

## Appendix B: Additional information on the ‘assemblage of species’ for the RMDS EC.

Table B1: Examples of non-woody aquatic and riparian vegetation known to occur, or to have previously occurred (shaded in grey), within the River Murray—Darling to Sea ecological community (EC).....	2
Table B2: Indicative fish species of the RMDS ecological community and their conservation status .....	14
Table B3: Three main waterbird foraging groups of the Coorong and Lower Lakes – common elements and examples of regular summer birds. ....	17
Table B4: Foraging groups of terrestrial birds in the Coorong region .....	18
Table B5: Migratory bird species occurring within the RMDS ecological community that are bound by international agreements. ....	19
Table B6: At least 18 bat species that are known to occur or are likely to occur within RMDS EC (i.e. in floodplain, riparian, woodland, and/or forest habitats) from survey records and reports ....	21
Table B7: Ecological objectives for fish passage under <i>the Murray Futures: Coorong, Lower Lakes &amp; Murray Mouth Recovery Project</i> : Management Action 8 Construction of Fishways (DENR 2013). ....	22

**Table B1: Examples of non-woody aquatic and riparian vegetation known to occur, or to have previously occurred (shaded in grey), within the River Murray—Darling to Sea ecological community (EC).**

Vegetation is listed under five main categories: Littoral and Riparian (min. 7 species); Emergent (min. 25 species); Submergent/emergent (min. 2 species); Floating (min. 6 species); and, Submergent (min. 16 species). [Notes; 'Voucher' refers to preserved biological samples, usually kept in a herbarium or museum. 'AVH' refers to the [Australian Virtual Herbarium](#). All information within this table was obtained from this source, with further details of these species and their ecological importance given within the main text of this conservation advice. The use of 'Lakes' references Lakes Alexandrina and Albert, while the use of 'lagoons' refers to either the permanent North and South Lagoon of the Coorong or the smaller and usually ephemeral waterbodies south of the Coorong]. Further plant species lists, including for floodplain trees and understory, can be found in Gehrig & Nicol (2010), Nicol (2012), Holland et al. (2013), Smith & Smith (2014), Nicol et al. (2018; 2020).

