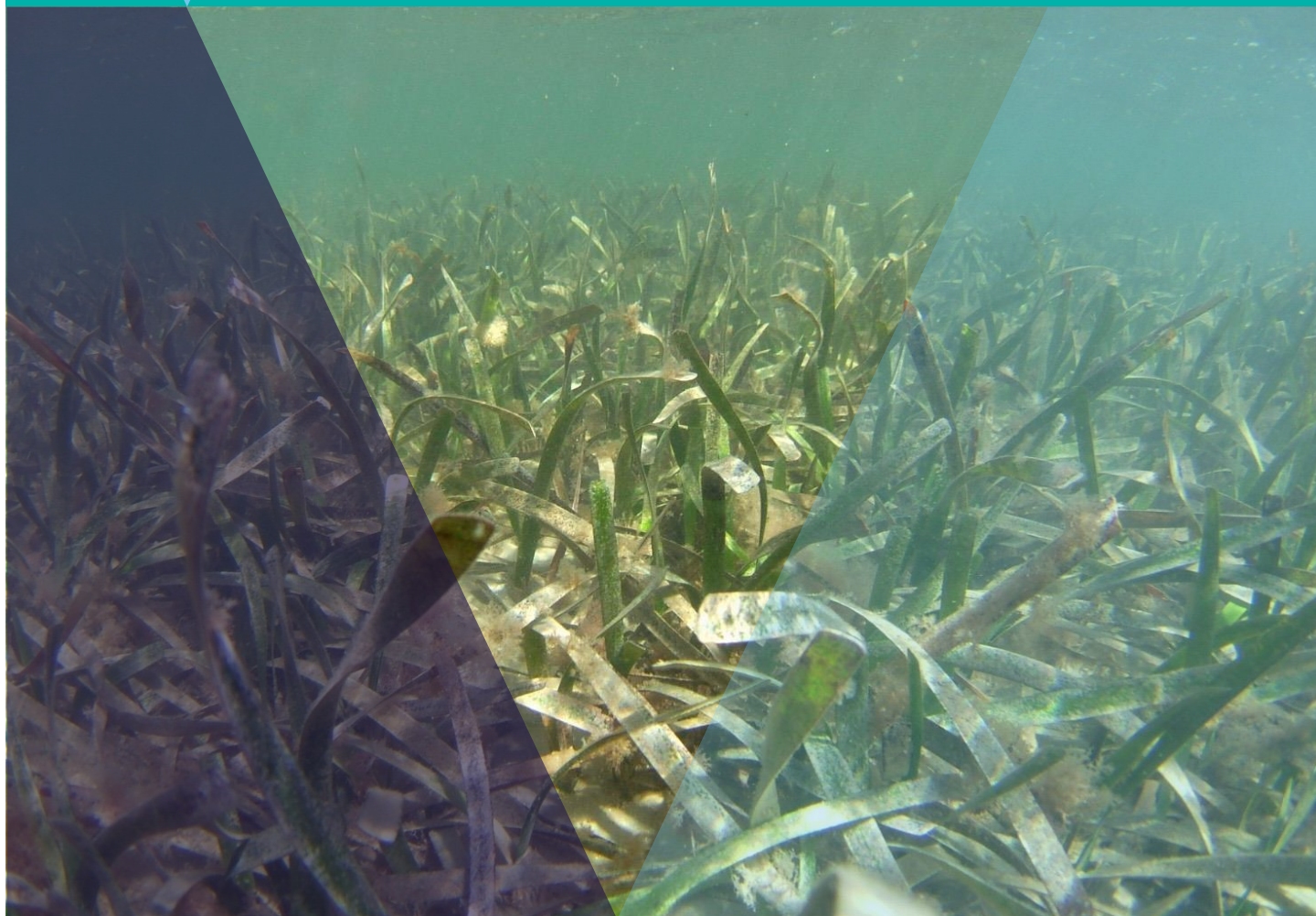


Ecological Character Description Addendum

Corner Inlet Ramsar Site



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Author

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1. Introduction

An ecological character description (ECD) was completed for the Corner Inlet Ramsar Site in 2011 (BMT WBM 2011). Since that time, new information has been generated for the site, which has resulted in amendments to the ECD for the site documented in this addendum. These amendments comprise:

- a review of wetland types present in the wetland, and their areas
- a review of the Criteria for Identifying Wetlands of International Importance (Ramsar criteria) met by the site
- a review of identified critical components, processes and service, with an update to the critical service “supports threatened species” to reflect recent changes to species listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and
- review and update of Limits of Acceptable Change (LAC).

