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FINAL RECOMMENDATION

AQUATIC ECOLOGICAL COMMUNITY IN THE NATURAL DRAINAGE SYSTEM OF THE LOWLAND CATCHMENT OF THE DARLING RIVER

The Fisheries Scientific Committee, established under Part 7A of the *Fisheries Management Act 1994* (the Act), has made a recommendation to list the Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River as an ENDANGERED ECOLOGICAL COMMUNITY in Part 3 of Schedule 4 of the Act.

Under Part 7A of the Act (Division 1, Section 220B), an ecological community means an assemblage of species of fish or marine vegetation (or both) occupying a particular area. Listing of Endangered Ecological Communities is provided for by Part 7A, Division 2 of the Act.

The area covered by this recommendation includes all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches, and the floodplains of the Darling River within the State of New South Wales, and including Menindee Lakes and the Barwon River. This area includes:

- The main channels and tributaries of the lower Darling and Barwon-Darling Rivers from Mungindi (28°59'S; 149°30'E) on the Queensland border to the convergence with the Murray River at Wentworth (34°07'S; 141°55'E), and including the Menindee Lakes.

- The arid-zone intermittent rivers including the Warrego (29°00'S; 145°42'E), Culgoa (29°00'S; 147°22'E) and Narran Rivers (29°00'S; 148°05'E) and their tributaries south of the Queensland border.

- The border rivers including the MacIntyre River below Graman Weir (29°25'S; 150°58.8'E), Severn River downstream of Pindari Dam (29°23'S; 151°14'E) and the Dumaresq River below the junction with the Mole River (28°59.7'S; 151°31'E).

- The north-western slope rivers including the following: the Gwydir River from Copeton Dam (29°55'S; 150°55'E) downstream; the Namoi River from the junction of the Manilla River at Manilla (including Mehi River channel west of Moree) (30°46'S; 150°44'E) downstream; the Manilla River from Split Rock Dam (30°35'S; 150°42'E) downstream; the Peel River from Chaffey Dam (31°31'S; 151°08'E) downstream; the Macquarie River from Burrendong Dam (32°40'S; 149°10'E) downstream; the Cudgegong River from Windamere Dam (32°44'S; 149°46'E) downstream; the Castlereagh River from below Binnaway (31°30'S; 149°20'E) downstream; and the Bogan River from below Peak Hill (32°50'S; 148°00'E) downstream.

Excluded from this recommendation are the man made/artificial canals, water distribution and drainage works, farm dams and off-stream reservoirs, and also the Paroo River and Bulloo River Overflow with their associated lakes and tributaries. Other watercourses above 500m not specifically named in this recommendation are excluded.

The Fisheries Scientific Committee has found that:

1. The aquatic ecological community in the natural drainage system of the lowland catchment of the Barwon-Darling River is characterised by the following assemblage of native animal species:

WORMS (ANNELIDA)	
Heteroporodrilus mediterreus (water worm)	*Richardsonianus australis* (leech)
CRUSTACEANS	
Caridina mccullochi (shrimp)	*Alona macracantha* (water flea)
Chydorus hybrious (water flea)	*Celsinotum hypsilophum* (water flea)
Euastacus armatus (Murray cray)	*Daphnia carinata* (water flea)
Lepidurus viridis (shield shrimp)	*Euastacus suttoni* (Sutton's cray)
Tachaea picta (shrimp lice)	*Pleuroxus aduncus* (water flea)
Alona camboui (water flea)	*Paratya australiensis* (shrimp)
Austrochiltonia subtennuis (water scud)	*Tachaea caridophaga* (shrimp lice)
Macrobrachium australiense (prawn)	*Heterias pusilla* (freshwater slater)
Holthuisana transversa (crab)	*Cherax destructor* (yabbie)
Apus australiensis (shield shrimp)	*Branchinella australiensis* (fairy shrimp)
FINFISHES (OSTEICHTHYES)	
Nematalosa erebi (Bony bream)	*Neosilurus hyrtlii* (Hyrtl's catfish)
Tandanus tandanus (Freshwater catfish)	*Retropinna semoni* (Australian smelt)
Craterocephalus amniculus (Darling River hardyhead)	*Craterocephalus stercusmuscarum fulvus* (Flyspecked hardyhead)
Melanotaenia fluviatilis (Crimsonspotted rainbowfish)	***Ambassis agassizi* (Olive perchlet/Agassizs glassfish)**
Gadopsis marmoratus (River blackfish)	**^*Maccullochella macquariensis* (Trout cod)**
Maccullochella peelii peelii (Murray cod)	**^*Macquaria australasica* (Macquarie perch)**
Macquaria ambigua (Golden perch)	***Bidyanus bidyanus* (Silver perch)**
Leiopotherapon unicolor (Spangled perch)	*Hypseleotris klunzingeri* (Western carp gudgeon)
Hypseleotris sp. 4 (Midgleys carp gudgeon)	*Hypseleotris sp. 5* (Lakes carp gudgeon)
***Mogurnda adspersa* (Purplespotted gudgeon)**	*Philypnodon grandiceps* (Flathead gudgeon)
Philypnodon sp. (Dwarf flathead gudgeon)	
INSECTS (COLEOPTERA)	
Adelotopus dytiscides (beetle)	*Allodessus bistrigatus* (beetle)
Antiporus decempunctatus (beetle)	*Antiporus femoralis* (beetle)
Antiporus gilberti (beetle)	*Apotomus australis* (beetle)
Arthropterus angulicornis (beetle)	*Arthropterus denudatus* (beetle)
Arthropterus westwoodii (beetle)	*Carenum interruptum* (beetle)
Carenum tinctilatum (beetle)	*Cenogmus waterhousei* (beetle)
Chlaenius australis (beetle)	*Chlaenius darlingensis* (beetle)
Coxelimis novemnotata (beetle)	*Cybister tripunctatum* (beetle)
Eudalia nigra (beetle)	*Geoscaptus laevissimus* (beetle)
Gnathaphanus pulcher (beetle)	*Helluo insignis* (beetle)
Helochares australis (beetle)	*Hydrobiomorpha tepperi* (beetle)
Hydrovatus armstrongi (beetle)	*Lecanomerus discoidalis* (beetle)
Megacephala cylindrica (beetle)	*Megalopaussus amplipennis* (beetle)