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<b>Littoral and Riparian vegetation</b>						
<i>Frankenia pauciflora</i>	Southern Sea-heath	Found throughout ecological community but particularly around Lakes and Coorong				
<i>Gahnia filum</i>	Thatching Grass		This species is common around the Lakes, across much of the ephemeral lagoons and brackish swamps that are fringing and south of the South Lagoon but was not vouchered in the area until 1974. Host to the Yellowish Sedge-skipper butterfly. Many stands within ecological community are currently poor hosts due to lack of flooding and a build-up of dead plant material.			
<i>Rumex bidens</i>	Mud Dock	Commonly found around Lakes and along river channels, it was frequently vouchered in the 1960s and 1980s. It was first vouchered in 1848 alongside the river at Wellington. Between 1849 and 1895, it was sampled as far upriver as Moorundie and across the Lakes to the Murray Mouth.				
<i>Samolus repens</i>	Creeping Brookweed	First vouchered in 1886 near Raukkan. Found along the fringing wetlands along the river channel from Walker Flat down and around Lakes Alexandrina and Albert. This species is also found in and around groundwater soaks along the Coorong, swamps fringing Salt Creek (vouchered in the 1970s-80s) and in the ephemeral lagoons (first vouchered 1925).				
<i>Thyridia repens</i>	Creeping Monkey Flower	Found the full length of the ecological community. Often found in fringing swamps and within the littoral zone.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Wilsonia backhousei</i>	Narrow-leaf Wilsonia			Can be found the length of the Coorong, particularly near groundwater soaks on subsaline soils. First vouchered in 1956 and still frequently observed.		
<i>Wilsonia humilis</i>	Silky Wilsonia					Collected in 1970s from ephemeral lagoon sections of the Coorong and still observed there.
<b>Emergent vegetation</b>						
<i>Bolboschoenus caldwellii</i>	Sea Club-rush	Vouchered near Mannum in 1924 and on Lake Alexandrina near Milang in 1967. Was extensively vouchered along the River Channel of the EC in the 1970s-80s, around the Lakes and in soaks along the Younghusband Peninsula from the Murray Mouth to Gnarling Point.				
<i>Carex appressa</i>	Tall sedge	Vouchered from the River Channel between Murray Bridge & Milang prior to 1947 & from the river flats at Wellington in 1979. Most ALA records for the EC are from 1999-2002.				
<i>Cotula coronopifolia</i>	Water buttons	Found along the River Channel, tributaries, in soaks and along the edges of both Lakes, with the earliest vouchers from 1954.				Occasionally found in fresher ephemeral lagoons.
<i>Cotula vulgaris</i>	Slender Cotula		Found around ephemeral waterbodies and soaks alongside the Coorong. Earliest record is 1848 near Wellington on the Murray flats and in 1880 in the shallows of Lake Alexandrina.			
<i>Cycnogeton procerum</i>	Common Water-ribbons	Found along the wetlands fringing the River Channel from Swan Reach to Wellington, tributaries and in several locations around Lake Alexandrina in shallow water. It was first sampled near Milang in 1880. It also vouchered in the 1950s, 60s, 90s and 2002.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Cyperus gymnocaulos</i>	Spiny Flat-sedge	Many records along the River Channel, around the Lakes and in soaks along Coorong. Sampled at Meningie in 1952 and Wellington in 1959.				Can be found in the fresher soaks along the dunes.
<i>Eleocharis acuta</i>	Common Spike-rush	Common around fringes of Lakes and salt pans, as well as within riverine wetlands. Sampled in 1939 at Tailem Bend, twice in the 1950s at Wellington and around both Lakes in 1959.				
<i>Eleocharis pusilla</i>	Small Spike-rush	Vouchered along the riverine channel in the 1800s, but not collected in Lake Alexandrina until the 1990s.				
<i>Ficinia nodosa</i>	Knobby Club-rush		Commonly found around the Lakes, in salt pans, fringing swamps, and near dune soaks. Earliest vouchers for the region within the EC were in 1937 and 1941.			
<i>Juncus articulatus</i>	Jointed Rush	Earliest vouchers within EC collected in 1959. Found from Mannum to Goolwa, around both Lakes.				
<i>Juncus usitatus</i>	Common Rush	Earliest vouchers within EC collected in 1931-39. Found from the SA border to Goolwa, around both Lakes.				
<i>Lilaeopsis polyantha</i>	Australian Lilaeopsis	First sampled around Mannum in 1883 and vouchered as far upstream as Barmera. Regularly sampled around the Lakes since 1951.				
<i>Lythrum hyssopifolia</i>	Lesser Loosestrife	Grows along River Channel, and around fringes of Lakes. Earliest record within EC at Jervois Swamp, Tailem Bend in 1937 but most records are in the 1970s - 2010s.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Persicaria decipiens</i>	Slender Knotweed	Common along River Channel and around Lakes. Frequently vouchered 1955 to present, but as early as 1849 near Blanchetown & 1882 near Murray Bridge. Occasional vouchers taken up as far as the Darling junction during early 20th century.				
<i>Persicaria lapathifolia</i>	Woolly Knotweed	Common in wetland areas fringing the main River Channel throughout the EC, as well as Lakes Alexandrina and Albert. Earliest voucher from Wellington in 1848, however it was not vouchered in the Lakes until almost a hundred years later.				
<i>Phragmites australis</i>	Common Reed	Phragmites was vouchered in 1896 in a wetland near Murray Bridge & in 1947 near Renmark. All other vouchers are post-regulation. The species is throughout the EC now, including in sandhill soaks adjacent to the Coorong. Earliest voucher from around Lakes and Coorong, taken in 1961 at Meningie & 1968 at Wellington.				Can be found in the fresher soaks along the dunes.
<i>Ranunculus amphitrichus</i>	Small River Buttercup	Generally found on swampy ground around lakes and watercourses. First vouchered from within the EC at Morgan in 1848. It was recorded at Tailem Bend in 1939, then around the Lakes and Mt Lofty Ranges tributaries in 1959.				
<i>Schoenoplectus tabernaemontani</i> ( <i>S. validus</i> )	River Club-rush	Found along the entire freshwater portion of the EC. First collected near Murray Bridge & Mannum in 1880s-90s, with regular collections since. Was extensively planted around the Lakes during Millenium Drought recovery actions.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Triglochin minutissima</i>	Tiny Arrowgrass					Found on ephemerally wet pans and soaks along Coorong. First vouchered in 1965.
<i>Triglochin striata</i>	Streaked Arrowgrass	Found in wetlands fringing the lower River Murray, with the first voucher within the EC in 1955. Vouchered at several locations within the Lakes in 1959, and regularly between then and the Millenium Drought, but, to date, not in the time since.				Found in the fresher soaks of Youngusband Peninsula.
<i>Typha domingensis</i>	Cumbungi	Three earlier vouchers in 1918-37 at Murray Bridge, Tailem Bend & in a tributary of the Finnis; most vouchers taken from 1950s onward. Now common throughout the fresher portions of the EC.				Occasionally found in dunal soaks.
<i>Vaucheria</i> spp.	Water felt	This genus was vouchered from the Goolwa Barrages up to the Darling Junction by a single collector from 1983-5.			<i>Vaucheria</i> was vouchered from Magrath Flat to Cantara (the full length of the South Lagoon, including the ephemeral portion) in 1983-5.	

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<b>Submergent / emergent vegetation</b>						
<i>Myriophyllum caput-medusae</i>	Coarse Milfoil	Historically found throughout both Lakes. First voucher collected in 1848 in Lake Alexandrina. Likely to be one of the species MacDonald noted in 1884, creating a tangled mass of waterweeds for the last mile into the Meningie wharf. Also vouchered in the River Channel and in permanent wetlands along the river. In 1950s-80s, regularly vouchered in approx. 40cm of water. Can still be found entwined with more substantial reeds and rushes.				
<i>Myriophyllum muelleri</i>	Hooded Milfoil		A more salinity and exposure-tolerant Milfoil and usually occurs closer to Lake shorelines. Often found in dried-up saline swamps. 1970s-90s vouchers from both Lakes.			

