Abridged Threatened Species Nomination Form

For nominations under the Common Assessment Method (CAM) where supporting information is available, but not in a format suitable for demonstrating compliance with the CAM, and assessment against the IUCN Red List threat status.

Cover Page *(Office use only)*

Species name (scientific and common name)**:**	***Nannoperca pygmaea* (little pygmy perch)**
Nomination for (addition, deletion, change)**:**	**Addition**
Nominated conservation category and criteria:	**Endangered B1ab(i,ii,iii)**

Scientific committee assessment of eligibility against the criteria:		
This assessment is consistent with the standards set out in Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding.		Yes ☐ No ☐
A.	Population size reduction	•
B.	Geographic range	•
C.	Small population size and decline	•
D.	Very small or restricted population	•
E.	Quantitative analysis	•

Outcome*:*			
Scientific committee meeting date:			
Scientific committee comments:			
Recommendation:			
Ministerial approval:		*Date of Gazettal/ Legislative effect:*	

Nomination summary *(to be completed by nominator)*

Current conservation status			
Scientific name:	*Nannoperca pygmaea*		
Common name:	little pygmy perch		
Family name:	Percicthyidae	Fauna ☒	Flora ☐
Nomination for:	Listing ☒	Change of status ☐	Delisting ☐

1. *Is the species currently on any conservation list, either in a State or Territory, Australia or Internationally?* 2. *Is it present in an Australian jurisdiction, but not listed?*	*Provide details of the occurrence and listing status for each jurisdiction in the following table*

Jurisdiction	**State / Territory in which the species occurs**	**Date listed or assessed (or N/A)**	**Listing category i.e. critically endangered or 'none'**	**Listing criteria i.e. B1ab(iii)+2ab(iii)**
International (IUCN Red List)				
National (EPBC Act)				
State / Territory	1. Western Australia	03/11/2015	Endangered	B1ab(i,ii,iii)
	2.			
	3.			

Consistent with Schedule 1, item 2.7 (h) and 2.8 of the Common Assessment Method Memorandum of Understanding, it is confirmed that:	
• this assessment meets the standard of evidence required by the Common Assessment Method to document the eligibility of the species under the IUCN criteria;	Yes ☒ No ☐
Comments:	
• surveys of the species were adequate to inform the assessment;	Yes ☒ No ☐
Comments:	There were targeted surveys for the species between 2012 and 2015. The project involved surveying > 80 sites and capturing and measuring > 35,000 fish. The project detected three new subpopulations not previously known. The data from these surveys were used to map the species' distribution, determine aspects of its ecology, and assess, quantify and prioritise threats to the species. The Murdoch University Freshwater Fish Group, Centre for Fish and Fisheries Research, are issued with annual licences to conduct surveys for freshwater fish in southwestern Australia, including locations where this species may occur.
• the conclusion of the assessment remains current and that any further information that may have become available since the assessment was completed supports or is consistent with the conclusion of the assessment.	Yes ☒ No ☐
Comments:	The species' conservation status was assessed and nominated for listing in WA in 2015 as Endangered B1ab(i,ii,iii) based on the results of the targeted surveys. No further information has become available.

Nominated national conservation status: category and criteria		
Presumed extinct (EX) ☐	Critically endangered (CR) ☐	Endangered (EN) ☒ Vulnerable (VU) ☐
None (least concern) ☐	Data Deficient ☐	Conservation Dependent ☐
What are the IUCN Red List criteria that support the recommended conservation status category?	**B1ab(i,ii,iii)**	
Eligibility against the IUCN Red List criteria (A, B, C, D and E)		
*Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the species no longer meets the requirements of the current conservation status.*		
A.	Population size reduction (evidence of decline)	• (A2) Several subpopulations are suspected to have contracted, but having only recently discovered several subpopulations, there is insufficient information to make an assessment of any potential population declines across the species' full range. • **No information to assess.**
B.	Geographic range (EOO and AOO, number of locations and evidence of decline)	• (B1) The species has an EOO of 3,004 km^2 (EOO<5,000km^2) • (B2) The species has an AOO of 40 km^2 but listing using this criteria is not supported due to fish utilising all available habitat. • (a) The species appears to be restricted to small areas within the Denmark, Mitchell/Hay and Kent Rivers and Lake Smith (4 locations based on river reaches within different catchments) and has not been detected in other catchments during surveys. The species is not considered to be severely fragmented but it is known from < 5 locations. • (b) The subpopulation within the Hay River catchment is very restricted in distribution and is suspected to have contracted due to land clearing and secondary salinity. Contraction of the Kent River subpopulation is also suspected to have occurred. Ongoing declines in (i) EOO and (ii) AOO are inferred/projected based on known (iii) habitat declines from increasing salinity, riparian degradation, flow declines (in past 40 years), and proliferation of instream barriers. • (c) The species seasonally and spatially fluctuates in abundance, but this is due to its natural history (seasonal movement and breeding patterns, with annual spawning season peaks in July-August) and therefore listing using this criteria is not supported. • **Meets criteria for Endangered B1ab(i,ii,iii)**
C.	Small population size and decline (population size, distribution and evidence of decline)	• A total of 750 individuals (including juveniles) were captured during the 2012-2015 study, representing 2.2 % of the total fish catch during the study. The number of mature individuals is unknown but estimated to be < 2,500. • Several subpopulations are suspected to have contracted, but having only recently discovered several subpopulations, there is insufficient information to make an assessment of any potential population declines.

		• **Insufficient information to assess.**
D.	Very small or restricted population (population size)	• (D) A total of 750 individuals (including juveniles) were captured during the 2012-2015 study, representing 2.2 % of the total fish catch during the study. The number of mature individuals is unknown but estimated to be < 2,500. • (D2) The species is known from <5 locations but no known plausible threats that could drive the taxon to Critically Endangered/Extinct in a very short time period. • **Insufficient information to assess/ does not meet criteria.**
E.	Quantitative analysis (statistical probability of extinction)	• **No information to assess.**

Summary of assessment information

EOO	3,004 km^2 (Minimum Convex Polygon α-hull)	AOO	40 km^2 (2 km x 2 km grid)	Generation length	1 year

No. locations	4	Severely fragmented	Yes ☐ No ☒ Unknown ☐
No. subpopulations	4	No. mature individuals	Unknown, possibly < 2,500
Percentage global population within Australia		100 %	
Percentage population decline over 10 years or 3 generations		Unknown	

Threats *(detail how the species is being impacted)*

Threat *(describe the threat and how it impacts on the species. Specify if the threat is past, current or potential)*	Extent *(give details of impact on whole species or specific subpopulations)*	Impact *(what is the level of threat to the conservation of the species)*
Climate change: *Past, present and future* • Projected drastic flow declines due to rainfall reduction will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. Reduction in groundwater would also impact on the species, particularly on refuge pools in lotic systems and Lake Smith. • The impact on climate change on the spawning migrations and by extension recruitment of sympatric species has recently been demonstrated (Beatty *et al*. 2014) to place enormous pressure on the species. Adaptive management will be required to help ensure the species long-term survival in the wild.	Entire	Extreme

Water quality decline: *Past, present and future* • Salinisation is the major threat which is highly likely to be exacerbated by future flow declines associated with climate change (particularly warmer temperatures and decreased dissolved oxygen). • The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments. • Non-point pollution (nutrients, pesticides) and its associated impacts (eutrophication, ecotoxicity) is a potential threat in the more modified Hay and Kent catchments and could lead to fish kill events that might affect the little pygmy perch subpopulations. • Contamination of artificial water points with fire retardant chemicals is also a possibility in the Denmark catchment, although the impacts of these chemicals on the species are unknown. • Feral pigs (*Sus scrofa*) cause reduced water quality by destruction of fringing vegetation, increased turbidity and siltation, which is suspected to negatively impact fish survival (Bengsen *et al*. 2014, Doupe *et al*. 2010).	Entire	Extreme
Predation from and competition with introduced species: *Past, present and future* • The little pygmy perch is sympatric with the aggressive eastern mosquitofish (*Gambusia holbrooki*) in refuge pools in the Kent and Hay Rivers. • However, the eastern mosquitofish is in relatively low abundance in these rivers. • Any future introduction of large piscivores (e.g. rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*) or redfin perch (*Perca fluviatilis*)) could be disastrous for the long-term survival of the little pygmy perch.	Entire	High
Water abstraction: *Future* • The species uses fire-fighting water points as refugia (e.g. Denmark subpopulation) and therefore it warrants careful consideration from a management perspective, as excessive pumping from those points could extirpate the subpopulation. • Surface water extraction may potentially impact the species, particularly spawning sites in the lower Mitchell River. • Groundwater extraction from aquifers – should they connect with refuge habitat of the species – could results in loss of key habitats.	Entire	Moderate
Fire: *Past, present and future* • The impact of increased frequency of fires on southwestern Australian fish is unknown. • Habitat in the lower Mitchell was recently burnt and it was recolonised by the species after the event. • The species uses fire-fighting water points as refugia (e.g. Denmark subpopulation) and therefore it warrants careful consideration from a management perspective, as excessive pumping from those points	Entire	Moderate

could extirpate the subpopulation, with additional threat of potential spillage of fire retardant.		
Instream barriers: *Past, present and future* • A ford on Mitchell River may partially impede migrations in shoulder flow periods. • The several potential low barriers to movements of the species are not yet known to impede the spawning migration.	Entire	Low
Exploitation: *Present and future* • Due to the limited number of locations and low abundance of the species, it is vulnerable to collection for the aquarium trade.	Entire	High

Management and Recovery

Is there a Recovery Plan (RP) or Conservation Management Plan operational for the species?	Yes ☐ No ☒

List all relevant recovery or management plans (including draft, in-preparation, out-of-date, national and State/Territory recovery plans, recovery plans for other species or ecological communities, or other management plans that may benefit or be relevant to the nominated species).