Octhebius australis (beetle)	*Pericompsus australis* (beetle)
Pogonoschema sloanei (beetle)	*Prosopogmus monochrous* (beetle)
Sarticus cyaneocinctus (beetle)	*Tachys monochrous* (beetle)
Tachys spenceri (beetle)	
INSECTS (DIPTERA)	
Cladopelma eurtivalva (fly)	*Chironomus cloacalis* (fly)
Cryptochironomus grisiedorsum (fly)	*Coelopynia pruinosa* (fly)
Elassogaster linearis (fly)	*Dicrotendipes conjunctus* (fly)
Kiefferulus martini (fly)	*Kiefferulus intertinctus* (fly)
Procladius paludicola (fly)	*Polypedilum nubifer* (fly)
Tabanus particaecus (fly)	*Simulium ornatipes* (fly)
Tabanus strangmannii (fly)	*Tabanus queenslandii* (fly)
	Tanytarsus fuscithorax (fly)
INSECTS (HEMIPTERA)	
Agraptocorixa eurynome (bug)	*Micronecta annae annae* (bug)
Micronecta gracilis (bug)	*Micronecta robusta* (bug)
Microvelia distincta (bug)	*Microvelia paramoena* (bug)
INSECTS (ODONATA)	
Apocordulia macrops (dragonfly)	*Antipodogomphus acolythus* (dragonfly)
Austroaeschna parvistigma (dragonfly)	*Argiocnemis rubescens* (damselfly)
Austroagrion watsoni (damselfly)	*Austroaeschna unicornis* (dragonfly)
Austrogomphus amphiclitus (dragonfly)	*Austroargiolestes icteromelas* (damselfly)
Austrogomphus cornutus (dragonfly)	*Austrogomphus australis* (dragonfly)
Austrogomphus melaleucae (dragonfly)	*Austrogomphus guerini* (dragonfly)
Cordulephya montana (dragonfly)	*Austrogomphus ochraceus* (dragonfly)
Diphlebia coerulescens (damselfly)	*Cordulephya pygmaea* (dragonfly)
Diphlebia nymphoides (damselfly)	*Diphlebia lestoides* (damselfly)
Hemianax papuensis (dragonfly)	*Diplacodes bipunctata* (dragonfly)
Hemicordulia intermedia (dragonfly)	*Hemicordulia australiae* (dragonfly)
Hemicordulia tau (dragonfly)	*Hemicordulia superba* (dragonfly)
Hemigomphus heteroclytus (dragonfly)	*Hemigomphus gouldi* (dragonfly)
Nososticta solida (damselfly)	*Ischnura heterosticta* (damselfly)
Pseudagrion aureofrons (damselfly)	*Parasynthemis regina* (dragonfly)
Xanthagrion erythroneurum (damselfly)	*Synlestes selysi* (damselfly)
INSECTA TRICHOPTERA	
Orthotricia atraseta (caddis fly)	*Ecnomus pansus* (caddis fly)
Triplectides australis (caddis fly)	*Notolina spira* (caddis fly)
INSECTA EPHEMEROPTERA	
Atalophlebia australis (may fly)	*Tasmanocoenis arcuata* (may fly)
MOLLUSCA	
Alathyria condola (mussel)	*Alathyria jacksoni* (mussel)
Austropeplea lessoni (snail)	*Austropeplea tomentosa* (snail)
Bayardella cosmeta (snail)	*Bithynia affinis australis* (snail)
Corbicula australis (clam)	*Ferrissia petterdi* (limpet snail)
Ferrissia tasmanica (snail)	*Glacidorbis hedleyi (snail)*
Glyptophysa aliciae (snail)	*Glyptophysa gibbosa* (snail)
Gyraulus gilberti (snail)	*Gyraulus scottianus* (snail)
Isidorella newcombi (snail)	*Musculium problematicum* (clam)
Musculium quirindi (clam)	***Notopala sublineata* (snail)**
Notopala suprafasciata (snail)	*Pisidium carum* (clam)
Pisidium hallae (clam)	*Pisidium ponderi* (clam)
Posticobia brazieri (snail)	*Thiara balonnensis* (snail)
Velesunio ambiguus (mussel)	

