installed (SunWater 2010). In 1997, the fishway was upgraded to a “vertical-slot” style (SunWater 2010). However the species remains undetected in the Burnett River system, suggesting no recolonisation has occurred from populations further south (Anon 2014).</p> <p>In the Mary River catchment, anecdotal evidence suggests that pinkeye mullet are now locally extinct in Tinana Creek above the barrier created by Teddington Weir (Hutchison pers. comm. 2012).</p> <p>An audit identified 3300 barriers to fish movement (weirs, dams, road crossings and floodgates) in coastal New South Wales catchments (Gordos et al., 2007).</p> <p>Following a fishway installation on Tallowa Dam on the Shoalhaven River in southern New South Wales, pinkeye mullet have been recorded in strong numbers below the dam wall indicating desire to migrate further upstream, but have not been detected above the dam wall (Walsh et al., 2014). A tagging study on the species which captured individuals downstream of Tallowa Dam and released them upstream of the dam, showed that 85% (17 of 20) tagged individuals successfully migrated downstream over the spillway with high rates of survivorship (Walsh et al., 2014). Only one individual made at least one return migration upstream through the fishway (Walsh et al., 2014), possibly indicating that downstream movement over the dam spillway is not adversely impacting the species here, but upstream movement may be inhibited and not adequately supported by the fishway.</p>
Harvest from the wild		
Bycatch in commercial fisheries	suspected past, current, future	<p>Pinkeye mullet are known to be caught as bycatch (secondary species) in a number of New South Wales estuarine fisheries (Gray et al., 1990; West &amp; Walford 2000). The species is caught as bycatch in mesh nets targeting <i>Mugil cephalus</i> (sea mullet) in the New South Wales managed Estuary General Fishery (NSW DPI 2013). There is likely to be a low level of catch in the New South Wales managed Ocean Haul Fishery, where sea mullet are targeted using haul nets (NSW DPI 2013). It is also likely caught in trawl nets of the New South Wales managed Estuary Prawn Fishery. In southern Queensland, the pinkeye mullet is probably caught in the Queensland managed River and Inshore Beam Trawl Fishery which uses trawl nets to target prawns. Bycatch in the fishery is “mainly small fin fish species” (Qld DAF 2015). Sea mullet are targeted in the Queensland East Coast Inshore Fin Fish Fishery (Qld DAFF 2014), and it is assumed that some the</p>



		targeting of sea mullet in southern parts of this fishery's operational area would result in bycatch of pinkeye mullet. Some level of depletion from the combined activities of these fisheries in Queensland and New South Wales is assumed. However, the level of impact that is being caused by this depletion is unquantified and unknown.
Invasive species		
Competition and predation by alien fish species	suspected past, current, future	A number of alien fish species are likely present in coastal catchments of Queensland and New South Wales where pinkeye mullet occur. Species include the redfin ( <i>Perca fluviatilis</i> ), European carp ( <i>Cyprinus carpio</i> ), Mozambique tilapia ( <i>Oreochromis mossambicus</i> ) and eastern gambusia ( <i>Gambusia holbrooki</i> ) (I&I NSW 2010; PestSmart 2012; NSW DPI 2017). Likely impacts to pinkeye mullet in these areas include competition for food and habitat resources, and predation from these species.

### **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			
	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<div style="display: flex; align-items: flex-start;"> <div style="flex: 1;"> <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> </div> <div style="flex: 1; margin-left: 20px;"> <p><i>based on any of the following</i></p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul> </div> </div>			

#### **Evidence:**

#### **Insufficient data to determine eligibility**

Observational records indicate that pinkeye mullet may be more widespread than has been commonly accepted until now (ALA 2017). However, there are few data on abundance or population which can be used to adequately assess whether decline has occurred and by how much the species' total population has declined. While there are anecdotal reports that the



species has declined in river catchments in southern Queensland and disappeared from the Burnett, Kolan, Gregory and Burrum/Isis river catchments (Anon 2014), targeted surveys are required to establish the validity of these claims, especially given that an individual was recorded from Water Park Creek in 2011 (QM 2017). The area where anecdotal reports are reporting declines and localised extinctions represents a relatively small portion of the species' entire Australian distribution. Given that declines and level of impacts in the remainder of the species' Australian distribution remain unclear there are insufficient quantitative data to judge whether the species has undergone substantial declines across its entire range.

It appears 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.