- Department of Environment and Conservation (2008). *Western Trout Minnow (Galaxias truttaceus hesperius) Recovery Plan (WA Wildlife Management Program No. 47).* Available from: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/recovery_plans/western-trout-minnow-recovery_plan_47.pdf
- Commonwealth Threatened Species Scientific Committee (2008). *Commonwealth Conservation Advice on Nannatherina balstoni*. Canberra, ACT: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66698-conservation-advice.pdf
- Beatty, S., Close, P., Morgan, D., Allen, M. and Lawrence, C. (2015). *Conserving freshwater fish in south-west Western Australia: a summary of distribution, migration, critical habitats and threats to the region's most endangered freshwater fishes.* Prepared for the State Natural Resource Management Office, WA. Project No. 12035. Available from: http://www.endangeredfishesofsouth-westernaustralia.com/

List current management or research actions, if any, that are being undertaken that benefit the conservation of the species.

- Murdoch University is currently assessing the aquatic fauna of fire waterpoints to determine whether they could be managed as native fish refuges.
- The Freshwater Ecosystems Working Group is an interagency group, involving Department of Primary Industries and Regional Development (Fisheries), Department of Water and Environmental Regulation (Water) and Department of Biodiversity, Conservation and Attractions, working toward protecting and enhancing the freshwater ecosystems of WA.
- WA Freshwater Biodiversity Research Network is a communication network between relevant State and Local government departments, and university and independent researchers.
- Murdoch University's Freshwater Fish Group and Fish Health Unit conduct research into WA's freshwater fish. http://www.freshwaterfishgroup.com and https://centreforfishfisheriesresearch.wordpress.com
- Department of Primary Industries and Regional Development (Fisheries) requires fishers/researchers to report and euthanase aquatic pests and educates the public on the importance of never releasing non-native species into the wild.

List further recommended management or research actions, if any, that would benefit the conservation of the species.

- Encourage/ensure more sustainable land-use practices and surface and groundwater abstraction.
- Continue to monitor and manage existing refuges.
- Address salinity in Hay and Kent Rivers by preparation and implementation of an action/recovery plan, similar to the recovery plan for the Denmark River Catchment which has resulted in a reversed salinisation trend in the Denmark River (Ward *et al.* 2011).
- Conduct fencing and revegetation to protect/rehabilitate habitats where necessary.
- Monitor and control introduced species (e.g. Eastern mosquitofish).
- Remove barriers (e.g. weirs, dams) from rivers and implement other strategies to reconnect aquatic habitats to help mitigate the impact of flow declines.
- Conduct research to determine environmental tolerances (temperature and salinity), microhabitat requirements, reproductive biology, impact of predators, diet, and age and growth.
- Investigate/research potential use of captive breeding for conservation reintroductions/supplementation.

References

Bengsen, A.J., Gentle, M.N., Mitchell, J.L., Pearson, H.E. and Sounders, G.R. 2014. Impacts and management of wild pigs Sus scrofa in Australia. *Mammal Review* 44:135-147.

Doupe, R.G., Mitchell, J., Knott, M.J., Davis, A.M. and Lymbery, A.J. 2010. Efficacy of exclusion fencing to protect ephemeral floodplain lagoon habitats from feral pigs (*Sus scrofa*). *Wetlands Ecol. Management* 18:69-78.

Ward, B., Sparks, T. and Blake, G. 2011, *Denmark River water resource recovery plan*, Salinity and land use impacts series, Report no. SLUI 40, Department of Water, Perth. Available at: https://www.water.wa.gov.au/__data/assets/pdf_file/0003/3099/101359.pdf

Nomination coversheet prepared by:	
Contact details:	
Date submitted:	3/01/2018

If the nomination has been refereed or reviewed by experts, please provide their names and contact details:

Summary of subpopulation information *(detailed information to be provided in the relevant sections of the form)*						
Location	Land tenure	Survey information: Date of survey and No. mature individuals	AOO	Site / habitat Condition	Threats *(note if past, present or future)*	Specific management actions
Hay River (including lower Mitchell River)	National Park	2012-2015: 440 (incl. juveniles)	$10km^2$	Hay River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, secondarily salinised (max. recorded salinity 6.5 ppt) Mitchell River (lower reaches): intact riparian vegetation, with complex instream habitat, flows seasonally and dessicates completely during baseflow, water fresh (max. recorded salinity 6.5 ppt) Intact riparian vegetation, ephemeral Mitchell River, secondarily salinised (Hay River)	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Eastern mosquitofish, pigs). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere). Instream barriers (ford on Mitchell River may partially impede migrations in shoulder flow periods). **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Other potential introductions). Climate change (flow reductions, refuge pool loss). Water abstraction (from the Mitchell River).	Ongoing research into ecology and distribution of the species. Education to prevent further alien/non-native species introductions/ releases to the wild. Addressing salinisation in the Hay River catchment (as has been achieved in the Denmark Catchment). Research to quantify future population viabilities (particularly salinity and temperature tolerances).

					Fire (knowledge gap but known to impact freshwater fish elsewhere).	
Denmark River (including unnamed tributary)	National Park	2012-2016: 151 (incl. juveniles)		Denmark River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, water fresh (max. recorded salinity ~6.5 ppt) Unnamed tributary: intact riparian vegetation, flows seasonally, water contracts to two artificial pools (DPaW water points) during baseflow, water is fresh (max. recorded salinity 6.5 ppt)	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Climate change (flow reductions, refuge pool loss). Introduced species (Eastern mosquitofish, pigs). Fire (knowledge gap but known to impact freshwater fishes elsewhere; water extraction and potential contamination with retardant chemical in fire-fighting water points occupied by the species). Instream barriers (full catchment has not been assessed but several barriers are known). **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Climate change (flow reductions, refuge pool loss). Introduced species (other potential introductions). Fire (extraction from fire-	Denmark salinity action plan has reversed salinisation trend in the Denmark River. Ongoing research into ecology and distribution of the species. Education to prevent further alien/non-native species introductions/ releases to the wild. More distributional surveys are required including mapping refuge pools (partially achieved under the State NRM project 2012-2015, including the discovery of the Denmark, Kent and Lake Smith populations). Careful management of the existing artificial water points that are used as refuge in the Denmark catchment. Research to quantify future population viabilities (particularly salinity and temperature tolerances). Possible intra-catchment translocation to neighbouring tributaries with known baseflow refuges could expand EOO/AOO.

					fighting waterpoints, potential contamination with retardant chemicals, plus impacts of fire itself).	
Kent River (including Moombaki Creek)	National Park; Private Property	2012-2015: 173 (incl. juveniles)		River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, secondarily salinised (max. recorded salinity 6.5 ppt) "Moombaki Creek": land for wildlife farmland with some areas of intact riparian vegetation, flows seasonally and contracts to disconnected pools during baseflow; instream barriers (dams) present.	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Eastern mosquitofish). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere). Instream barriers. **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (other potential introductions). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere).	Ongoing research into ecology and distribution of the species. Education to prevent further alien/non-native species introductions/ releases to the wild. Addressing salinity in the Kent River catchment (as has been achieved in the Denmark Catchment). Research to quantify future population viabilities (particularly salinity and temperature tolerances).

Lake Smith	National Park	2014: Unknown		Permanent wetland (~400x150m at peak water levels) with intact riparian vegetation; water fresh (max. recorded salinity ~6.5 ppt)	**Past/Present:** Climate change (lowered groundwater, reduced recharge). Fire (knowledge gap but known to impact freshwater fishes elsewhere). **Future:** Introduced species (potential introductions). Climate change (lowered groundwater, reduced recharge). Potential water abstraction (groundwater). Fire (knowledge gap but known to impact freshwater fishes elsewhere).	Ongoing research into ecology and distribution of the species. Education to prevent further alien/non-native species introductions/ releases to the wild. Ensuring adequate water levels in Lake Smith are maintained (i.e. conservative groundwater abstractions limits if relevant). Research to determine distribution and population viabilities in neighbouring lakes (State Strategic NRM project 2012-2015 discovered this population). Research to quantify phyiscochemical tolerances (particularly salinity and temperature).

Threatened species nomination

For nominations to the WA Threatened Species Scientific Committee (and the Minister for Environment) to amend threatened species listings under the WA *Wildlife Conservation Act 1950* or their IUCN Red List threat status.

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Species name (scientific and common name)**:**	***Nannoperca pygmaea* (little pygmy perch)**
Nomination for (addition, deletion, change)**:**	**Addition**
Nominated conservation category and criteria:	**Endangered B1ab(i,ii,iii)c(ii)+2ab(i,ii,iii)c(ii)**

TSSC assessment of eligibility against the criteria:		
A.	Population size reduction	• Insufficient data to be able to assess eligibility against criterion A.
B.	Geographic range	• The species has an EOO of 3420km^2 (EOO < 5000 km^2) and occurs at < 5 locations. The restricted population within the Hay River catchment is suspected to have contracted due to secondary salinity, and contraction of the Kent River subpopulation is suspected to also have occurred.
C.	Small population size and decline	• Insufficient data to be able to assess eligibility against criterion C.
D.	Very small or restricted population	• Insufficient data to be able to assess eligibility against criterion D.
E.	Quantitative analysis	• Insufficient data to be able to assess eligibility against criterion E.