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<b>Floating vegetation</b>						
<i>Azolla rubra</i>	Pacific Azolla	Very common throughout the Murray Darling Basin. Collected multiple times from edges of Lake Alexandrina, as early as 1848.				
<i>Callitriche</i> sp.	Water-starwort	The introduced <i>C. stagnalis</i> has naturalised to Australia and is listed as an environmental weed in several States. However, there is an 1880 voucher from Lake Alexandrina identified as this species. It is possible that this voucher is of a native species and therefore that some of the more recent ones found, are also.				
<i>Landoltia punctata</i>	Thin Duckweed	Collected from the eastern side of Lake Alexandrina in 1848, with further collections around both Lakes and along the river during the 1900s-1990s.				
<i>Lemna disperma</i>	Common Duckweed	Earliest vouchers of this species within the EC were from the 1950s, however it is now commonly collected or observed.				
<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Water Primrose	Most commonly sampled emergent. Found the whole length of the River Channel and in the Lakes. Earliest sample was taken in 1886 at Murray Bridge, with a consistent record to the present.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Ottelia ovalifolia</i> subsp. <i>ovalifolia</i>	Swamp Lily	Found in stagnant water near Lake Alexandrina in 1848. Also found at the great bend near Loxton in approx. 1889. There is then a break in the record until human observation places them in the Chowilla Game Reserve and along the river in the Murray Sunset National Park in 2005-10.				
Submergent vegetation						
<i>Nitella hyalina</i> and other spp.	Stonewort			1965 In ephemeral lagoons adjacent to Salt Creek and in 1974 in large swampy area, adjacent to the Nurrung ferry landing.		
<i>Acetabularia peniculus</i>	Balloon-tops				1954 - 1979 often found in shallow embayments of the South Lagoon, from Magrath Flat to Bul Bul Basin. It has not been vouchered or formally recorded since 1979.	
<i>Althenia cylindrocarpa</i> and affiliated species	Long-fruit Water mat		First vouchered in the southernmost section of the South Lagoon, in 1963. Since then, found throughout the lowest flow, warmest water, sunlit saline sections of the Lakes and Coorong, from the samphire-dominated wetlands fringing the Lakes through to the shallow South Lagoon embayments and the ephemeral lagoons at the southern end. Note, unless vouchers are taken, it is often mistaken for <i>Ruppia tuberosa</i> .			

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Vallisneria australis</i>	Ribbon-weed	Has been vouchered along the full length of the River Channel and along Mt Lofty Ranges tributaries. Vouchers also taken along the Goolwa channel and at Wellington.				
<i>Chara fibrosa</i>	Stonewort		Usually sampled in wetlands off the main River, this stonewort was first sampled in sluggish muddy water not far from the edge of Lake Alexa. in 1848.			
<i>Chara globularis</i>	Stonewort			Collected in 1974 from a large swampy area, adjacent to the Nurrung ferry landing.		
<i>Gracilaria chilensis</i>	Estuarine Wireweed			Grows throughout North Lagoon and along the marine section of the Goolwa channel. Vouchered from 1976 to present.		

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Lamprothamnium macropogon</i> species complex	Stonewort		This species has regularly been vouchered in the swamps fringing the Lakes.	This species has regularly been vouchered throughout the South Lagoon and ephemeral lagoons, but only recently in the southern section of the North Lagoon. The earliest vouchers in the South Lagoon were collected in 1935, but there is other evidence that it has persisted in the South Lagoon and ephemeral lagoons for thousands of years. When dominant in the South Lagoon, this species was critical for water quality, fisheries, and waterfowl. Since reinstating flows along Salt Creek, a permanent stand of this species has established along the creekline, although it is currently transitioning to a <i>Ruppia megacarpa</i> stand. <i>Lamprothamnium</i> stands were largely missing from the South Lagoon from 1978 to 2022, but trials using sediment from the South Lagoon, along with vouchers collected in both lagoons of the Coorong during the 2022-23 flood, show that this species persists in the South Lagoon and grows well when the conditions are right. See main text of this Conservation advice for more detailed discussion of the ecology, habitat requirements and references.		
<i>Potamogeton perfoliatus</i>	Clasped Pondweed	Collected in 1942 from the river at Tailem Bend, as well as from fringing wetlands and creeks up near the Darling junction. While there are no vouchers of this species from the Lakes, there are notes on the vouchers of other species, stating they were growing with <i>Potamogeton</i> sp.				

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Ruppia megacarpa</i> (plus occasional <i>Ruppia maritima</i> )	Large-fruited Seatassel / Seatassel		<i>Ruppia megacarpa</i> was vouchered from Lake Albert in 1965 and in 1980-81. No other mention of this species at this location is made within the official records.	A collection of vouchers for this species were taken along the full length of the North Lagoon in 1978-83, which was the first systemic study of them. Salinities during this study varied from 41-82g/L. There is evidence that this species was once the main species in this area and it is still found in the North Lagoon, just not in vast stands (Waycott et al. 2023)	First vouchered in the South Lagoon in 1965 and was a major part of the macrophyte cover in the South Lagoon until 1977-8, disappearing from this area after that (Coleman 2024). A healthy stand persists in Salt Creek. Isolated plants were found in the South Lagoon during the 2023 flood but are awaiting DNA confirmation (Waycott 2023).	
<i>Ruppia polycarpa</i>	Widgeon Grass		This species was first vouchered in 1959-65 in three Lake Albert locations, then in a salt pan near Loveday Bay. In the late 1970s and 1980s, this species was found in the ephemeral lagoons, and in Tolderol Game Reserve. More recently, it has been found seaward of Hindmarsh Island and in the South Lagoon, however these recent observations are still mainly comments in reports, e.g. Waycott et al. 2023, and are yet to appear in the herbarium records.			