Threats to the site were reviewed but remain unchanged from the ECD.

2. Wetland types

Additional mapping of wetlands, estuaries, bathymetry, saltmarsh and mangroves has been undertaken since the ECD was completed in 2011. This has resulted in a revision of wetland types and adjustment of areas for most types (Table 1, Figure 1).

The revision reflects improved mapping accuracy rather than an actual change in the extent of wetland types. Mapping of wetland Types A, B and G across the site was last undertaken in 1998. The revision of areas for these types is the result of adjustments to accommodate more recent mapping of other wetland types where overlap occurred.

Table 1. Area of Ramsar wetland types in the Corner Inlet Ramsar Site based on a variety of data sources¹.

Ramsar wetland type	Habitats within wetland type	Area (approx.)
Type A - Permanent Shallow Marine Waters	Subtidal <5 metres	4770
	Subtidal >5 metres	5750
Type B: Marine Subtidal Aquatic Beds	Seagrass	14810
Type D: Rocky Marine Shores	-	<1 ²
Type E: Sand, Shingle or Pebble Shores	-	Not available
Type F: Estuarine Waters	-	1090
Type G: Intertidal Mud, Sand or Salt Flats	-	24950
Type H: Intertidal Marshes	Saltmarsh	3510

¹ Corner Inlet Depth Contour Polygons updated 2017, Victorian Wetland Inventory (Current) updated 2016, Corner Inlet Seagrass 1998 (available from <https://www.data.vic.gov.au/>), Saltmarsh and mangrove mapping (Boon et al. 2011), DELWP estuary dataset 2012.

² Area reported in (BMT WBM 2011).

Ramsar wetland type	Habitats within wetland type	Area (approx.)
	Estuarine scrub, Estuarine Flats Grassland and Estuarine Wetland	300
	Saline Aquatic Meadow	50
Type I: Intertidal Forested Wetlands	Mangroves	3000
Type N: Seasonal Rivers/Streams/Creeks	-	Not available
Type Ts: Seasonal/Intermittent Freshwater Marshes/Pools on inorganic soils	-	160
Non-wetland	Mainly coastal woodland, scrub and grassland. Some small areas of exotic vegetation	7480