Outcome*:*			
TSSC Meeting date:	8 May 2015		
TSSC comments:	The committee noted that the AOO was calculated using 1 km^2 grids instead of 2 km^2 grids as per the IUCN guidelines. The listing due to AOO was not supported as the fish utilise all available habitat and the seasonal movements, contraction to refuge pools over summer, are part of the species natural history. The application of severely fragmented and extreme fluctuations was also not supported for the same reason.		
Recommendation:	**Endangered B1ab(i,ii,iii)**		
Ministerial approval:	21 October 2015	*Government Gazette:*	3 November 2015

Nomination summary *(to be completed by the nominator)*

1.1 Current conservation status				
Scientific name:	*Nannoperca pygmaea*			
Common name:	Little Pygmy Perch			
Family name:	Percichthyidae	Fauna ☒	Flora ☐	
Nomination for:	**Listing** ☒	Change of status ☐	Delisting ☐	
Is the species currently on any conservation list, either in WA, Australia or Internationally?		Yes ☒ *If Yes; complete the following table*	No ☐ *If No; go to the next question Nominated conservation status'*	

Jurisdiction	**List or Act name**	**Date listed or assessed**	**Listing category i.e. critically endangered**	**Listing criteria i.e. A4ce; B1ab(iii)+2ab(iii)**
International	IUCN Red List			
National	Australian Society for Fish Biology (using IUCN Criteria)	July 2011	Critically Endangered	B2a,b,c
State of WA	WC Act			
	Priority Fauna List	1☐	2 ☒ 3 ☐ 4 ☐ 5 ☐	
Other States or Territories				

1.2 Nominated conservation status: category and criteria				
Presumed extinct (EX) ☐	Critically endangered (CR) ☐	**Endangered (EN)** ☒	Vulnerable (VU) ☐	
None ☐	Priority 1 ☐	Priority 2 ☐	Priority 3 ☐	Priority 4 ☐
What criteria support the conservation status category above? *Refer to Appendix A table 'Summary of the five criteria (A-E)' and the check version that can be completed to indicate all criteria options*		**B1ab(i,ii,iii)c(ii)+B2ab(i,ii,iii)c(ii)**		

1.3 Eligibility against the criteria		
*Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For **delisting**, provide details for why the species no longer meets the requirements of the current conservation status.*		
A.	Population size reduction	• A2. The population within the Hay River catchment is suspected to have contracted due to secondary salinisation of that catchment, where it is now very restricted in distribution; breeds within a single small tributary and retreats to a few small pools during seasonal desiccation of the tributary. Contraction of the Kent River

		sub-population is suspected to have also occurred.
B.	Geographic range	• B1. EOO = 3420 km^2, calculated using minimum convex polygon alpha hull (EOO < 5000 km^2), • B2. AOO =10 km^2, calculated using 1 km x 1 km grid squares (AOO < 500 km^2), • And: a) Severely fragmented and number of locations ≤ 5. This includes a restricted area of the Denmark, Mitchell/Hay, Kent, and Lake Smith = four locations (Figure 1). Despite being in three adjacent catchments (i.e. Hay, Denmark, Kent), it does not appear to be in others between the Kent and Lake Smith to the west (Figure 1). There is another as yet undescribed *Nannoperca* species in the rivers of the Broke Inlet (Murphy *et al*. unpubl.) and we have recently surveyed the Bow River specifically searching for *N. pygmaea* and did not detect it. Surveys have also recently (past 5 years) been conducted in the all rivers between the Lake Smith and the Kent River populations without detecting the species. However, additional, more targeted surveys are still required to confirm its absence from those systems. • And: b) Continuing decline: (i) inferred past and projected future decline in EOO (ii) inferred past and projected future decline in AOO (iii) inferred past and projected future decline in area, extent and/or quality of habitat (iv) inferred past and projected future decline in the number of locations or subpopulations (v) inferred past and projected future decline in the number of mature individuals • And: c) (ii) Extreme fluctuations in area of occupancy and (iv)the number of mature individuals. Due to its seasonal movement and breeding patterns (i.e. from base-flow refuge pools to peak-flow breeding habitats in tributaries), it seasonally and spatially fluctuates in abundance. However, we have no evidence of interannual variation in total abundance within populations. It appears that the Hay/Mitchell population is the lowest in abundance relative to the Denmark and the Kent (the latter being the most abundant and widespread based on CPUE in fyke netting.
C.	Small population size and decline	• This is a knowledge gap, however, a total of only 750 Little Pygmy Perch have been captured during a recent study (2012-2015) that has surveyed > 80 sites. They represented only 2.2 % of the total fish catch during that

		study. Generation time is 1 year, due to the species having a one year life-cycle. No population declines have been documented since the recent discovery of the species in 2010. Three of the four populations have been discovered even more recently (2012-2014), with insufficient time having passed to make an assessment of population decline.
D.	Very small or restricted population	• This is a knowledge gap, however, a total of only 750 Little Pygmy Perch have been captured during a recent study (2012-2015) that has surveyed > 80 sites (Figure 1). They represented only 2.2 % of the total fish catch during that study. The number of mature individuals is likely to be small. The AOO is < 500 km^2, with populations in the Hay and Denmark rivers restricted to just 1 km^2 and 3 km^2, respectively.
E.	Quantitative analysis	• N/A

1.4 Reasons for change of status

Genuine change ☐ New knowledge ☒ Taxonomic change ☐ Previous mistake ☐ Other ☐

1.5 Summary of assessment information *(detailed information to be provided in the relevant sections of the form)*

EOO	3420 km^2	AOO	10 km^2 (1 km x1 km grid squares)	Generation length	1 year

No. Locations	Four (location = sections of connected rivers)	Severely Fragmented	Yes ☒ No ☐
No. Mature individuals	Unknown, possibly <2500	No. sub-populations	Four

Percentage global population within WA	100
Percentage global population within Aust.	100
Percentage population decline over 10 years or 3 generations	Unknown

1.6 Summary of subpopulation information *(detailed information to be provided in the relevant sections of the form)*							
Location *(include coordinates)*	Survey date *(note if targeted)*	No. Mature individuals	AOO	Site / habitat Condition	Land tenure	Threats *(note if past, present or future)*	Specific management actions
Hay River (incl. lower Mitchell River)	2012-2015 (Strategic State NRM Project)	440* captured (N.B. this is an overestimation as this includes juveniles and length at maturity has not been quantified)	10 km^2	Hay River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, secondarily salinised (max. recorded salinity 6.5 ppt) Mitchell River (lower reaches): intact riparian vegetation, with complex instream habitat, flows seasonally and dessicates completely during baseflow, water fresh (max. recorded salinity 6.5 ppt) Intact riparian vegetation, ephemeral Mitchell River, secondarily salinised (Hay River)	National Park	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Eastern Gambusia, pigs). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere). Instream barriers (ford on Mitchell River may partially impede migrations in shoulder flow periods). **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Other potential introductions). Climate change (flow reductions, refuge pool	**Current:** Ongoing research into ecology and distribution of the species. Education to mitigate the risk of further alien species introductions. **Required:** Addressing salinisation in the Hay River catchment (as has been achieved in the Denmark Catchment). Education to mitigate the risk of further alien species introductions. Research to quantify future population viabilities (particularly salinity and temperature tolerances).

						loss). Water abstraction (from the Mitchell River). Fire (knowledge gap but known to impact freshwater fish elsewhere).	
Denmark River (incl. unnamed tributary)	2012-2015 (Strategic State NRM Project)	137* captured (N.B. this is an overestimation as this includes juveniles and length at maturity has not been quantified)		Denmark River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, water fresh (max. recorded salinity ~ 6.5 ppt) Unnamed tributary: intact riparian vegetation, flows seasonally, water contracts to two artificial pools (DPaW water points) during baseflow, water is fresh (max. recorded salinity 6.5 ppt)	National Park	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Climate change (flow reductions, refuge pool loss). Introduced species (Eastern Gambusia, pigs). Fire (knowledge gap but known to impact freshwater fishes elsewhere; water extraction and potential contamination with retardant chemical in fire-fighting water points occupied by the species). Instream barriers (full catchment has not been assessed but several barriers are known). **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated	**Current:** Denmark salinity action plan has reversed salinisation trend in the Denmark River. Ongoing research into ecology and distribution of the species. Education to mitigate the risk of further alien species introductions. **Required:** Education to prevent further introduced species being introduced. More distributional surveys are required including mapping refuge pools (partially achieved under the State NRM project 2012-2015, including the discovery of the Denmark, Kent and Lake Smith populations). Careful management of the existing artificial water points that are used as refuge in the Denmark catchment. Research to quantify future population viabilities (particularly salinity and temperature tolerances).Possible intra-

						impacts). Climate change (flow reductions, refuge pool loss). Introduced species (other potential introductions). Fire (extraction from fire-fighting waterpoints, potential contamination with retardant chemicals, plus impacts of fire itself).	catchment translocation to neighbouring tributaries with known baseflow refuges could expand EOO/AOO.
Kent River (incl. Moombaki Creek)	2012-2015 (Strategic State NRM Project)	173* captured (N.B. this is an overestimation as this includes juveniles and length at maturity has not been quantified)		Kent River: intact riparian vegetation with complex instream habitat, flows seasonally and contracts to a series of disconnected pools during baseflow, secondarily salinised (max. recorded salinity 6.5 ppt) "Moombaki Creek": land for wildlife farmland with some areas of intact riparian vegetation, flows seasonally and contracts to disconnected pools during baseflow; instream barriers (dams) present.	Nat. Park, and private property	**Past/Present:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (Eastern Gambusia). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere). Instream barriers. **Future:** Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts). Introduced species (other	**Current:** Ongoing research into ecology and distribution of the species. Education to mitigate the risk of further alien species introductions. **Required:** Addressing salinity in the Kent River catchment (as has been achieved in the Denmark Catchment). Education to mitigate the risk of further alien species introductions. Research to quantify future population viabilities (particularly salinity and temperature tolerances).

						potential introductions). Climate change (flow reductions, refuge pool loss). Fire (knowledge gap but known to impact freshwater fishes elsewhere).	
Lake Smith	2012-2015 (Strategic State NRM Project) (November 2014 sample)	Unknown; only captured on a single occasion		Permanent wetland (~ 400 x 150 m at peak water levels) with intact riparian vegetation; water fresh (max. recorded salinity ~6.5 ppt)	Nat. Park	**Past/Present:** Climate change (lowered groundwater, reduced recharge). Fire (knowledge gap but known to impact freshwater fishes elsewhere). **Future:** Introduced species (potential introductions). Climate change (lowered groundwater, reduced recharge). Potential water abstraction (groundwater). Fire (knowledge gap but known to impact freshwater fishes elsewhere).	**Current:** Ongoing research into ecology and distribution of the species. Education to mitigate the risk of further alien species introductions. **Required:** Ensuring adequate water levels in Lake Smith are maintained (i.e. conservative groundwater abstractions limits if relevant). Education to mitigate the risk of further alien species introductions. Research to determine distribution and population viabilities in neighbouring lakes (State Strategic NRM project 2012-2015 discovered this population). Research to quantify phyiscochemical tolerances (particularly salinity and temperature).