Species	Common name	Riverine swamps, streams & channels	Lakes Alexandrina & Albert	Murray Mouth & North Lagoon	South Lagoon	Soaks & ephemeral lagoons
<i>Ruppia tuberosa</i>	Widgeon Grass		Collected in Lake Albert in 1965, in adjacent swamps in 1978 and near Clayton Bay in 1992. Notes on the vouchers within AVH state that it was recently found to dominate macrophytes in small salt pans adjacent to Lake Alex. and near the Murray Mouth.	First collected from the North Lagoon in 1978-1985.	Collected from Magrath Flat in 1973 and the South Lagoon from 1970 onwards. Sediment cores suggest it only appeared in the main area of the South Lagoon sometime after 1950. See main text for more details of this evidence.	Found in the ephemeral lagoons south of the Coorong from 1965 onwards.
<i>Tolypella nidifica</i>	Bird's Nest Stonewort				Vouchered in ephemeral lagoons alongside and south of the South Lagoon in 1960.	
<i>Zostera muelleri</i>	Eelgrass			<i>Zostera</i> was found growing densely throughout the southern half of the North Lagoon in March 1925 (with a voucher taken at this time), but it had vanished by October 1930. There is no formal record of this species in the EC since that time.		

**Table B2: Indicative fish species of the RMDS ecological community and their conservation status (McNeil & Hammer 2007, Hammer et al. 2009, Bice et al. 2018; Kohen et al. 2020; Lintermans 2023).** [Conservation Status Key: CE=critically endangered; E=endangered; Ex=locally extinct (extirpated); FPAL=under EPBC assessment; P=protected in SA; R=rare in SA; V=vulnerable]. Note, there may be further marine-estuarine and marine straggler/stray species that enter the EC from time to time.

Common name (Family)	Scientific Name	Conservation status				Notes
Native species		EPBC <sup>1</sup>	SA <sup>2,3</sup>	NSW <sup>4</sup>	VIC	
<b>Australian smelt</b> (Retropinnidae)	<i>Retropinna semoni</i>	-	-	-		freshwater-est. opportunist
<b>Black bream</b> (Sparidae)	<i>Acanthopagrus butcheri</i>					estuarine
<b>Blue-spot goby</b> (Gobiidae)	<i>Pseudogobius olorum</i>	-	-	-		estuarine
<b>Bony herring</b> (Clupeidae)	<i>Nematalosa erebi</i>	-	-	-		freshwater-est. opportunist
<b>Boofhead carp gudgeon</b> (Eleotridae)	<i>Hypseleotris bucephala</i>	-	-	-		freshwater
<b>Bridled goby</b> (Gobiidae)	<i>Arenigobius bifrenatus</i>					estuarine- mostly (+ inshore marine)
<b>Carp gudgeon complex*</b> [ x3 hemiclonal] (Eleotridae)	<i>Hypseleotris</i> spp.	-	-	-		freshwater
<b>Climbing galaxias</b> (Galaxiidae)	<i>Galaxias brevipinnis</i>	-	-, R	-		freshwater
<b>Common galaxias</b> (Galaxiidae)	<i>Galaxias maculatus</i>	-	-	-		semi-catadromous
<b>Congolli</b> (Bovichtidae)	<i>Pseudaphritis urvillii</i>	-	-, V	-		catadromous
<b>Cryptic carp gudgeon</b> (Eleotridae)	<i>Hypseleotris acropinna</i>	-	-	-		freshwater
<b>Dwarf flat-headed gudgeon</b> (Eleotridae)	<i>Philypnodon macrostomus</i>	-	-	-		freshwater-estuary straggler
<b>Estuary perch</b> (Percichthyidae)	<i>Percalates colonorum</i>	-	-, CE	-		semi- catadromous
<b>Flat-headed galaxias</b> (Galaxiidae)	<i>Galaxias rostratus</i>	CE	-Ex	CE	V?	freshwater <b>Extirpated</b>
<b>Flat-headed gudgeon</b> (Eleotridae)	<i>Philypnodon grandiceps</i>	-	-	-		freshwater-est. opportunist
<b>Freshwater catfish</b> (Plotosidae)	<i>Tandanus tandanus</i>	-	P, E	E	E	freshwater-estuary straggler
<b>Golden perch</b> (Percichthyidae)	<i>Macquaria ambigua ambigua</i>	-	-	-		freshwater-estuary straggler
<b>Greenback flounder</b> (Pleuronectidae)	<i>Rhombosolea tapirina</i>	-	-	-	-	marine-estuarine- resident Coorong
<b>Lagoon goby</b> (Gobiidae)	<i>Tasmanogobius lasti</i>	-	-	-		estuarine
<b>Macquarie perch</b> (Percichthyidae)	<i>Macquaria australasica</i>	E	-, Ex	E		estuarine <b>Extirpated</b>
<b>Mountain galaxias</b> (Galaxiidae)	<i>Galaxias olidus</i>	-	-, V	-		freshwater
<b>Mulloway</b> (Sciaenidae)	<i>Argyrosomus japonicus</i>					marine-estuarine (nursery)
<b>Murray cod</b> (Percichthyidae)	<i>Maccullochella peelii</i>	VU	P, E	-	E	freshwater-estuary straggler
<b>Murray-Darling rainbow fish</b> (Melanotaeniidae)	<i>Melanotaenia fluviatilis</i>	-	R	-	E	freshwater-estuary straggler
<b>Murray hardyhead</b> (Atherinidae)	<i>Craterocephalus fluviatilis</i>	E	P, CE	CE, Ex	CE	freshwater- estuary straggler
<b>Obscure galaxias</b> (Galaxiidae)	<i>Galaxias oliros</i>	-	-	-		freshwater