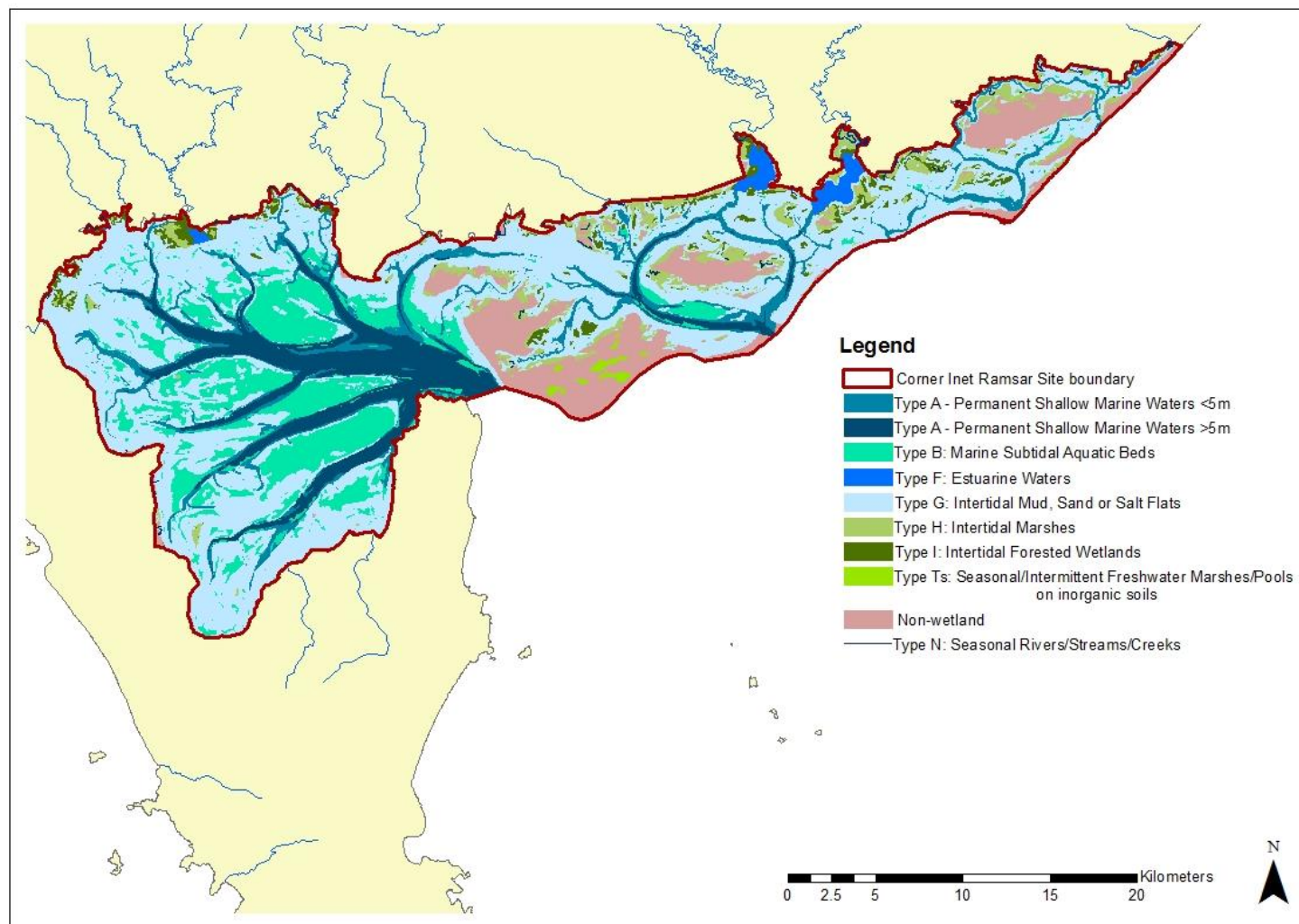


Figure 1. Main Ramsar wetland types in the Corner Inlet Ramsar Site.

3. Ramsar criteria

The criteria met by the site as stated in BMT WBM (2011) have been reviewed. At the time of listing, the Corner Inlet Ramsar Site would have met six of the current nine criteria, and continues to do so.

3.1 Changes resulting from a review of the Ramsar criteria

Criterion 1

This criterion considers habitat types and their representativeness within a given biogeographic region (bioregion). As the basis for assessing criterion 1, BMT WBM (2011) identified both the bioregional framework appropriate for inland and coastal wetlands (drainage divisions) and the framework for marine wetlands, the Integrated Marine and Coastal Regionalisation of Australia (IMCRA). Corner Inlet is primarily a marine wetland and the values relating to criterion 1 are of a marine nature. Thus, this addendum clarifies that the appropriate bioregional framework for assessing criterion 1 is the IMCRA (DSEWPac 2012).

Criterion 2

Seven species of threatened palaeartic migratory waders and the hooded plover now meet Criterion 2 as well as the Australian Grayling. There is insufficient evidence (due to insufficient recent counts) to determine if the Australian Fairy Tern continues to be regularly supported over the period since listing in 1982.

Orange-bellied parrot and the growling grass frog are not considered to have met Criterion 2 at the time of listing or to meet it now.

BMT WBM (2011) states that there were seven records of the orange-bellied parrot (*Neophema chrysogaster*). Unpublished data that covers the period 1884 to 2014 provided by DELWP (Table 2) indicates that the species has been recorded within the Ramsar site on only nine occasions since the site was listed in 1982.

Table 2. Orange-bellied parrot records for Corner Inlet Ramsar Site.

Year	Location	Count
1983	Corner Inlet, Chinaman's Creek	1
1986	Corner Inlet, Mangrove Island	2
1986	Corner Inlet, Barry Island	1
1987	Corner Inlet, Barry Island	1
1987	Corner Inlet, Barry Island	1
1988	Corner Inlet, Barry Island	1
1988	Corner Inlet, Port Albert	5
2004	Corner Inlet, E of Pt. Franklin	1
2004	Corner Inlet, N of Clonmel Island	2

The wild population has seriously declined from an estimated 150 in 2006 (OBPRT 2006) to 50 birds in May 2016 (DELWP 2016) to an estimated 14 individuals in November 2016 (<http://theconversation.com/there-are-14-wild-orange-bellied-parrots-left-this-summer-is-our-last-chance-to-save-them-69274>). Given the paucity of records from the decade around 1982, when the Ramsar site was listed, and the lack of records since 2004, there is no evidence

that Corner Inlet regularly supported this species (in two thirds of years) at the time of listing or has done so since. However, Corner Inlet provides apparently good quality non-breeding saltmarsh habitat for the species.