PORIFERA	
Eunapius fragilis (sponge)	*Eunapius crassissimus* (sponge)
Heterorotula capewelli (sponge)	*Eunapius sinensis stanleyi* (sponge)
Heterorotula contraversa (sponge)	*Heterorotula multidentata* (sponge)
ROTIFERA	
Asplanchna brightwelli (rotifer)	*Asplanchna priodonta* (rotifer)
Asplanchna sieboldi (rotifer)	*Asplanchnopus hyalinus* (rotifer)
Brachionus angularis (rotifer)	*Brachionus budapestinensis* (rotifer)
Brachionus calyciflorus amphiceros (rotifer)	*Brachionus calyciflorus anuraeiformis* (rotifer)
Brachionus calyciflorus gigantea (rotifer)	*Brachionus dichotomus* (rotifer)
Brachionus falcatus (rotifer)	*Brachionus keikoa* (rotifer)
Brachionus nilsoni (rotifer)	*Brachionus novaezealandia* (rotifer)
Brachionus quadridentatus (rotifer)	*Brachionus rubens* (rotifer)
Brachionus urceolaris (rotifer)	*Cephalodella biungulata* (rotifer)
Cephalodella gibba (rotifer)	*Cephalodella mucronata* (rotifer)
Collotheca mutabilis (rotifer)	*Collotheca pelagica* (rotifer)
Colurella uncinata (rotifer)	*Conochilus dossuarius* (rotifer)
Conochilus hippocrepis (rotifer)	*Conochilus unicornis* (rotifer)
Dicranophorus hauerianus (rotifer)	*Dipleuchlanis propatula* (rotifer)
Dissotrocha macrostyla (rotifer)	*Encentrum aquilis* (rotifer)
Eosphora najas (rotifer)	*Epiphanes clavulata* (rotifer)
Epiphanes senta (rotifer)	*Euchlanis dilatata lucksiana* (rotifer)
Euchlanis meneta (rotifer)	*Euchlanis oropha* (rotifer)
Euchlanis triquetra (rotifer)	*Filinia australiensis* (rotifer)
Filinia grandis (rotifer)	*Filinia longiseta* (rotifer)
Filinia opoliensis (rotifer)	*Filinia passa* (rotifer)
Filinia pejleri (rotifer)	*Hexarthra intermedia* (rotifer)
Hexarthra mira (rotifer)	*Keratella australis* (rotifer)
Keratella cochlearis (rotifer)	*Keratella procurva robusta* (rotifer)
Keratella slacki (rotifer)	*Keratella tropica* (rotifer)
Keratella valga (rotifer)	*Lacinularia elliptica* (rotifer)
Lecane aculeata (rotifer)	*Lecane closterocerca* (rotifer)
Lecane curvicornis (rotifer)	*Lecane flexilis* (rotifer)
Lecane hamata (rotifer)	*Lecane ludwigii (rotifer)*
Lecane luna (rotifer)	*Lecane lunaris* (rotifer)
Lecane signifera (rotifer)	*Lecane stenroosi* (rotifer)
Lepadella acuminata (rotifer)	*Lepadella monodactyla* (rotifer)
Limnias ceratophylli (rotifer)	*Macrotrachela multispinosa* (rotifer)
Platyias quadricornis (rotifer)	*Polyarthra dolichoptera* (rotifer)
Polyarthra vulgaris (rotifer)	*Pompholyx complanata* (rotifer)
Proales werneckii (rotifer)	*Rotaria macrura* (rotifer)
Rotaria neptunia (rotifer)	*Synchaeta litoralis* (rotifer)
Synchaeta longipes (rotifer)	*Synchaeta oblonga* (rotifer)
Synchaeta pectinata (rotifer)	*Synchaeta stylata* (rotifer)
Synchaeta tavina (rotifer)	*Synchaeta tremula* (rotifer)
Trichocerca chattoni (rotifer)	*Trichocerca insignis* (rotifer)
Trichocerca pusilla (rotifer)	*Trichocerca rattus carinata* (rotifer)
Trichocerca similis (rotifer)	*Trichocerca stylata* (rotifer)
Trichotria tetractis (rotifer)	*Wolga spinifera* (rotifer)

***** denotes a listed threatened species in the Act.

^ denotes Australian Museum records from the late 1800's.

2. The total species list of the Darling River Drainages is larger than that given above. The above list is based on a combination of Australian Museum and literature records, and is data deficient for many areas of the Darling River Drainages. At any particular site, not all of the species listed above may be present. The species composition of a site will be influenced by the time of the year, the size and ecological characteristics of the area and the level of threatening processes present. The species listed in the above table are considered aquatic species, under the definition of the *Fisheries Management Act 1994*.

3. In its natural state, many of the water-bodies in this area are characterised by variable and unpredictable patterns of high and low flows. The natural morphology of the river systems includes deep channels, deep pool areas, suspended load depositional 'benches', higher floodplain 'benches', braided channels, terminal wetland complexes, gravel beds and riffle zones. The floodplain is also an integral part of this river system. Many fish species rely on the seasonal flow pattern and inundation of the floodplain for successful reproduction. The complex river morphology provides a multitude of habitats that play a critical role in the life cycles of the species making up this ecological community. Regulation of the system by numerous dams and weirs has reversed the seasonal flow regime, reduced frequency and extent of flooding, reduced channel complexity and has stopped fish migrations upriver. Fish passages over or around the man-made barriers are few. The release of cold water from the bottom of dams and weirs (cold water pollution) has also upset the natural temperature regime in the system, with further deleterious effects on fish migration and reproduction.

4. The Fisheries Scientific Committee has identified the following threats to the continued survival of the Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River:

- Instream structures, such as weirs and dams, have regulated natural flows and thereby affected the normal reproductive and other biological cues for the aquatic community. Regulation of the system by numerous dams and weirs has altered the flow regime, reduced channel complexity and has stopped fish migrations upriver because passages over or around the barriers are few. Passage of the more mobile species has been interrupted by weirs and dams. Instream structures, particularly dams, have introduced thermal pollution. The release of cold water downstream of dams has altered the natural temperature regime, with further deleterious effects on fish reproduction.