Common name (Family)	Scientific Name	Conservation status				Notes
Native species		EPBC <sup>1</sup>	SA <sup>2,3</sup>	NSW <sup>4</sup>	VIC	
<b>Olive perchlet/ Agassiz's glassfish</b> (Ambassidae)	<i>Ambassis agassizii</i>	-	Ex, P, CE	E	Ex	freshwater <b>Extirpated</b>
<b>Pouched lamprey</b> (Geotriidae)	<i>Geotria australis</i>	-	-, E	-		anadromous
<b>River blackfish</b> (Percichthyidae)	<i>Gadopsis marmoratus</i>	-	P, E	E		freshwater-estuary straggler
<b>Sandy sprat</b> (Clupeidae)	<i>Hyperlophus vitattus</i>					marine-estuarine (foodweb Coorong)
<b>Short-finned eel</b> (Anguillidae)	<i>Anguilla australis</i>	-	-, R	-		catadromous; rare
<b>Short-headed lamprey</b> (Mordaciidae)	<i>Mordacia mordax</i>	-	-, E	-		anadromous
<b>Silver perch</b> (Percichthyidae)	<i>Bidyanus bidyanus</i>	CE→E	P, E	V	E	freshwater-estuary straggler
<b>Small-mouthed hardyhead</b> (Atherinidae)	<i>Atherinosoma microstoma</i>	-	-	-		estuarine
<b>Southern pygmy perch-MDB lineage</b> (Percichthyidae)	<i>Nannoperca australis</i>	VU	P, E	E	V?	freshwater-estuary straggler
<b>Southern purple-spotted gudgeon-MDB lineage</b> (Eleotridae)	<i>Mogurnda adspersa</i>	FPAL	P, CE	E	CE	freshwater
<b>Spangled perch</b> (Percichthyidae)	<i>Leiopotherapon unicolor</i>	-	-	-		freshwater-estuary straggler
<b>Spotted galaxias</b> (Galaxiidae)	<i>Galaxias truttaceus</i>	-	-	-		freshwater
<b>Tamar River goby</b> (Gobiidae)	<i>Afurcagobius tamarensis</i>	-	-	-		estuarine
<b>Trout cod</b> (Percichthyidae)	<i>Maccullochella macquariensis</i>	E	P, Ex	E		freshwater <b>Extirpated</b>
<b>Unspecked hardyhead</b> (Atherinidae)	<i>Craterocephalus fulvus</i>	-	R	-		freshwater-estuary straggler
<b>Western bluespot goby</b> (Gobiidae)	<i>Pseudogobius olorum</i>					estuarine
<b>Western carp gudgeon</b> (Eleotridae)	<i>Hypseleotris klunzingeri</i>	-	-	-		freshwater
<b>Western river garfish</b> (Hemiramphidae)	<i>Hyporhamphus regularis regularis</i>					estuarine
<b>Yarra pygmy perch</b> (Percichthyidae)	<i>Nannoperca obscura</i>	E	P, CE	-	V	freshwater-estuary straggler <b>Extirpated#</b>
Alien species						
<b>Oriental weatherloach</b> (Cobitidae)	<i>Misgurnus anguillicaudatus</i>	-	-	-	-	freshwater-estuary straggler
<b>Goldfish</b> (Cyprinidae)	<i>Carassius auratus</i>	-	-	-	-	freshwater-estuary straggler
<b>European Carp</b> (Cyprinidae)	<i>Cyprinus carpio</i>	-	-	-	-	freshwater-estuary straggler
<b>Tench</b> (Cyprinidae)	<i>Tinca tinca</i>	-	-	-	-	freshwater-estuary straggler
<b>Redfin perch</b> (Percidae)	<i>Perca fluviatilis</i>	-	-	-	-	freshwater-estuary straggler
<b>Eastern gambusia</b> (Poeciliidae)	<i>Gambusia holbrooki</i>	-	-	-	-	freshwater-estuary straggler
<b>Rainbow trout</b> (Salmonidae)	<i>Oncorhynchus mykiss</i>	-	-	-	-	likely (illegally) stocked

<sup>1</sup>EPBC – Environment Protection and Biodiversity Conservation Act 1999; <sup>2</sup>Fisheries Management (General) Regulations 2007 – Schedule 5 (SA); <sup>3</sup> Action Plan for South Australian Freshwater Fishes (Hammer et al. 2009); <sup>4</sup>Fisheries Management Act 1994 (NSW); # in Wild.

**\*Note re the Carp gudgeon complex:**

While several distinct species of carp gudgeon are recognised, genetically most of the group demonstrates hemiclinal combination (Thacker et al. 2022a,b)—*H. klunzingeri* is an exception (Thacker et al. 2022a,b). This is not strictly hybridisation, but rather the hemiclones have a hybrid origin. These result from breeding between two ‘species’, but the fish transmit their genome clonally each generation. By comparison, usually F1 hybrids are generated fresh each generation from two different species, and if they pass on anything to future generations it will be a blend of the two species. However, these carp gudgeons have no recombination when they make gametes (P. Unmack pers. comm.).

*Hypseleotris* taxon that occur within the region of the RMDS EC are (P. Unmack pers. comm.):

<b><i>Species</i></b>	<b><i>Hemiclinal combinations</i></b>
<i>H. acropinna</i> (cryptic carp gudgeon)	<i>H. acropinna</i> x <i>bucephela</i>
<i>H. bucephela</i> (boofhead carp gudgeon)	<i>H. acropinna</i> x <i>gymnocephela</i>
<i>H. klunzingeri</i> (rare in EC)	<i>H. bucephela</i> x <i>gymnocephela</i>

For the purposes of the species count for the fish fauna of the RMDS EC, these carp gudgeon taxa have been counted as six ‘species’. The hemiclinal combinations are considered to be on independent evolutionary pathways, similar to the way a species is but without the ability to recombine. However, they may still be influenced by mutation and by the genome they obtain when they mate with one of the other ‘species’ (P. Unmack pers. comm.). Additionally, pure populations of *H. gymnocephela* have only been recorded to date in two tributaries of the upper Lachlan River (P. Unmack pers. comm.)—i.e. outside of the EC.

