

PROPOSED DETERMINATION

***Craterocephalus amniculus* – Darling River hardyhead population in the Hunter River catchment as an Endangered Population.**

The Fisheries Scientific Committee, established under Part 7A of the *Fisheries Management Act 1994* (the Act), is proposing to list the Hunter River population of *Craterocephalus amniculus* – Darling River hardyhead as an ENDANGERED POPULATION in Part 2 of Schedule 4 of the Act.

The listing of endangered populations is provided for by Part 7A, Division 2 of the Act.

The Fisheries Scientific Committee, with reference to the criteria relevant to this species, prescribed by Part 16 of the *Fisheries Management (General) Regulation 2010* (the Regulation) has found that:

Background

- 1) Darling River hardyhead – *Craterocephalus amniculus* (Crowley and Ivanstoff 1990) is a valid, recognised taxon and is a species as defined in the Act.
- 2) The species distribution includes the Border Rivers, Gwydir and Namoi catchments of the Murray-Darling Basin above 200 m and up to at least 1,030 m ASL and the Hunter catchment between 50 m and at least 330 m ASL (Battaglione 1985, Adams *et al.* 2011, OZCAM database, Tarmo Raadik, unpublished data, Fisheries NSW Freshwater Fish Research Database). Although its distribution extends into the Queensland portion of the Border Rivers catchment, the majority of the species distribution is in New Species Wales.
- 3) Although limited to only two specimens from the Hunter catchment, genetic analysis suggests little genetic divergence of the Murray-Darling Basin and Hunter populations (Adams *et al.* 2011). However, the population in Tenterfield Creek likely represents a unique undescribed taxon (Adams *et al.* 2011).
- 4) Little of the biology of *Craterocephalus amniculus* is known. The average and maximum size is 42 mm fork length (FL) and 80 mm FL respectively (Fisheries NSW Freshwater Fish Research Database). The species is present in a range of waterways from large rivers (ie. the MacIntyre, Namoi and Hunter Rivers) through to small tributary streams with flows of ~ 5 ML day⁻¹. Habitats range from turbid to clear waters and from small weedy pools to clear gravel pools (Battaglione 1985). Preliminary analysis of habitat associations suggest that presence is more often associated with flowing water meso-habitats (riffles and rapids) and the presence of filamentous algae (Dean Gilligan, Fisheries NSW, unpublished data).
- 5) Diet consists of algae (48% diet composition), dipteran (true flies) larvae (34%), plecopteran (stoneflies) larvae (3%) and unidentified small insects (15%). A small percentage (1.4%) of individuals sampled by Fisheries NSW were affected by black spot disease (*Neascus* spp) and 0.5% have been affected by anchor worm (*Lerneae* spp).
- 6) No data are available on the species' reproductive biology. Its closely related congener, the Murray hardyhead (*Craterocephalus fluviatilis*) (Adams *et al.* 2011) is considered an annual species with a prolonged breeding season from spring through to Autumn (Ellis 2005). Eggs are deposited amongst aquatic vegetation (Ellis 2005).

- 7) *Craterocephalus amniculus* is currently recognised as Vulnerable on the 2011 International Union for Conservation for Nature (IUCN) Red List of Threatened Species (Wager 1996) and the by the Australian Society for Fish Biology (ASFB). It is not listed in any other state, nor is it listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- 8) Crowley and Ivanstoffs (1990) raised the possibility that the Hunter population was a non-endemic population founded from individuals translocated from the Murray-Darling Basin. The species was not collected from the Hunter catchment until 1976 (Australian Museum specimens IDs I19034-004 and I.28891-001). Whilst the genetic results of Adams *et al.* (2011) do not refute this possibility, only two samples from the Hunter catchment were analysed and their results should be interpreted with caution pending additional analysis of a greater number of samples. The headwaters of the Hunter and Namoi catchments abut at a reasonably low elevation of 700 m ASL at the headwaters of the Pages River (Hunter catchment) and Borambil Creek (Namoi catchment) and whilst no other species is known to have breached the divide between these two catchments, it is not implausible that *Craterocephalus amniculus* may have colonised the Hunter catchment naturally.