<b>Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy</b>			
	<b>Critically Endangered Very restricted</b>	<b>Endangered Restricted</b>	<b>Vulnerable Limited</b>
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:**

### **Eligible under Criterion 2 B2(a)(b)(iii) for listing as Vulnerable**

The extent of occurrence (EOO) is estimated to be 305 512 km<sup>2</sup>, and the area of occupancy (AOO) is estimated to be 576 km<sup>2</sup> (see Figure 1, page 11) (DoEE 2017). These figures are based on the mapping of point records since 1997, obtained from state governments, museums and CSIRO. Therefore, the area of occupancy classifies as limited. The EOO was calculated using a minimum convex hull, and the AOO calculated using a 2x2 km grid cell method, based on the IUCN Red List Guidelines 2014 (see Figure 1, page 11) (DoEE 2017). With the estimate of AOO at 576 km<sup>2</sup> as the indicator, the geographic distribution of pinkeye mullet classifies as Limited.

The geographic distribution is likely to be severely fragmented given that most eastern coastal river catchments in southern Queensland and throughout New South Wales have barriers to movement within channels (Gordos et al., 2007; SunWater 2010) meeting Condition (a) of this Criterion. Continuing decline is inferred given that the construction of additional barriers, such as dams, weirs, levees, culverts within the species' range are allowed for under existing Queensland and New South Wales legislation, meeting Condition (b)(iii) of this Criterion. These two conditions indicate that given geographic distribution of pinkeye mullet classifies as Limited, the species' distribution is precarious for survival.



In this context, the data presenting above appear to demonstrate that the species is **eligible for listing as Vulnerable** under this criterion. However, the purpose of this consultation document is to elicit additional information to better understand the species' status. The 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:

#### Insufficient data to determine eligibility

From a thorough desktop review of the available scientific literature, there appears to be no definitive information on the number of mature individuals of pinkeye mullet across its entire distribution and it is unlikely to be 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:

#### Insufficient data to determine eligibility

As mentioned above, from a thorough desktop review of the available scientific literature, there appears to be no definitive information on the number of mature individuals of pinkeye mullet across its entire distribution and is unlikely to be 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:

### Insufficient data to determine eligibility

From a thorough desktop review of the available scientific literature, it appears that no population viability analysis has been undertaken for pinkeye mullet and 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

### Recovery Plan

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

### Primary Conservation Action

Implement management and engineering solutions to physical barriers, such as dams, weirs, levees, culverts, to improve connectivity between freshwater and estuarine habitats in coastal river catchments where pinkeye mullet are found, or have been known to occur.

### Conservation and Management Priorities

Habitat loss, disturbance and modification

- Revegetate and protect riparian vegetation in coastal river catchments in Queensland and New South Wales where pinkeye mullet are found, or have been known to occur.

Stakeholder engagement

- Install appropriate signage (e.g. at boat ramps, popular fishing locations) and distribute literature educating recreational fishers about how to identify pinkeye mullet (especially in comparison to other mullet species) and informing of its conservation status.



- Engage with private landholders and land managers responsible for areas adjacent to waterways in which populations of pinkeye mullet inhabit at various times of the year and encourage these key stakeholders to contribute to the implementation of conservation management actions.