**Note:**

- **TOTAL Native Fish Species in EC is 47**
- **Total Extirpated species = 5**
- **Total Alien species = 8**

**Table B3: Three main waterbird foraging groups of the Coorong and Lower Lakes – common elements and examples of regular summer birds (after Paton 2010; Paton et al. 2018).**

Invertebrate Foragers	Waterfowl (mainly aquatic plant feeders)	Fish-eating Group
<ul style="list-style-type: none"> <li>• <b>shorebirds</b> - sandpipers, plovers, stilts, curlews, godwits, oystercatchers, gulls and lapwings</li> <li>• the larger ibis and spoonbills</li> <li>• <b>resident waders</b> (i.e. that breed in Australia) e.g. <i>Cladorhynchus leucocephalus</i> (banded stilt), <i>Charadrius ruficapillus</i> (red-capped plover), <i>Recurvirostra novaehollandiae</i> (red-necked avocet)</li> <li>• <b>migratory waders</b> (i.e. that breed in the Northern Hemisphere) e.g. <i>Calidris (Ereunetes) ruficollis</i> (red-necked stint), <i>Calidris alba</i> (sanderling), <i>Calidris ferruginea</i> (curlew sandpiper), <i>C. acuminata</i> (sharp-tailed sandpiper), <i>Numenius madagascariensis</i> (eastern curlew)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>ducks, teal, swan</b></li> <li>• <i>Anas gracilis</i> (grey teal)</li> <li>• <i>Tadorna tadornoides</i> (Australian shelduck)</li> <li>• <i>Anascastanea</i> (chestnut teal)</li> <li>• <i>Cygnus atratus</i> (black swan)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>cormorants, grebes, terns, egrets, darters and heron</b></li> <li>• <i>Poliocephalus poliocephalus</i> (hoary-headed grebe)</li> <li>• <i>Phalacrocorax sulcirostris</i> (little black cormorant)</li> <li>• <i>Thalasseus bergii</i> (crested tern), <i>Chlidonias hybrida</i> (whiskered tern), <i>Sternula nereis</i> (fairy tern)</li> <li>• <i>Egretta novaehollandiae</i> (white faced heron)</li> <li>• <i>Tringa nebularia</i> (common greenshank)</li> <li>• <i>Pelecanus conspicillatus</i> (Australian pelican)</li> </ul>

**Table B4: Foraging groups of terrestrial birds in the Coorong region (after Paton 2010; Paton et al. 2018).**

Frugivores	Insectivores	Nectivores	Granivores
~50%	~33%		
<b>Examples:</b> <ul style="list-style-type: none"> <li>• <i>Zosterops lateralis</i> (silveryeye)</li> <li>• <i>Gavicalis virescens</i> (singing honeyeater)</li> <li>• <i>Acanthagenys rufogularis</i> (spiny-cheeked honeyeater)</li> <li>• <i>Anthochaera carunculata</i> (red wattlebird)</li> <li>• <i>Dromaius novaehollandiae</i> (emu)</li> </ul>	<b>Examples:</b> <ul style="list-style-type: none"> <li>• <i>Sericornis frontalis</i> (white-browed scrubwren)</li> <li>• <i>Malurus cyaneus</i> (superb fairy wren)</li> <li>• <i>Acanthiza pusilla</i> (brown thornbill)</li> <li>• <i>Dasyornis broadbenti</i> (rufous bristlebird)</li> <li>• <i>Stipiturus malachurus intermedius</i> (southern emu wren)</li> </ul>	<b>Example:</b> <ul style="list-style-type: none"> <li>• <i>Phylidonyris novaehollandiae</i> (New Holland honeyeater)</li> </ul>	<b>Examples:</b> <ul style="list-style-type: none"> <li>• <i>Neophema elegans</i> (elegant parrot)</li> <li>• <i>Phaps elegans</i> (brush bronzewing)</li> </ul>

**Note:** Banding studies show that silveryeyes, the most abundant frugivore that lives and breeds in the Coorong during summer, move to areas like the Eastern Mount Lofty Ranges for winter (Paton 2010), indicating an important connection between the Coorong's coastal scrublands and these elevated areas of the ecological community. Also, the critically endangered *Neophema chrysogaster* (orange bellied parrot) was a semi-regular winter visitor (Paton 2010).

**B5: Migratory birds under International Agreement.**

Within the ecological community there are several wetland and coastal water birds that come under various international agreements (see [Table B5](#)). These occur between Australia and several Asian nations. Their aim is to minimise harm to the major areas used by migratory birds which migrate between the two countries. Three such agreements are relevant to international migratory birds that spend time within, and are dependent on, the ecological community.

- JAMBA – The agreement between the Governments of Australia and Japan for the protection of migratory birds in danger of extinction and their environment.
- CAMBA – The agreement between the Governments of Australia and the People’s Republic of China for the protection of migratory birds in danger of extinction and their environment.
- ROKAMBA – The agreement between the Governments of Australia and the Republic of Korea for the protection of migratory birds and exchange of notes.

These agreements provide for cooperation on measures for the management and protection of migratory birds, birds in danger of extinction, and the management and protection of their environments. They require each country to take appropriate measures to preserve and enhance the environment of birds protected under the provisions of the agreement. Birds listed under one or more of these agreements is considered a Matter of National Environmental Significance (MNES) under the EPBC Act.