Criteria – reduction in abundance, geographic distribution or genetic diversity (Regulation clause 274)

- 1) There are insufficient time-series data from any individual sites occupied by *Craterocephalus amniculus* to quantify changes in abundance.
- 2) Whilst populations within the Murray-Darling Basin are patchily distributed, comparison of the distribution of museum specimens and historical data with recent data collected by Fisheries NSW suggests that there has not been any reduction in its total distribution. The species was collected at 10.7% of 253 sites above 200 m ASL in the Border Rivers, Gwydir and Namoi catchments sampled between 2002 and 2011 (Fisheries NSW Freshwater Fish research Database).
- 3) *Craterocephalus amniculus* has presumably always been uncommon in the Hunter catchment as it has only ever been reported from nine widely dispersed sites and Battaglione (1985) reported that in 1980 the species was “far less abundant in the Hunter catchment than the Peel and Namoi Rivers”. Battaglione (1985) collected *Craterocephalus amniculus* at 18% of 22 sampling sites in 1980. The next and most recent records of the species in the Hunter catchment were from two widely dispersed sites: 1) the Krui River (32.083°S, 150.117°E) in September 2002, and 2) Dart Brook (31.91°S, 150.673°E) in September 2003 (Tarmo Raadik, Victorian Department of Sustainability & Environment, unpublished data). No *Craterocephalus amniculus* have been collected from the Hunter catchment since September 2003 despite 282 individual sampling events at 89 sites distributed broadly throughout the catchment (Fisheries NSW Freshwater Fish research Database), including some of those locations where the species had been collected previously (Faulks 2010).
- 4) In light of the above, the Fisheries Scientific Committee has found that the Hunter catchment population of *Craterocephalus amniculus* has always been relatively uncommon. However despite this, the failure to detect any individuals despite extensive recent sampling throughout its potential distribution suggests that the Hunter population meets the criteria of an Endangered population.

Criteria – threatening processes (Regulation clause 272)

- 1) General habitat degradation caused by soil erosion, land clearing (including clearing of riparian vegetation) and livestock damage to riverbanks across much of the species distribution within the Hunter catchment may have reduced the abundance and distribution of *Craterocephalus amniculus*.
- 2) Thermal pollution from Glenbawn Dam, Lake Lidell and Lake St Clair is likely to affect populations in those waterways downstream, as is the regulated flow regime in these rivers.
- 3) The presence of alien goldfish (*Carassius auratus*), eastern gambusia (*Gambusia holbrooki*) and common carp (*Cyprinus carpio*) in the Hunter catchment may have a detrimental effect on *Craterocephalus amniculus*. Carp in particular only invaded the Hunter catchment some time after 1980 (Battaglione 1985) and their introduction may coincide with the decline of the already uncommon hardyhead. It is likely that gambusia prey on eggs and larvae of the *Craterocephalus amniculus*. The potential impacts of goldfish are unknown.
- 4) Water extraction from drought refugia in smaller tributary streams may put additional pressure on remnant populations during drought periods.
- 5) In light of the above, the Fisheries Scientific Committee has found that one or more of these threatening processes continue to operate throughout the geographic distribution of the Hunter population of this species.

Conclusion pursuant to section 220FA(1) of the Act

In the opinion of the Fisheries Scientific Committee:

- (a) The Hunter River population of *Craterocephalus amniculus* is facing a very high risk of extinction in New South Wales in the near future, as determined in accordance with the criteria prescribed by the Regulation as discussed above; and
- (b) The population is eligible to be listed as an ENDANGERED POPULATION.

Sources and Links

Adams, M., Wedderburn, S.D., Unmack, P.J., Hammer, M. P. and Johnson, J.B. (2011) Use of congeneric assessment to reveal the linked genetic histories of two threatened fishes in the Murray-Darling Basin, Australia. *Conservation Biology* **25**: 767-776.

Battaglione, S.C. (1985) Preliminary study of the fish resources of the Hunter Valley. Prepared for the Water Resources Commission of New South Wales by the Division of Fisheries, New South Wales Department of Agriculture, Brackish Water Fish Culture Research Station, Port Stephens.

Crowley, L.E.L.M. and Ivanstoffs, W. (1990) A review of species previously known as *Craterocephalus eyresii* (Pisces: Atherinidae). *Proceedings of the Linnaean Society of New South Wales* **112**: 87-103.

Ellis, I (2005) Ecology of the Murray hardyhead *Craterocephalus fluviatilis* (McCulloch), Family Atherinidae. Literature review prepared for the Mallee catchment management Authority, Murray-Darling Freshwater Research Centre Technical Report 03/2005, Mildura.

Faulks, L. (2010) A survey of the Hunter River catchment for the Darling River hardyhead and southern purple spotted gudgeon. Industry & Investment NSW, Port Stephens Fisheries Institute, Taylors Beach.

Wager, R. (1996) *Craterocephalus amniculus*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 31 May 2012.

Dr Jane Williamson
Chairperson
Fisheries Scientific Committee