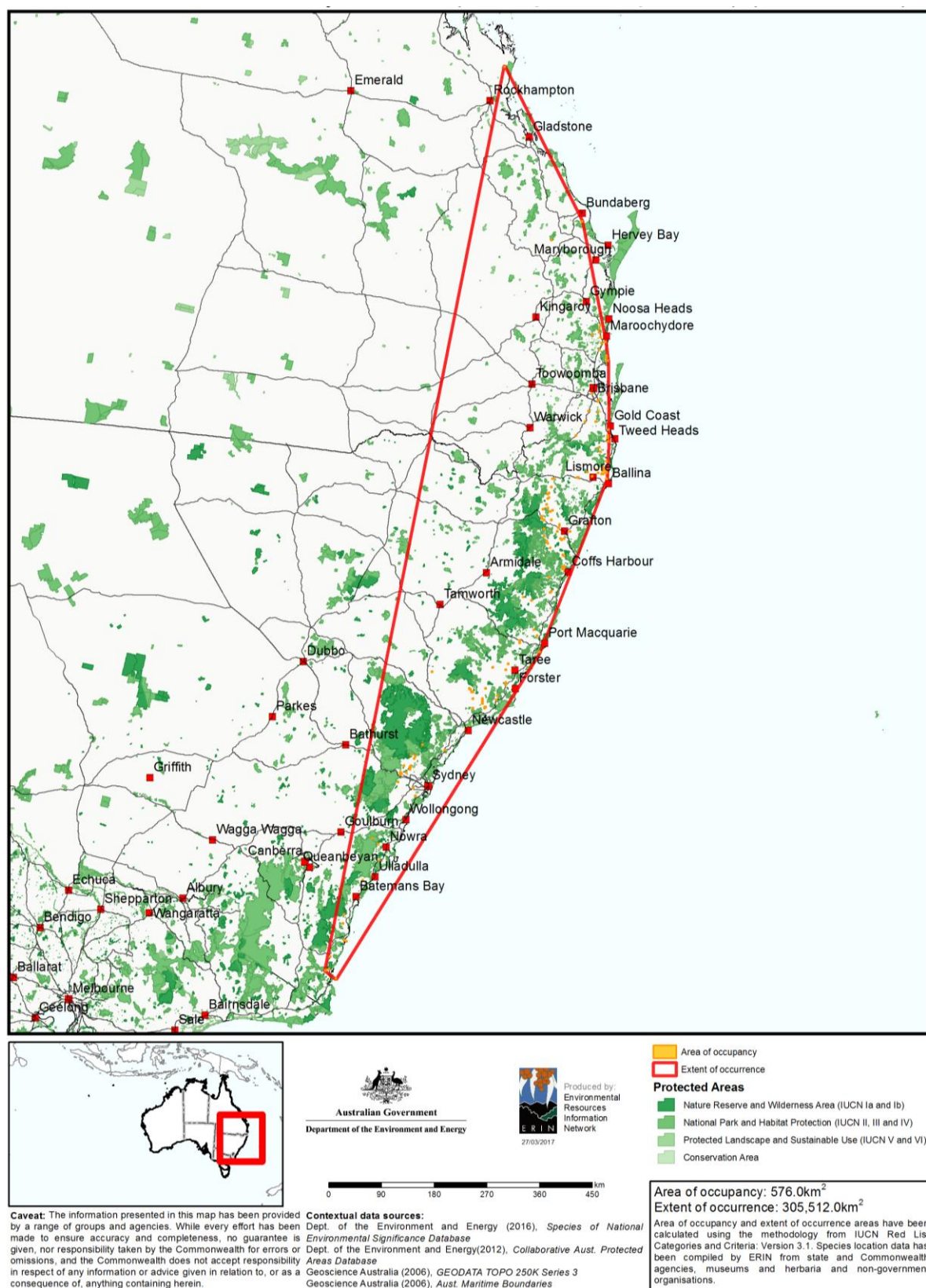
### **Survey and Monitoring priorities**

- Collect and record species-specific data of catch amounts (retained and discarded) for pinkeye mullet in all commercial fisheries where the species is caught.
- Survey and monitor population abundance across its range sufficiently so that judgements can be made about the trajectory of its population (conservation) status.

### **Information and Research priorities**

- Investigate more effective fish transfer facilities to move small to medium schooling fish, such as the pinkeye mullet, upstream and downstream of man-made barriers built along river courses, such as dams and weirs, to determine the most suitable types to allow movement.
- Study the impacts of alien fish species, including but not limited to redbfin perch, European carp, tilapia and gambusia, on pinkeye mullet. Specific focus should be placed on competition and predation impacts. This should include studying alien fish stomach contents using DNA assays (to detect small or visually unidentified samples).





**Figure 1:** Current distribution (EOO and AOO) of the *Trachystoma petardi* (pinkeye mullet) based on records between 1997–2017.



## **Collective list of questions for pinkeye mullet (*Trachystoma petardi*) – your views**

### **Biological information**

1. Can you provide any additional information or alternative estimates for the pinkeye mullet's longevity (14 years), age-at-maturity (4 years) or generation length with supporting references?
2. Given that the species appears to spawn in freshwater habitats and larvae drift downstream to more saline, estuarine and marine habitats, can you provide any additional information regarding its requirements for recruitment?

### **Population size**

3. Are you aware of any stock assessments for this species, or mullet species in general, on the east coast of Australia? Please provide reference to any supporting information.

### **Evidence of total population size change**

4. Are you able to provide an estimate of decline in the total population size over the last three generations (27 years)? Please provide justification for your response.

If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species numbers, and also choose the level of confidence you have in this estimate.