**Table B5: Migratory bird species occurring within the RMDS ecological community that are bound by international agreements.**

<b>Taxonomic Name</b>	<b>Common Name</b>	<b>EPBC status</b>	<b>JAMBA</b>	<b>CAMBA</b>	<b>ROKAMBA</b>
<i>Ardenna carneipes</i> <sup>1</sup> (syn. <i>Puffinus carneipes</i> )	Pale-footed Shearwater (Flesh-footed shearwater)	Marine; Migratory			✓
<i>Ardenna grisea</i> <sup>1</sup> (syn. <i>Puffinus griseus</i> )	Sooty shearwater	<b>Vulnerable</b>	✓	✓	
<i>Ardenna tenuirostris</i> <sup>1</sup> (syn. <i>Puffinus tenuirostris</i> )	Slender-billed Shearwater (Short-tailed shearwater)	Marine; Migratory			✓
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	<b>Vulnerable</b>	✓	✓	✓
<i>Calidris alba</i>	Sanderling	Marine; Migratory	✓	✓	✓
<i>Calidris canutus</i>	Red knot; Knot	<b>Vulnerable</b>	✓	✓	✓
<i>Calidris ferruginea</i>	Curlew sandpiper	<b>Critically Endangered</b>	✓	✓	✓
<i>Calidris melanotos</i>	Pectoral Sandpiper	Marine; Migratory	✓		✓
<i>Calidris ruficollis</i>	Red-necked stint	Marine; Migratory	✓	✓	✓
<i>Calidris subminuta</i>	Long-toed stint	Marine; Migratory	✓	✓	✓
<i>Calidris tenuirostris</i>	Great knot	<b>Vulnerable</b>	✓	✓	✓
<i>Charadrius leschenaultii</i>	Greater sand plover	<b>Vulnerable</b>	✓		✓
<i>Charadrius mongolus</i>	Mongolian plover (lesser sand plover; Mongolian sand-dotterel)	<b>Endangered</b>	✓	✓	✓

Taxonomic Name	Common Name	EPBC status	JAMBA	CAMBA	ROKAMBA
<i>Charadrius veredus</i>	Oriental plover	Marine; Migratory			✓
<i>Egretta alba</i> (syn. <i>Ardea alba</i> )	Great egret; white egret	Marine	✓	✓	-
<i>Egretta sacra</i>	Eastern Reef Egret	Marine		✓	
<i>Haliaeetus leucogaster</i> <sup>1</sup>	White-bellied sea-eagle	Marine; Migratory	-	✓	-
<i>Hydroprogne caspia</i> <sup>1</sup>	Caspian tern	Marine; Migratory	-	✓	-
<i>Numenius madagascariensis</i>	Eastern curlew; Far eastern curlew	<b>Critically Endangered</b>	✓	✓	✓
<i>Numenius minutus</i>	Little Whimbrel; Little Curlew	Marine; Migratory	✓	✓	✓
<i>Numenius phaeopus</i>	Whimbrel	Marine; Migratory	✓	✓	✓
<i>Phaethon lepturus</i> <sup>1</sup>	White-tailed Tropicbird	Marine; Migratory	✓	✓	
<i>Plegadis falcinellus</i>	Glossy ibis	Marine; Migratory	-	✓	-
<i>Pluvialis squatarola</i>	Grey Plover	<b>Vulnerable</b>	✓	✓	✓
<i>Rostratula benghalensis</i>	Painted Snipe	<b>Endangered</b>		✓	
<i>Sterna albifrons</i> (syn. <i>Sternula albifrons</i> )	Little Tern	Marine; Migratory	✓	✓	✓
<i>Sterna hirundo</i> <sup>1</sup>	Common Tern	Marine; Migratory	✓	✓	✓
<i>Tringa glareola</i>	Wood Sandpiper	Marine; Migratory	✓	✓	✓
<i>Tringa nebularia</i>	Greenshank	<b>Endangered</b>	✓	✓	✓
<i>Tringa stagnatilis</i>	Marsh Sandpiper; Little greenshank	Marine; Migratory	✓	✓	✓
<i>Tringa totanus</i>	Redshank	Marine; Migratory		✓	✓
<i>Xenus cinereus</i>	Terek Sandpiper	<b>Vulnerable</b>	✓	✓	✓

Marine = Declaration under section 248 of the EPBC Act 1999 – List of Marine Species Available at:

<https://www.legislation.gov.au/F2008B00465/asmade/text>

Migratory = Wildlife Conservation Plan for Migratory Shorebirds (2015). Available at:

<https://www.dcceew.gov.au/environment/biodiversity/publications/wildlife-conservation-plan-migratory-shorebirds-2016>

<sup>1</sup>Wildlife Conservation Plan for Seabirds. In effect under the EPBC Act from 16-Jun-2022. Available

at: <http://www.dcceew.gov.au/environment/biodiversity/publications/wildlife-conservation-plan-seabirds-2022>.