Section 1: Species information

1.1 Morphology / physical description

Insert photograph(s) of species or provide as an attachment:

Describe the species:	A full taxonomic description of the species is provided by Morgan *et al*. 2011. Small percichthyid (maximum total length 65 mm, most individuals < 50 mm) with a small mouth, a deeply notched dorsal fin, tan brown base colouration with a line of square-shaped dark blotches on the middle of the sides, 5–10 thin lateral stripes most obvious below lateral line, a dark spot at the base of the tail surrounded by a pale halo, reddish-orange dorsal and caudal fins. It differs from the sympatric congener Western Pygmy Perch *Nannoperca vittata* (Castelnau) by a slightly blunter snout, the possession of thin latero-ventral stripes, absence of dark pigment on the belly, and generally fewer dorsal rays and anal rays. Distinguished from Balston's Pygmy Perch *Nannatherina balstoni* (Regan) by having a smaller mouth (rarely reaching eye in *N. pygmaea*), ctenoid body scales (vs. cycloid), generally fewer pectoral rays and a smaller maximum size.

1.2 Biology *(provide details)*

The annual spawning season peaks in July-August. It is potamodromous (migrates within river systems for breeding) and moves upstream into tributaries when they begin flowing (June) (unpubl. data). Although the early life-history (egg deposition, hatching times, ontogeny) has not been fully determined, the species is a serial batch-spawner (similar to *Nannoperca vittata*) with females releasing multiple batches of eggs, most likely amongst inundated vegetation during winter. By October, the majority of mature fish have completed their breeding (based on external examination of female). Probably less long-lived than the Western Pygmy Perch (based on length-frequency distributions) with a maximum age of < 3 years, although specimens captured in artificial water points are larger on average and probably live longer than 3 years.

1.3 Ecology *(provide details)*

Dietary analysis has not yet been completed but based on gut content analysis of a limited number of individuals; it appears to be carnivorous, similar to the sympatric *N. vittata*, consuming aquatic macroinvertebrates (terrestrial insect larvae, Copepods, Ostracods). Decline in quality or amount of riparian vegetation or further decline in water quality may reduce the abundance and/or diversity of macroinvertebrates available to the species. Nothing is

known of its parasites/diseases or physicochemical tolerances. The salinity tolerance is likely to be similar to the sympatric pygmy perches *N. balstoni* and *N. vittata* which have acute tolerances of 8.2 and 14.6 $g.L^{-1}$, respectively (Beatty *et al*. 2011) with capture sites suggesting it can tolerate a salinity of at least ~ 6.5 ppt. Mean winter temperatures in the Hay River sites of occupation are ~ 12 °C with summer means of ~ 23 °C.

Section 2: Taxonomy

2.1 Current taxonomy		
Species name and Author:	*Nannoperca pygmaea* Morgan, Beatty and Adams 2013	
Subspecies name(s) and Author:		
Is the species conventionally accepted?		Yes ☒ No ☐
Is there any controversy about the taxonomy?		Yes ☐ No ☒
If not conventionally accepted and/or if there is any controversy; provide details:		
Has the species formally described?		Yes ☒ No ☐
Has the species been recently described?		Yes ☒ No ☐
If the species has not been formally described; is it in the process of being described? When will the species be described? Is there an anticipated date for the publication of the description? Has a type specimen been deposited? And if so provide the registration number and where is it deposited.		
If there are any closely related taxa provide details and include key distinguishing features:	It differs from the sympatric congener Western Pygmy Perch *Nannoperca vittata* (Castelnau) by a slightly blunter snout, the possession of thin latero-ventral stripes, absence of dark pigment on the belly, and generally fewer dorsal rays and anal rays. Distinguished from Balston's Pygmy Perch *Nannatherina balstoni* (Regan) by having a smaller mouth (rarely reaching eye in *N. pygmaea*), ctenoid body scales (vs. cycloid), generally fewer pectoral rays and a smaller maximum size. Allozyme analyses unequivocally demonstrate that sympatric populations of *Nannoperca pygmaea* and *Nannoperca vittata* represent distinct genetic lineages, display no genetic intermediates, and are diagnosable by fixed allozyme differences at 15 different loci.	
2.2 Taxonomic history		
Are there recent synonyms for the species?		Yes ☐ No ☒
If Yes; provide details of synonyms:		
Have there been recent changes in the taxonomy or nomenclature?		Yes ☐ No ☒
If Yes; provide details of changes:		
2.3 Hybridisation		
Is there any known hybridism with other species in the wild?		Yes ☐ No ☒ Unknown ☐

If Yes; Where does this occur and how frequently?	

Section 3: Geographic range

3.1 Distribution	
Insert map(s) of the species distribution, or provide as an attachment: See Figure 1 below.	
What is the current distribution of the species within Western Australia?	Mitchell River (~ 1 rkm) and Hay River (~ 0.8 rkm). One site in the Denmark River and probably at least ~12 km of an unnamed eastern – flowing tributary that meets the Denmark River ~ 1 km upstream of its site of occupancy at Powley Rd crossing on the main channel. The forested middle reaches of the Kent River (and probably its tributaries) between Moombaki Creek (Kentdale area) and Basin Rd. Lake Smith (one site only) (Figure 1).

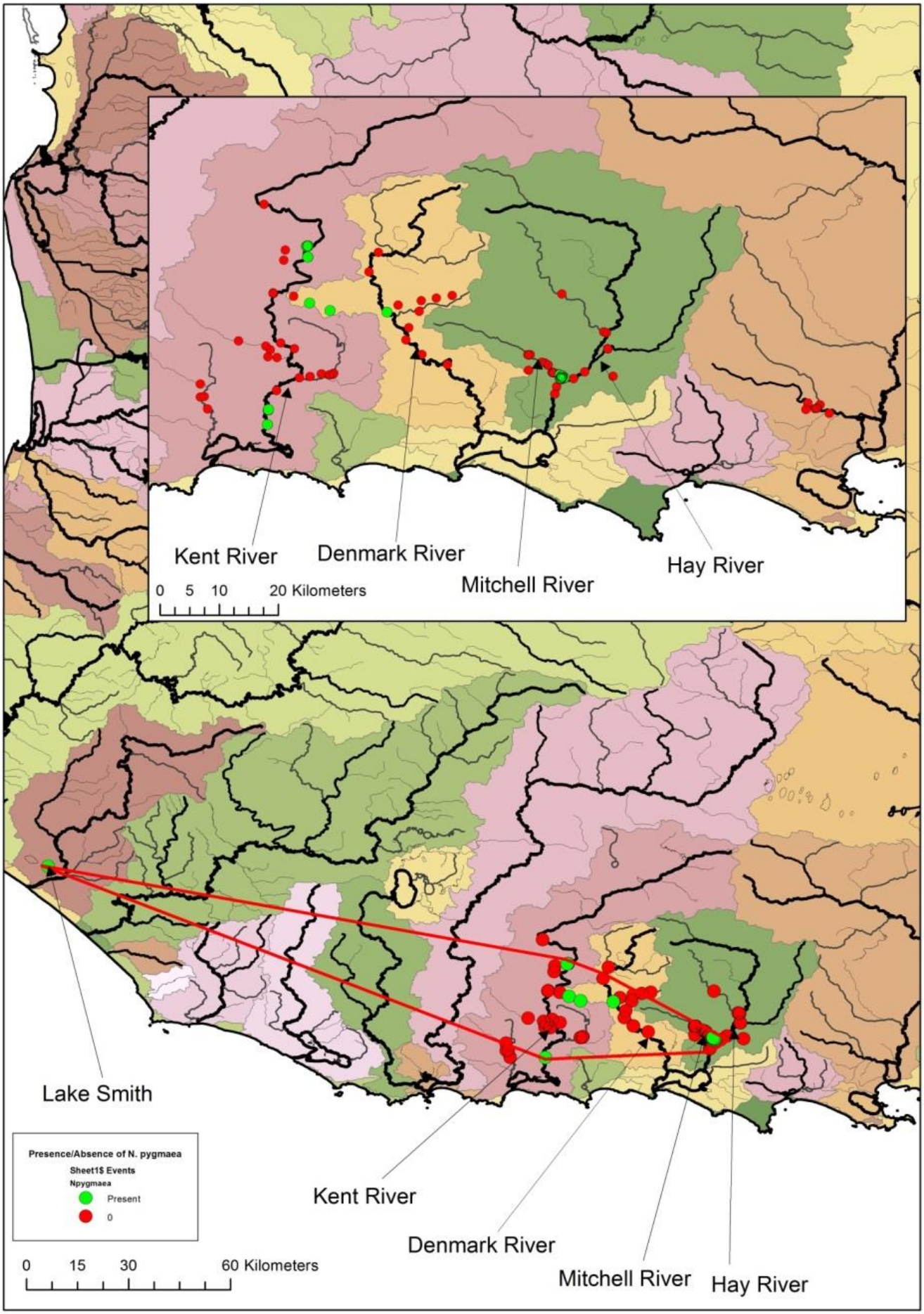


Figure 1: Current known distribution of *Nannoperca pygmaea*. (N.B. Data from the nominators as part of a State Strategic NRM study sampling > 80 sites 2012-2015 - Murdoch University and CENRM, UWA).