Decline estimated to be in the range of:
<input type="checkbox"/> 1–30% <input type="checkbox"/> 31–50% <input type="checkbox"/> 51–80% <input type="checkbox"/> 81–100% <input type="checkbox"/> 90–100%
Level of your confidence in this estimated decline:
<input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much information to go on
<input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence
<input type="checkbox"/> 51–95% - reasonably certain, suggests this range of decline
<input type="checkbox"/> 95–100% -high level of certainty, information indicates a decline within this range
<input type="checkbox"/> 99–100% - very high level of certainty, data are accurate within this range

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

### **Current distribution/range/extent of occurrence, area of occupancy**

6. The species appears to be eligible for listing as Vulnerable under Criterion 2. Does the information provided in the advice accurately estimate the area of occupancy (see under Criterion 2 (page 7–8) and Figure 1 (page 11)) of the species in Australia? If not, are you able to suggest an alternative method to best capture that information and are you able provide justification for your response?



7. Has the survey effort for the species been adequate to determine its distribution? If not, please provide justification for your response.
8. Do you agree with the estimates of the current extent of occurrence in the advice (see under Criterion 2 (page 7–8) and Figure 1 (page 11))? If not, can you provide an alternative estimate with supporting information?

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

Extent of occurrence is estimated to be in the range of: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span><input type="checkbox"/> &lt;100 km<sup>2</sup></span> <span><input type="checkbox"/> 100 – 5000 km<sup>2</sup></span> <span><input type="checkbox"/> 5001 – 20 000 km<sup>2</sup></span> <span><input type="checkbox"/> &gt;20 000 km<sup>2</sup></span> </div>
Level of your confidence in this estimated extent of occurrence <div style="margin-top: 10px;"> <input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on  <input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence  <input type="checkbox"/> 51–95% - reasonably certain, data suggests this range of decline  <input type="checkbox"/> 95–100% -high level of certainty, data indicates a decline within this range  <input type="checkbox"/> 99–100% - very high level of certainty, data is accurate within this range         </div>

#### **Past distribution/range/extent of occurrence**

9. Do you consider that the way historical distributional information has been estimated is appropriate? Please provide justification for your response?

Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the former extent of occurrence and/or area of occupancy?

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

Past extent of occurrence is estimated to be in the range of: <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span><input type="checkbox"/> &lt;100 km<sup>2</sup></span> <span><input type="checkbox"/> 100 – 5 000 km<sup>2</sup></span> <span><input type="checkbox"/> 5 001 – 20 000 km<sup>2</sup></span> <span><input type="checkbox"/> &gt;20 000 km<sup>2</sup></span> </div>
Level of your confidence in this estimated extent of occurrence <div style="margin-top: 10px;"> <input type="checkbox"/> 0–30% - low level of certainty/ a bit of a guess/ not much data to go on  <input type="checkbox"/> 31–50% - more than a guess, some level of supporting evidence  <input type="checkbox"/> 51–95% - reasonably certain, data suggests this range of decline  <input type="checkbox"/> 95–100% -high level of certainty, data indicates a decline within this range         </div>



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

## General

10. What are your views on whether the species is eligible for national threatened species listing under the *Environment Protection and Conservation Biodiversity Act 1999*?
11. Can you provide additional data or information relevant to this assessment?

## Threats

12. Do you agree that the potential threats listed below are correct and that their effects on the species have been significant? Are you able to provide any documentation or evidence that these may actually be known threats for the species?
  - a. riparian vegetation degradation.
  - b. barriers to movement.
  - c. bycatch in commercial fisheries.
  - d. competition and predation by alien fish species, such as redfin (*Perca fluviatilis*), European carp (*Cyprinus carpio*), Mozambique tilapia (*Oreochromis mossambicus*) and eastern gambusia (*Gambusia holbrooki*).
13. Can you provide additional or alternative information on threats, past, current or potential that may adversely affect this species at any stage of its life cycle, with supporting references? For example, are you aware of any proposals or plans to construct additional dams, weirs, levees, culverts, barrages within the known range of pinkeye mullet that would further affect the species' distribution and abundance?

## Management

14. Are there any planning, management and/or recovery actions currently in place, in parts or across its entire distribution, which support protection and recovery of the species? To what extent have they been effective?
15. Are you aware of any information on the effectiveness of management and recovery actions that are currently in place for the species?
16. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species?



## **References cited in the advice**

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