**Table B6: At least 18 bat species that are known to occur or are likely to occur within RMDS EC (i.e. in floodplain, riparian, woodland, and/or forest habitats) from survey records and reports (after Carthew & Reardon 2009; Blakey et al. 2018; Armstrong et al. 2019, 2020a, b).**

Taxonomic Name	Common Name	EC Habitat Pref.	Comment
<b>EMBALLONURIDAE</b> (sheath-tailed bats) x1			
<i>Saccolaimus flaviventris</i>	yellow-bellied sheath-tailed bat	may be migratory	rare
<b>VESPERTILIONIDAE</b> (evening bats) x 13			
<i>Chalinolobus gouldii</i>	Gould's wattled bat	variety	most abundant species
<i>Chalinolobus morio</i>	chocolate wattled bat	water, riparian	
<i>Chalinolobus picatus</i>	little pied bat	mallee, north	Threatened SA
# <i>Myotis Macropus</i>	large-footed myotis (fishing bat)	water, floodplain	Threatened SA
^ <i>Nyctophilus corbeni</i>	Corben's long-eared bat		Threatened SA, EPBC Act
<i>Nyctophilus geoffroyi</i>	lesser long-eared bat		common (top 6 species)
<i>Nyctophilus gouldi</i>	Gould's long-eared bat	NSW RM at Mildura, not counted for EC	Not recorded but possibly in EC?
<i>Scotorepens balstoni</i>	inland broad-nosed bat		1 site north of MR
<i>Scotorepens greyii</i>	little broad-nosed bat		
<i>Vespadelus spp.</i>	evening bats	not counted for EC	common (top 6 species)
<i>Vespadelus baverstocki</i>	inland forest bat	woodland, mallee	
<i>Vespadelus darlingtoni</i>	large forest bat	floodplain woodland	less common
<i>Vespadelus finlaysoni</i>	Finlayson's cave bat rest bat	woodland	1 site (near Burra)
## <i>Vespadelus regulus</i>	southern forest bat	floodplain woodland	
<i>Vespadelus vulturnus</i>	little forest bat	floodplain woodland	common (top 6 species)
<b>MINIOPTERIDAE</b> (bent-winged bats)			
** <i>Miniopterus orianae bassanii</i>	southern bent-winged bat	obligate cave dweller (not in EC)	Threatened SA, EPBC Act, 1 sighting in 1961 in EC
<b>MOLOSSIDAE</b> (free-tailed bats) x 4			
^^ <i>Austronomus australis</i>	white-striped free-tailed bat		common (top 6 species)
* <i>Ozimops petersi</i>	inland free-tailed bat		
* <i>Ozimops planiceps</i>	southern free-tailed bat	floodplain	common (top 6 species)
* <i>Ozimops ridei</i>	Ride's free-tailed bat	floodplain	

# *M. macropus*, Species-level taxonomy needs revisiting (Armstrong et al. 2020b).

^ *Nyctophilus corbeni* (syn. *N. timororiensis* south-eastern form) (Armstrong et al. 2020b).

## *V. regulus*, species-level revision in progress (Armstrong et al. 2020b).

\*\* *Miniopterus orianae bassanii* (syn *M. schreibersii bassanii*) (Armstrong et al. 2020b). There is one sighting from 1961; this species, an obligate cave dweller, is unlikely to be a resident of the region.

^^ *Austronomus australis* (syn *Tadarida australis*)

\**Ozimops* species were formerly identified as '*Mormopterus* spp. complex (3 species)' in Carthew & Reardon (2009).

Source: Armstrong KN, Reardon TB & Jackson SM (2020b) A current taxonomic list of Australian Chiroptera. Australasian Bat Society. Version 2020-06-09. URL:

[https://www.ausbats.org.au/uploads/4/4/9/0/44908845/abs\\_taxonomic\\_list\\_version20200609.xlsx](https://www.ausbats.org.au/uploads/4/4/9/0/44908845/abs_taxonomic_list_version20200609.xlsx)

**Table B7: Ecological objectives for fish passage under *the Murray Futures: Coorong, Lower Lakes & Murray Mouth Recovery Project: Management Action 8 Construction of Fishways* (DENR 2013).**

Objective	Description
High biomass	The lower and tidal reaches of large rivers usually have high biomass of fish. High biomass of fish can arrive at the barrages in migration pulses, either postspawning or in the recession of high flows. The 2009 acoustic tracking of congolli revealed the extensive movement of this species and their need to pass the barrages at the same time.
Fish spread over a wide area	The five barrages present a combined barrier to fish passage of 4.23 km. The multiple sites and the wide barrages result in fish that are attempting to migrate both upstream and downstream being attracted to several locations. While the existing fishways are working, four passages stretched over 4 km is a very large distance especially for fish less than 100 mm in length. The provision of increased fish passage options on all barrages is a key priority.
Variety of fish species and body size	A broad size range of fish (20 to 600 mm total length) migrate at the barrages. Swimming ability is directly related to body size which changes the hydraulic requirements of fishways for different size groups. For the purpose of fish passage at the barrages, three groups of fish body size were defined as having similar swimming ability that all need to be catered for: <ul style="list-style-type: none"> <li>• Large-bodied fish (250-600 mm)</li> <li>• Medium-bodied fish (100-250 mm)</li> <li>• Small-bodied fish (20-100 mm).</li> </ul>
Passage of fish at low flows	During summer it is common for little to no flow through some or all of the barrages, particularly during drought. It is important that any fish passage can be designed effectively with little water so that operation can be continuous or extended as long as possible when water is scarce.
Fish at moderate/ high flows	Fishways must be designed to work when moderate to high discharge of water is flowing through. The targeted fish sizes must be able to swim through the water velocities, integrated with suitable attractant flow placement.
Surface-dwelling fish	Some species, such as mullet, will only swim near the surface and will not enter a submerged entry of a fishway.
Bottom-dwelling (benthic) fish	Some species, such as congolli, are benthic and need fishways with low, submerged entrances.