What percentage of the species distribution is within WA?	100
What is the current distribution of the species within the other Australian States and Territories?	NA
Does the species occur outside of Australia?	Yes ☐ No ☒
If Yes, what percentage of the species distribution is within Australia?	
What is the current international/global distribution of the species?	NA
What is the current international trend for the species?	NA

3.2 Migration

Is the species migratory?	Yes ☒ No ☐
Is the migration within WA or within Australia or international?	Within rivers in south-west W.A.

It is potamodromous (migrates within river systems for breeding) and moves from baseflow refuge pools (two known from the Hay River, five from the Kent River, two from a tributary of the Denmark River, and Lake Smith) to other habitats (likely to be tributaries for most populations) during winter. By October, all mature fish have completed their breeding (based on external examination of females). Breeding habitats in the Mitchell River dry to a series of small pools, however, the species has not been detected in them. Their only known baseflow refuges in this system are downstream in the Hay River main channel (two pools). In the Denmark River, the species is known from the main channel (one site) and an east flowing seasonal tributary where it is found year-round in two artificial pools (fire-fighting water points). During the dry season it occupies the pools and moves into the adjoining flooded streamline during the breeding period. In the Kent River, it occurs in relatively large numbers in two (and present in a further three) known baseflow refuge pools, but the precise breeding habitats remain unknown (work continuing). Nothing is known of the movement of the Lake Smith population which was only discovered in November 2014.

3.3 Extent of Occurrence (EOO)

What is the current EOO?	3420 km^2
How has this been calculated?	Presence records were mapped as vector data in ArcGIS™ Desktop 10.2. Minimum convex polygons (α-hulls) drawn following IUCN guidelines (IUCN, 2013).
What is the historical EOO?	Unknown prior to 2008.
What is the current EOO trend?	Decreasing ☒ Increasing ☐ Stable ☐
Provide details on the current trend	Assessment is data deficient in terms of trend in EOO, however, we assume a declining trend consistent with a number of other south-western Australian freshwater fishes over the past 100 years; particularly within the Hay and Kent rivers which are subjected to increasing levels of secondary salinisation.
If there has been a change in EOO when did this change occur?	We assume declining EOO in the past ~ 100 years since secondary salinsation has impacted the Hay and Kent rivers.
Was the change observed, estimated,	Inferred (past). We inferred past decline associated with increasing salinity, riparian degradation, flow declines (past 40 years), proliferation of instream

inferred or projected?	barriers (e.g. dams, weirs, fords) and possibly introduced species (*G.holbrooki* introduced in W.A. in the 1930s is known to negatively impact perchichthyids). These stressors are acting in all systems occupied by *N. pygmaea* aside from Lake Smith which is currently free of introduced fishes (the others have *G. holbrooki* in their catchment). We assume that the species would have been more widespread in the upper catchments of the Kent and Hay Rivers prior to the salinisation of those areas. There is a recent trend of declining salinity in the Denmark River, so we are less certain of historical distribution, however, clearing in the upper catchment may have caused loss from that area as well.
If the EOO is decreasing / declining, is it continuing?	Yes ☒ No ☐
Is the continuing decline observed, estimated, inferred or projected?	We project future decline due to projected amplification of the key stressors of flow declines and salinisation (and possibly other introduced species). The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (~ 6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation reducing EOO/AOO from salinity being limited in this catchment, however, projected flow declines due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. The impact of climate change on the spawning migrations of sympatric species has recently been demonstrated (Beatty *et al*. 2014).
Is there extreme fluctuation in EOO?	Yes ☒ No ☐
If Yes, provide details:	While this is still somewhat data deficient, the non-permanency of seasonally utilised habitat causes loss of the species from large areas of occupancy during baseflow periods in the Mitchell River (and probably other systems where it occurs). Due to its seasonal movement and breeding patterns (i.e. from base-flow refuge pools to peak-flow breeding habitats in tributaries), it seasonally and spatially fluctuates in abundance. However, we have no evidence of interannual variation in total abundance within populations. It appears that the Hay/Mitchell population is the lowest in abundance relative to the Denmark and the Kent (the latter being the most abundant and widespread based on CPUE in fyke netting.
3.4 Area of Occupancy (AOO)	
What is the current AOO?	10 km^2.
How has this been calculated?	Based on point sampling at sites throughout its range fitting capture sites with 1 km^2 grids.

What is the historical AOO?	Unknown
What is the current AOO trend?	Decreasing ☒ Increasing ☐ Stable ☐
Provide details on the current trend	Based on other fishes in the region and the past and projected stressors (discussed above), acting in its catchments, it is inferred and projected that the AOO is decreasing.
If there has been a change in AOO when did this change occur?	Past 100 years, particularly the past 40 years.
Was the change observed, estimated, inferred or projected?	Inferred
If the AOO is decreasing / declining, is it continuing?	Yes ☒ No ☐
Is the continuing decline observed, estimated, inferred or projected?	Based on other fishes in the region and the past and projected stressors, acting in its catchments, it is projected that the decreasing AOO is continuing. We project future decline of AOO due to projected amplification of the key stressors of flow declines and salinisation (and possibly other introduced species). The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (~ 6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation reducing EOO/AOO from salinity being limited in this catchment, however, projected flow declines due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. The impact of climate change on the spawning migrations of sympatric species has recently been demonstrated (Beatty *et al*. 2014).
Is there extreme fluctuation in AOO?	Yes ☒ No ☐
If Yes, provide details:	Due to its seasonal movement and breeding patterns (i.e. from base-flow refuge pools to peak-flow breeding habitats in tributaries), it seasonally and spatially fluctuates in extent of occurrence, being highly concentrated (in refuge pools) during baseflow before (apparently) dispersing across a broader area during peak flows to utilise seasonally flowing lotic habitats. It appears that the Hay/Mitchell population is the lowest in abundance relative to the Denmark and the Kent rivers (the latter being the most abundant and widespread based on CPUE in fyke netting).
Does the species have a restricted AOO?	Yes ☒ No ☐
If Yes, provide details:	We know it from relatively restricted river reaches in three catchments and a single lake locality (Figure 1). The localities, when grouped by rivers numbers only four. These include possible sub-populations in the middle-lower reaches of the Kent catchment, an unnamed

	tributary of the Denmark River (arising near the watershed border of the Kent catchment) including a single site nearby in the Denmark River near the confluence of that tributary, the lower Mitchell River/Hay River, and Lake Smith (Figure 1).

3.5 Number of Locations

How many locations does the species occur?	There are four localities (assuming grouping of localities within river reaches).	
Has there been a change in the number of locations?		Yes ☒ No ☐
If there has been a change, what was the change?	Decrease ☒	Increase ☐
If there has been a change, when did this change occur?	Past 100 years, particularly the past 40 years.	
Was the change observed, estimated, inferred or projected?	Inferred, see below	
If the number of locations is decreasing / declining, is it continuing?		Yes ☒ No ☐
Is the continuing decline observed, estimated, inferred or projected?	Inferred/projected Based on other fishes in the region and the past and projected stressors, acting in its catchments, it is inferred and projected that the number of locations (and EOO, AOO) is decreasing. We project future decline due to projected amplification of the key stressors of flow declines and salinisation (and possibly other introduced species). The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (up to ~ 6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation reducing EOO/AOO from salinity being limited in this catchment, however, projected flow declines due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. The impact of climate change on the spawning migrations of sympatric species has recently been demonstrated (Beatty *et al*. 2014).	
Is there extreme fluctuation in the number of locations?		Yes ☒ No ☐
If Yes, provide details:	Due to its seasonal movement and breeding patterns (i.e. from base-flow refuge pools to peak-flow breeding habitats in tributaries), it seasonally and spatially fluctuates in distribution associated with inundation of spawning habitat.	
Is the number of locations restricted?		Yes ☒ No ☐

If Yes, provide details:	The localities, when grouped by river reaches number only four. These include possible sub-populations in the middle reaches of the Kent catchment (centred around Bevan Rd), the lower Kent catchment (within and adjacent to Moombaki Creek), an unnamed tributary of the Denmark River (arising near the watershed border of the Kent catchment) and a single site nearby in the Denmark River near the confluence of that tributary, and the lower Mitchell River/Hay River (Figure 1).It relies on a limited number of refuge pools to survive the summer baseflow period (two major pools known in the Hay, two in the Denmark (both artificial fire-fighting water points), four from the Kent, and Lake Smith).
Does this species occur on any off-shore islands?	Yes ☐ No ☒
If Yes, provide details:	NA
3.6 Fragmentation	
Is the distribution fragmented?	Yes ☒ No ☐
Is the distribution severely fragmented?	Yes ☒ No ☐
If Yes, provide details:	Yes, despite being in three adjacent catchments (i.e. Hay, Denmark, Kent), it does not appear to occur in any catchments between the Kent and Lake Smith to the west. There is another as yet undescribed *Nannoperca* species in the rivers of the Broke Inlet (Murphy *et al*. unpubl.) and we have recently surveyed the Bow River specifically searching for *N. pygmaea* but did not detect it. Surveys have also recently (past 5 years) been conducted in all rivers between Lake Smith and the Kent River without detecting the species. However, additional, more targeted surveys are still required to confirm its absence from those systems.
3.7 Land tenure	
Is the species known to occur on lands managed primarily for nature conservation? i.e. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation	Yes ☒ No ☐
If Yes; provide details:	All but one (i.e. Moombaki Creek) of the 'subpopulations' exist in National Parks. These include D'Entrecasteaux National Park (Lake Smith), Mount Roe National Park (Kent River), Mount Lindesay National Park (Denmark River, and the Mitchell River including one side of the Hay River location).
Is the species known to occur on lands that are under threat? i.e. mining tenement, zoned for development	Yes ☐ No ☒
If Yes; provide details:	
Provide details of other land tenures where the species occurs	Moombaki / lower Kent population exists in a short section of privately held land.