  Altered floodplain and wetland inundation caused by the instream structures have further affected river productivity. The morphological complexity of the main channel and floodplain is critical for ecosystem health because they are major factors in the accumulation of organic matter, which provides the food source for many of the macro invertebrates at the bottom of the food chain. By simplifying and eroding the channel and alienating the floodplain, this complexity has been degraded.

  Water extraction has decreased flows in many parts of the system to levels detrimental to ecosystem functioning. The overall reduced flows cause increased erosion during flood events, with sand slugs developing in the upper reaches of some rivers. These changes decrease the available habitat for the aquatic ecological community and degrade that which remains.

The installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams has been listed as a Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*. The alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands has been listed as a Key Threatening Process in Schedule 3 of the *Threatened Species Conservation Act 1995.*

- The clearing of riparian vegetation and continued stock access to the riparian zone increases erosion and siltation, and removes critical habitat, including reproductive sites for species in this aquatic ecological community. Clearing of the floodplain vegetation for agriculture also increases sedimentation and reduces carbon inputs to the river, which are important food sources for instream invertebrates. Degradation of native riparian vegetation along NSW waterways has been listed as a Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*. The clearing of native vegetation has been listed as a Key Threatening Process in Schedule 3 of the *Threatened Species Conservation Act 1995.*
- The removal of snags reduces the amount of aquatic habitat and reproductive sites. For example, Murray cod (*Maccullochella peelii peelii*), river blackfish (*Gadopsis marmoratus*) and various species of gudgeons spawn adhesive eggs onto and in submerged logs. The removal of large woody debris has been listed as a Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*.
- The presence of at least five introduced species (carp, goldfish, redfin perch, mosquitofish and the snail *Physa acuta*) is an additional threat to the native community. Such introduced species can act as predators, competitors, disease carriers, and habitat modifiers. Carp, redfin perch, and mosquitofish have all been identified as having deleterious effects on native species. The introduction of fish to fresh waters within a river catchment outside their natural range has been listed as a Key Threatening Process in Schedule 6 of the *Fisheries Management Act 1994*.
- Some types of agriculture can produce threatening processes to native aquatic animals. The reduction of river flow by water extraction, and pollution through insecticide and fertilizer runoff, are detrimental to aquatic life. This is especially evident during periods of low river flow when demand for irrigation and stock water is highest.
- Overfishing has reduced populations of species Murray cod and golden perch. For species listed as endangered or vulnerable, such as olive perchlet (*Ambassis agassizii*), purple-spotted gudgeon (*Mogurnda adspersa*), silver perch (*Bidyanus bidyanus*), Macquarie perch (*Macquaria australasica*) and trout cod (*Muccullochella macquariensis*) targeted or incidental collection and recreational catch must be considered as a threatening process.

5. Five of the 21 native finfish species included in this community are listed in the Threatened Species Schedules for New South Wales. One species of freshwater snail within the community, *Notopala sublineata*, is endangered. At least a further two species of fishes (*Tandanus tandanus* and *Gadopsis marmoratus*) have documented declines.

6. The Committee recognises and greatly appreciates the initiatives undertaken by the Murray-Darling Basin Commission, State, Commonwealth and local governments, community groups and private interest stakeholders to address concerns about the decline in the health of this aquatic community. Improvements have been, or are being, made in numerous areas, including water sharing allocations, riparian vegetation management, irrigation runoff and fish passage at smaller weirs. The Committee also recognises that changes to commercial and recreational fishing regulations have been made in the interests of protection of threatened species and stock conservation for exploited species. Where these programs are found to also be of benefit to conservation of this aquatic ecological community, it is the wish of the Committee to see them incorporated into the recovery plan for the ecological community. However, at this stage the Committee does not consider that the benefits of these programs have reversed the decline of the aquatic community.

7. In light of the above, the Fisheries Scientific Committee is of the opinion that the Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Barwon-Darling River is likely to become extinct in nature, unless the circumstances and factors threatening its survival cease to operate. Therefore, the community qualifies for inclusion in Part 3 of Schedule 4, as an ENDANGERED ECOLOGICAL COMMUNITY.

Dr Alan Millar
Deputy Chairperson
Fisheries Scientific Committee