Section 4: Habitat

4.1 Habitat *(provide details in response to the question below)*	
Described the habitat suitable for the species (biological and non-biological):	The species exists in river reaches with relatively intact riparian vegetation with salinities < ~ 6 ppt. It is known to utilise ephemeral systems (in the Mitchell River and the Denmark tributary) for breeding and as nursery areas. It relies on a limited number of refuge pools to survive the summer

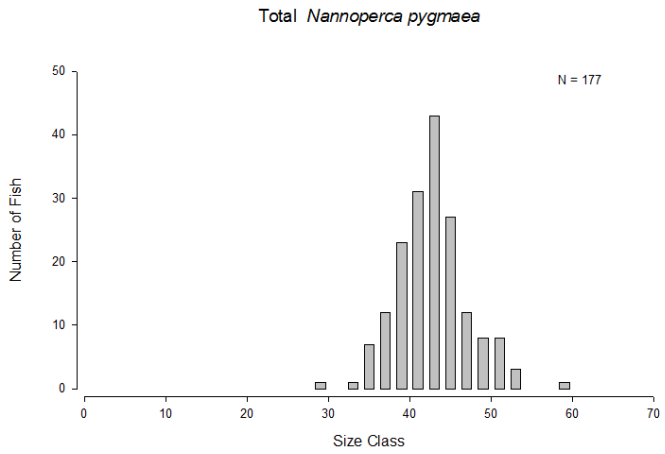
	baseflow period (two major pools known in the Hay, two in the Denmark (both artificial fire-fighting water points), four from the Kent, and Lake Smith). Fine scale habitat preferences have not been quantified; however, its habitats are typified by high instream habitat complexity including large woody debris and emergent riparian vegetation (sedges, rushes).
If the species occurs in a variety of habitats, is there a preferred habitat?	Other than broad scale habitat use gathered as part of distributional and ecological studies, fine scale habitat preferences have not been quantified. However, its habitats are typified by high instream habitat complexity including large woody debris and emergent riparian vegetation (sedges, rushes). It is also known to utilise artificial lentic systems with three such refuge pools known, including the modified wetland in Moombaki Creek, and two fire-fighting water points on a tributary of the Denmark River. In terms of lotic habitats, it appears to prefer systems with a high degree of physical and biological naturalness (i.e. generally isolated locations, largely free from introduced species, or major instream barriers to movements).
Does the species utilise a variety of habitats? (include for what purpose i.e. foraging, breeding, roosting, seasonal migration, different life stages)	Yes ☒ No ☐
If Yes, provide details:	It moves from isolated baseflow refuge pools in rivers and streams to lotic habitats during winter for breeding (known to be ephemeral tributaries in at least two of the four localities, i.e. the Mitchell River, and the Denmark tributary with the others yet to be discovered). Breeding habitats in the Mitchell River dry to a series of small pools, however, the species has not been detected in them. Their only known baseflow refuges in this system are downstream in the Hay River main channel (two pools). In the Denmark River, the species is known from the main channel (one site) and an east flowing seasonal tributary where it is found year-round in two artificial pools (fire-fighting water points). During the dry season it occupies the pools and moves into the adjoining flooded streamline during the breeding period. In the Kent River, it occurs in relatively large numbers in two baseflow refuge pools in the upper catchment but it then disappears from these presumably into tributary spawning habitats during winter which remain undetected (work continuing). It is also known from Moombaki Creek and the adjacent lower Kent River (Kentdale area). Nothing is known of the habitat use of the Lake Smith population which was only discovered in November 2014.
Does the species use refugia? *(include what is it and when is it used)*	It relies on a limited number of refuge pools to survive the summer baseflow period (two major pools known in the Hay, two in the Denmark (both artificial fire-fighting water points), four from the Kent, and Lake Smith).
Is this species reliant on a threatened or priority species or ecological community?	Yes ☐ No ☒
If Yes, provide details:	
Are there any other species (sympatric species) that may affect the conservation status of the nominated species?	Yes ☒ No ☐
If Yes, provide details:	Sympatric with the WCA, 1950 *Schedule 1* and EPBC 1999 *Threatened Nannatherina balstoni* and the WCA, 1950 *Schedule 1 Galaxiella munda.* Sympatric with the introduced Eastern Gambusia *G. holbrooki* that represents a considerable threat to the species.
What is the area, extent, abundance of habitat?	See Figure 1. During peak flow it is likely to occupy ~ 3 rkm of the Mitchell River (width < 4 m), an unknown length (possibly 15 rkm) within the Denmark River tributary (width < 4 m), an unknown length of the Kent River (possibly ~ 50 rkm), and Lake Smith (~ 300 x 150 m at peak water levels).

What is the quality of habitat?	Current habitat is relatively remote, undisturbed reaches (in terms of riparian habitat) of the three rivers and Lake Smith. The species exists in river reaches with relatively intact riparian vegetation with salinities < ~ 6 ppt. Baseflow refuges include artificial waterpoints that have some fringing vegetation that forms a broader, more natural inundated floodplain during winter and spring. Other refuges are relatively undisturbed. Its winter-spring tributary habitats (breeding and as nursery areas) are relatively undisturbed (aside from bushfire and limited vehicle tracks). Its habitats are typified by high instream habitat complexity including large woody debris and emergent riparian vegetation (sedges, rushes).
Is there a decline in habitat area, extent or quality?	Yes ☒ No ☐
If there is a decline, is the decline continuing?	Yes ☒ No ☐
Provide details:	The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (~ 6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation reducing EOO/AOO from salinity being limited in this catchment, however, projected flow declines due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. The impact of climate change on the spawning migrations of sympatric species has recently been demonstrated (Beatty *et al*. 2014).
What is the critical habitat for the species?	The species exists in (and probably requires) river reaches or perennial wetlands with relatively intact riparian vegetation with salinities < ~ 6 ppt. It is known to utilise ephemeral systems (in the Mitchell River and the Denmark tributary) for breeding and as nursery areas. It requires refuge pools (i.e. permanent water) to survive the summer baseflow period, and is known to use artificial pools (i.e. fire-fighting water points) for this purpose. Fine scale habitat preferences have not yet been quantified; however, its habitats are typified by high instream habitat complexity including large woody debris and emergent riparian vegetation (sedges, rushes).
What is the habitat important for the survival of the species?	Whilst its physiological tolerances and precise habitat preferences have not been quantified, it is highly likely it is stenohaline (such as sympatric species) and not able to tolerate salinities much above its current sites of occupancy (found up to ~6.5 ppt with the acute tolerance of *N. balstoni* being ~8 ppt) and this may be a driver of inferred distributional decline in secondarily salinised systems (i.e. Kent and Hay). As with its congeners, intact riparian zones provide food sources (i.e. macroinvertebrates), shelter, and probably spawning sites and are likely to be important for the survival of the species.

Section 5: Population

'Population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of mature individuals of the taxon. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. (IUCN 2001)
'Subpopulations' are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).
'Locations' are defined as a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. (IUCN 2001).

5.1 Population size *(include how numbers were determined/calculated)*	
What is the total population size?	This is a knowledge gap, however, a total of only 750 Little Pygmy Perch have been captured during a recent study (2012-2015) that has surveyed > 80 sites (Figure 1). They represented only 2.2 % of the total fish catch during this study. A multiple mark-recapture study in one of two main refuge pools in the Hay River calculated the number of mature (markable) individual *N. pygmaea* was 90 (±15.5 SE) *cf.* 8117 (95 % 2289-13944) *N. vittata* and 26 (±11.7 SE) *N. balstoni*.
What is the number of subpopulations?	Four
What percentage of the population is within WA?	100
What percentage of the population is within Australia?	100
5.2 Population dynamics *(include how numbers were determined/calculated)*	
What is the number of mature individuals?	Unknown.
What is the number of immature individuals?	Unknown.
What is the number of senescing/past reproductive individuals?	Unknown.
What is the maximum number of mature individuals per subpopulation?	Unknown,
What is the percentage of mature individuals in one subpopulation?	Length at maturity has not yet been quantified, however, it is likely that the life-cycle is short (most living < 3 years) and maturity is probably reached at 30-40 mm TL. Below is a figure of length-frequencies from a sub-sample of the Hay-Mitchell population.

	
What percentage of mature individuals is within WA?	100
What percentage of mature individuals is within Australia?	100
What is the age of sexual maturity?	Unknown
What is the life expectancy?	Likely < 3 years.
What is the generation length?	1 year.
What is the reproductive capacity? (i.e. litter size or number of seeds)	Unknown. We have recently determined the females to be batch-spawners (similar to *Nannoperca vittata*), releasing multiple batches of eggs during the breeding period (July-September, with a peak in July-August in the Hay/Mitchell system). By October, all mature fish have completed breeding (based on external examination of females).
What is the reproductive success?	Unknown
5.3 Population trend	
What is the current population trend (mature individuals)?	Decreasing ☒ Increasing ☐ Stable ☐
What is the percentage of the population change?	Unknown. Currently this is unable to be determined with existing data; however, we assume that it would likely have declined in both range and abundance over the past century as has occurred for sympatric species (i.e. *Nannatherina balstoni* and *Nannoperca vittata*) due to stressors, particularly secondary salinisation, introduced species and flow declines. See inferred decline sections above.
How has this been calculated?	NA
If the trend is decreasing; are the causes of the reduction understood?	Yes ☒ No ☐
Have the causes of the reduction ceased?	Yes ☐ No ☒
Are the causes of the reduction reversible?	Yes ☒ No ☐
Is the reduction continuing (continuing decline)?	Yes ☒ No ☐

Has the change been observed, estimated, inferred or is it suspected (direct observation, index of abundance appropriate to the species)?	Inferred. We project future decline due to projected amplification of the key stressors of flow declines and salinisation (and possibly other introduced species). The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (~ 6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation reducing EOO/AOO from salinity being limited in this catchment, however, projected flow declines due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. The impact of climate change on the spawning migrations of sympatric species has recently been demonstrated (Beatty *et al*. 2014).However, rising salinity trends are reversible (e.g. Denmark River) and further alien species introduction are preventable.
When was the reduction or is it anticipated to occur?	Past ☒ Present ☐ Future ☒
What is the period of time for the reduction (in years and generations)?	Probably over the past 50 -100 years (i.e. 50 – 100 generations).
Has there been a reduction in the number of subpopulations?	Yes ☒ No ☐
If Yes, provide details:	Unknown, but probable.
Are there extreme fluctuations in population size?	Yes ☒ No ☐
If Yes, provide details:	Due to its seasonal movement and breeding patterns (i.e. from base-flow refuge pools to peak-flow breeding habitats in tributaries), it seasonally and spatially fluctuates in abundance. However, we have no evidence of interannual variation in total abundance within populations. It appears that the Hay/Mitchell population is the lowest in abundance relative to the Denmark and the Kent (the latter being the most abundant and widespread based on CPUE in fyke netting.
5.4 Translocations and captive/enclosed subpopulations	
Have there been translocations (introduction or re-introduction)?	Yes ☐ No ☒
Are there proposed translocations (introduction or re-introduction)?	Yes ☐ No ☒
Are there captive/enclosed subpopulations?	Yes ☐ No ☒
Are there proposed captive/enclosed subpopulations?	Yes ☐ No ☒
Are there self-sustaining translocated subpopulations?	Yes ☐ No ☒

If Yes, provide details:	NA
Are there translocated subpopulations that are not self-sustaining?	Yes ☐ No ☒
If Yes, provide details:	NA
Are there self-sustaining captive/enclosed subpopulations?	Yes ☐ No ☒
If Yes, provide details:	NA
Are there captive/enclosed subpopulations that are not self-sustaining?	Yes ☐ No ☒
If Yes, provide details:	NA
Other information on translocations and captive/enclosed subpopulations for the species (including failures):	We have identified a neighbouring tributary in the Denmark Catchment that has permanent refuge habitat similar to the unnamed tributary that houses the species. They have similar physical characteristics and currently are devoid of percichthyids. We view this as an ideal pilot study site for translocating a small amount of mature *N. pygmaea* in order to mitigate the risk of extirpation from other refuges in the catchment.

5.5 Important subpopulations

Identify any subpopulations that are important or necessary for the long-term survival of the species and provide details for why they are considered as such (i.e. key breeding, edge or range, maintenance of genetic diversity):

Section 6: Survey

6.1 Survey effort

Has the species been well surveyed?	Yes ☐ No ☒
Have targeted surveys been conducted for the species?	Yes ☒ No ☐

There has been a concerted, targeted survey for the species (along with *G. truttaceus* and *N. balstoni*) that initially focussed on the Mitchell/Hay population but was later expanded to include the Denmark, Kent, Bow and others (see Figure 1). That study (2012-2015 State Strategic NRM) aimed to map the distribution of the species in the Mitchell/Hay, determine aspects of its ecology, and assess, quantify and prioritise threats to the species. This project is currently being finalised (complete mid-2015) but has been highly successful in terms of detecting three new sub-populations reported in the current listing document. It involved surveying > 80 sites and capturing and measuring > 35000 fish.

However, given the recent description of the species, its typical low relative abundance, and its superficial resemblance to sympatric *N. vittata*, it is possible that it also exists in other catchments on the south-coast and has been missed in previous surveys.

6.2 Survey methods *(Provide details)*

What survey methods are applicable to the species?	Fyke netting, seine netting. Both are highly effective at capturing freshwater fishes in south-western Australian lentic and lotic systems.
Are there preferred or recommended survey methods that yield better results	Fyke netting (first used to target south-western Australian fishes by the authors from 2004 as part of the Yarragadee Aquifer assessment for

for the species?	Department of Water, W.A.) have now become the standard equipment for surveying and monitoring fish communities. However, seine netting is appropriate, particularly in refuge pools with low levels of instream structure.
Are there special requirements, techniques, expertise or other considerations that are necessary when surveying for this species?	Fyke netting requires exemption permits from Department of Fisheries, W.A. and one must ensure air hatches are created to prevent drowning of air-breathing bycatch (e.g. turtles).
Are there reasons why the species may not be detected during surveys?	Given the recent description of the species, its typical low relative abundance, and its superficial resemblance to sympatric *N. vittata*, it is possible that it also exists in other catchments on the south-coast and has been missed in previous surveys.

Can the species be identified in the field?	Yes ☒ No ☐
Provide details:	Small percichthyid (maximum total length 65 mm, most individuals < 50 mm) with a small mouth, a deeply notched dorsal fin a tanbrown base colouration with a line of square-shaped dark blotches on the middle of the sides, 5–10 thin lateral stripes most obvious below lateral line, a dark spot at the base of the tail surrounded by a pale halo, reddish-orange dorsal and caudal fins.
Can the species be easily confused within similar species in the field?	Yes ☒ No ☐
Provide details:	It differs from sympatric congener Western Pygmy Perch *Nannoperca vittata* (Castelnau) by a slightly blunter snout, the possession of thin latero-ventral stripes, absence of dark pigment on the belly, and generally fewer dorsal rays and anal rays. Distinguished from Balston's Pygmy Perch *Nannatherina balstoni* (Regan) by having a smaller mouth (rarely reaching eye in *N. pygmaea*), ctenoid body scales (vs. cycloid), generally fewer pectoral rays and a smaller maximum size.
Has survey for this species been conducted as part of conditional requirements for an approval?	Yes ☐ No ☒
If Yes; provide details:	

List any published survey guidelines, guidance statements, protocols, standard operating procedures or other documents that are relevant to conducting surveys for this species.

Beatty, S., Allen, M., Morgan, D., Strehlow, K., Janicke, G. (2011). Ecological significance of the fish, macroinvertebrates and riparian vegetation in the Mitchell River catchment. Centre for Fish & Fisheries Research, Murdoch University Report to Water Corporation of Western Australia.

Morgan, D.L., Beatty, S.J. & Adams, M. (2013). Nannoperca pygmaea, a new species of pygmy perch (Teleostei: Percichthyidae) from Western Australia. Zootaxa 3637 (4): 401-411.

Morgan, D., Beatty, S., Lymbery, A., Adams, M., Murphy, J. & Keleher, J. (2010). Aquatic fauna values of the Mitchell and Quickup Rivers. Centre for Fish & Fisheries Research, Murdoch University, report to the Water Corporation of Western Australia.

6.3 Research *(Provide details)*

Has the species been well research?	Yes ☐ No ☒
What research has been or is being conducted?	The species was first discovered during a study of the Mitchell and Quickup rivers (see Morgan, D., Beatty, S., Lymbery, A., Adams, M., Murphy, J. & Keleher, J. (2010). Aquatic fauna values of the Mitchell and Quickup Rivers. Centre for Fish & Fisheries Research, Murdoch

	University, Report to the Water Corporation of Western Australia). The species was officially described in 2013 (seeMorgan, D.L., Beatty, S.J. & Adams, M. (2013). *Nannoperca pygmaea*, a new species of pygmy perch (Teleostei: Percichthyidae) from Western Australia. Zootaxa 3637 (4): 401-411.) (30 % contribution, Murdoch and South Australian Museum colleagues). There has been a concerted, targeted survey for the species (along with *G. truttaceus* and *N. balstoni*) that initially focussed on the Mitchell/Hay population but was later expanded to include the Denmark, Kent, Bow and others (see Figure 1). That study (2012-2015 State Strategic NRM) aimed to map the distribution of the species in the Mitchell/Hay, determine aspects of its ecology, and assess, quantify and prioritise threats to the species. This project is currently being finalised (complete mid-2015) but has been highly successful in terms of detecting three new sub-populations reported in the current listing document. It involved surveying > 80 sites and capturing and measuring > 35000 fish.
Is/has research on this species been conducted as part of conditional requirements for an approval?	Yes ☐ No ☐ N/A ☒
If Yes; provide details:	
What are the knowledge gaps for the species?	Physiological tolerances, diet, microhabitat requirements, ontogeny, aspects of its reproductive biology (length at maturity, fecundity, partially known), age and growth (partially known), predators, swimming ability (U_{sprint}), diseases/parasites, phylogenetics (of Lake Smith sub-population).
Research recommendations:	Studies into: Re-surveying other systems between Lake Smith and Bow River. Physiological tolerances (temperature and salinity). Dietary analyses Microhabitat requirements Ontogeny/larval description Reproductive biology (length at maturity, fecundity) Age and growth (partially known). Predators and trophic position Interactions with alien species (Eastern Gambusia) Diseases/parasites Phylogenetics of Lake Smith sub-population and any other sub-populations discovered in targeted surveys.
6.4 Monitoring *(Provide details)*	
Is the species monitored, either directly (targeted) or indirectly (general monitoring)?	State Strategic NRM has mapped the distribution of the species in the Mitchell/Hay, determined aspects of its ecology (movement patterns, abundance), and assessed/quantified/ prioritised threats to the species. This work is currently being finalised (complete mid-2015). The study monitored the Mitchell/Hay population over two years to determine movement patterns, aspects of its reproductive biology and abundance. Sporadic monitoring of sub-populations in the Denmark and

	Kent catchments has also occurred between 2013 and 2014.
What methods are used for monitoring?	Fyke netting, mark-recapture.
Is/has monitoring on this species been conducted as part of conditional requirements for an approval?	Yes ☐ No ☒ N/A ☐
If Yes; provide details:	
Monitoring recommendations:	Ongoing monitoring of all subpopulations (particularly those recently discovered in the Denmark, Kent, and Lake Smith) to determine seasonal fluctuations in distribution/abundance, and to determine key refuge and spawning sites for priority conservation management. This should involve seasonal sampling for movements and population / reproductive biology during winter and spring, coupled with distributional surveys during baseflow (including aerial mapping and ground-truthing of potential refuge pool habitats).

Section 7: Threats

7.1 Threats (*detail how the species is being impacted, i.e. how severe, the extent, evidence of the impact*)

Threat	Rating	Extent	Evidence	Time period *(past, present, future)*
Climate change	Extreme	Throughout range	Projected drastic flow declines projected due to rainfall reductions (Barron *et al*. 2013) will impact the amount and quality of both peak flow (breeding) habitat and baseflow (refuge) habitat. Furthermore, reductions in groundwater would also impact the species, particularly refuge pools in lotic systems and Lake Smith. The impact of climate change on the spawning migrations and by extension recruitment of sympatric species has recently been demonstrated (Beatty *et al*. 2014). There is little doubt that this will place enormous pressure on this species and adaptive management will be required to help ensure its long-term survival in the wild.	Since the 1970s – future
Water quality decline (salinisation, nonpoint pollution (e.g. nutrients, pesticides) and associated impacts)	Extreme	Throughout range	Salinisation is the major threat which is highly likely to be exacerbated by future flow declines associated with climate change (particularly increased temperature, decrease dissolved oxygen). The water quality and riparian condition in the Kent and Hay Rivers has declined due to land clearing and associated salinisation in the upper catchments (Evans *et al*. 1995; Mayer *et al*. 2005). The Kent ranges from brackish (Styx River junction) to	Past ~60 years – ongoing Kent, Hay

			moderately saline in the upper catchment (Rocky Glen), however, the increasing trend has slowed since the 1990s. The key spawning habitats of *N. pygmaea* in the Kent (likely to be tributaries) have not yet been identified but several baseflow refuge pools are moderately saline (up to 6 ppt, unpubl. data). The Hay River (52 % catchment cleared) is also moderately saline, with salinity increasing from the mid-1980s to the 1990s. The key baseflow refuge pools are moderately saline (~6 ppt), with the seasonal Mitchell River (breeding habitat) fresh. The Denmark River (31 % cleared) ranges from marginal downstream to brackish upstream. However, the key known breeding tributary for the *N. pygmaea* remains fresh. The trend is a reduction in the salinity in the Denmark River so we see the threat of salinisation being limited in this catchment, provided that broadscale land clearing does not occur in the upper reaches. Nonpoint pollution (e.g. nutrients, pesticides) and its associated impacts (e.g. eutrophication, ecotoxicity) is a potential threat in the more modified Hay and Kent catchments and could potentially lead to fish kill events that might affect *N. pygmaea* populations. Contamination of artificial water points with fire retardant chemicals is also a possibility in the Denmark catchment, although the impacts of these chemicals on the species are unknown.	
Introduced species (Eastern Gambusia).	High	Throughout range	The species is sympatric with the aggressive Eastern Gambusia in refuge pools in the Kent and Hay Rivers; however, Gambusia is in relatively low abundance. Any future introduction of large piscivores (such as Rainbow or Brown Trout, or Redfin Perch) could be disastrous for the survival of *N. pygmaea*.	Past, present, future.
Water abstraction (surface from the Mitchell River, groundwater throughout range).	Moderate	Throughout range	A planned extraction of water from the upper Mitchell River in 2009 could have negatively impacted the spawning sites of the species in the lower section of the river. Groundwater extraction from aquifers should they connect with refuge habitat of the species could result in loss of key habitats.	Future.

Fire (knowledge gap but known to impact freshwater fishes elsewhere).	Moderate	Throughout range	Impact of increased frequency of fires on south-western Australian fishes is unknown. The habitat in the lower Mitchell was recently burnt and was recolonised by the species after the event. However, its use of fire-fighting waterpoints as refuge (e.g. the Denmark populations) warrants careful consideration from a management perspective as excessive pumping from those points could extirpate the population (coupled with potential spillage of fire retardant).	Past, present and future.
Instream barriers (ford on Mitchell River may partially impede migrations in shoulder flow periods).	Low	Throughout range	Whilst there are several potential low barriers to the movement of the species, they are not yet known to impede the spawning migration.	Past, present, future.
Exploitation	High	Throughout range	Given the limited number of locations and low abundances of the species, it is vulnerable to collection for the aquarium trade.	Present, future.

7.2 Threats relevant to only a specific subpopulation or location (*detail impact and why not species level threat)*

Instream barriers (ford on lower Mitchell River) may impede migratory movements during shoulder flow periods.

7.3 Exploitation of the species (*detail how the species is currently exploited or may potentially be exploited)*

Given the limited number of locations and low abundances of the species, it is vulnerable to collection for the aquarium trade.

7.4 Key threatening processes under the EPBC Act (*list all applicable*)

Land clearance

Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases

Novel biota and their impact on biodiversity

Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pig

7.5 Threat abatement plans for Key Threatening Processes under the EPBC Act (*list all applicable*)

Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs - 2005

7.6 Biological and ecological characteristics threatening to the survival of the species *(i.e. low genetic diversity, semelparity (one reproduction event before death), foraging behaviour)*

Low abundance, apparent low reproductive potential, fragmented range, majority of the population < 3 years of age, dry season AOO is limited to a small number of refuge pools.

Section 8: Management

8.1 Current management	
Is the species managed?	Yes, directly ☐ Yes, indirectly ☐ No ☒
If Yes; provide details:	
Does the species benefit from the management of another species or ecological community?	Yes ☐ No ☒
If Yes; provide details:	

8.2 Recovery planning	
Is there an approved Recovery Plan (RP) or Interim Recovery Plan (IRP) for the species?	Yes ☐ No ☒

List all relevant recovery plans or interim recovery plans (including draft, in-preparation, out-of-date, national and other State/Territory plans, and plans for other species or ecological communities that may benefit or be relevant to the nominated species)

List other documents that may be relevant to the management of the species or the lands on which it occurs (i.e. management plans, conservation advices, referral guidelines)

8.3 Management recommendations

- Protection of existing refuge and spawning habitats in all systems
- Implement appropriate management arrangements for the artificial refuge habitat in the tributary of the Denmark catchment (i.e. two fire-fighting waterpoints) and Kent River (Moombarki Creek Dam).
- A captive breeding program should be instigated for the species (possibly at the population level) to help mitigate potential loss.
- Ongoing regional education program on the impacts of introduced aquatic species.

Ongoing research required

Physiological tolerances, diet, microhabitat requirements, ontogeny, aspects of its reproductive biology (length at maturity, fecundity, partially known), age and growth (partially known), predators.

Quantification of genetic diversity among and within populations

Re-surveying other systems between Lake Smith and Bow River

Physiological tolerances (temperature and salinity)

Dietary analyses

Microhabitat requirements

Ontogeny/larval description

Reproductive biology (length at maturity, fecundity)

Age and growth (partially known)

Predators

Section 9: References

9.1 References
Barron O, Silberstein R, Ali R, Donohue R, McFarlane DJ, Davies P, Hodgson G, Smart N, and Donn M (2012) Climate change effects on water-dependent ecosystems in south-western Australia. *Journal of Hydrology* 434-435: 95-109 Beatty, S.J., Morgan, D.L. and Lymbery, A.J. (2014) Implications of climate change for potamodromous fishes. Global Change Biology, 20 (6): 1794-1807. Beatty, S., Allen, M., Morgan, D., Strehlow, K., Janicke, G. (2011). Ecological significance of the fish, macroinvertebrates and riparian vegetation in the Mitchell River catchment. Centre for Fish & Fisheries Research, Murdoch University Report to Water Corporation of Western Australia. Beatty, S.J., Morgan, D.L., Rashnavidi, M. & Lymbery, A.J. (2011). Salinity tolerances of endemic freshwater fishes of south-western Australia: implications for conservation in a biodiversity hotspot. *Marine & Freshwater Research* 62: 91-100. Evans, F.H., Caccetta, A., Ferdowsian, R., Kiiveri, H.T., and Campbell N.A. (1995) *Predicting Salinity in the Upper Kent River Catchment.* A report from the LWRRDC project "Integrating Remotely Sensed Data With Other Spatial Data Sets to Predict Areas at Risk from Salinity". CSIRO, Curtin University, Department of Agriculture and Food, Western Australia. Mayer, X., Ruprecht, J. & Bari, M. 2005. Stream salinity status and trends in south-west Western Australia. Department of Environment Salinity and Land Use Impact Series, Report No. SLUI 38. Government of Western Australia. Morgan, D.L., Beatty, S.J. and Adams, M. (2013). Nannoperca pygmaea, a new species of pygmy perch (Teleostei: Percichthyidae) from Western Australia. *Zootaxa* 3637 (4): 401-411. Morgan, D., Beatty, S., Lymbery, A., Adams, M., Murphy, J. and Keleher, J. (2010). Aquatic fauna values of the Mitchell and Quickup Rivers. Centre for Fish & Fisheries Research, Murdoch University, report to the Water Corporation of Western Australia.

Nominator details

Nominator name(s):	
Contact details:	
Date submitted:	30 January 2015
if the nomination has been refereed or reviewed by experts, please provide their names and contact details:	
Dr David Morgan	