There are two records for growling grass frog (*Litoria raniformis*) from within the site boundary (1977 and 1994), insufficient to indicate the species is regularly supported. The only freshwater suitable habitat within the site is in the small freshwater systems on Snake Island. Given the paucity of records and the largely marine nature of the site, it is unlikely that Corner Inlet provides significant habitat for this species.

Criterion 4

The number of palaeartic migratory waders that have been recorded within the Ramsar site has been updated from 24 species (BMT WBM 2011) to 26 species. However, only 16 of these are regularly supported in the site. In addition, the site has been identified as particularly important for five beach nesting waterbirds.

Criterion 6

BMT WBM (2011) stated that Criterion 6 was met for seven species using a variety of periods as the baseline (Table 1). The addendum uses a standard baseline period (1981-1994) and has found that nine species met the criterion for this period and that eight species meet this criteria over the period 1981 to 2015 (Table 3).

Table 3. Species for which Criterion 6 was met in BMT WBM (2011), within the standard baseline period (1981- 1994) and for the period 1981-2015 (highlighted in bold).

Common name	Species name	No. of years with counts (and recorded) 1981-2015	Criterion 6 met		
			BMT WBM (2011) (baseline period)	1981-1994 period	1981-2015 period
Australian fairy tern	<i>Sternula nereis nereis</i>	15 (14)	Yes 1987 to 1991	Yes	Insufficient evidence
Australian pied oystercatcher	<i>Haematopus longirostris</i>	35 (35)	Yes 1988 to 1992	Yes	Yes
Bar-tailed godwit	<i>Limosa lapponica</i>	35 (35)	No	Yes	Yes
Chestnut teal	<i>Anas castanea</i>	27 (24)	Yes 1980 to 1992	Yes	Yes
Curlew sandpiper	<i>Calidris ferruginea</i>	35 (35)	No	Yes	Yes
Eastern curlew	<i>Numenius madagascariensis</i>	35 (35)	No	Yes	Yes
Red-necked stint	<i>Calidris ruficollis</i>	35 (35)	Yes 1986 to 1990	Yes	Yes
Red knot	<i>Calidris canutus</i>	35 (35)	Yes 1987 to 1991	Yes	Yes
Sooty oystercatcher	<i>Haematopus fuliginosus</i>	35 (35)	Yes 1984 to 1988	Yes	Yes
Pacific gull	<i>Larus pacificus</i>	16 (14)	Yes 1977 to 1981	Insufficient evidence	Insufficient evidence

3.2 Updated justification for Ramsar criteria met

Criterion 1

A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

The appropriate bioregion for the site is the Southeast IMCRA Transition Provincial Bioregion which includes coastal marine waters in Victoria from just west of Corner Inlet to the south coast of NSW near Nowra. Commonwealth of Australia 2006). Corner Inlet is an example of a near natural wetland which continues to function in what is considered an almost natural way. Corner Inlet contains good representatives of Ramsar wetland types: B (marine sub-tidal aquatic beds); G (intertidal mud, sand or salt flats); H (intertidal marshes) and I (intertidal forested wetlands).

The site contains intertidal mud and sand flats that are the most extensive in the bioregion (BMT WBM 2011) and the saltmarsh (wetland type H) and mangrove (wetland type I) habitats are considered to be in good condition (Boon et al. 2011). The site supports extensive *Posidonia* beds, which are among the largest in the bioregion.

Corner Inlet plays a substantial hydrological role in the natural functioning of a major coastal system through its protection from oceanic swells providing habitat for wetland development, receiving and channelling the flow of rivers and creeks within the South Gippsland Basin.

Criterion 2

A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

This criterion is only applied to wetland dependent flora, fauna and ecological communities, and the site regularly supports one ecological community and eight fauna species listed under the EPBC Act:

- Coastal saltmarsh – vulnerable ecological community.
- Bar-tailed godwit (*Limosa lapponica baueri*) - Vulnerable³.
- Curlew sandpiper (*Calidris ferruginea*) – Critically endangered.
- Eastern curlew (*Numenius madagascariensis*) – Critically endangered.
- Great knot (*Calidris tenuirostris*) – Critically endangered.
- Greater sand plover (*Charadrius leschenaultii*) – Vulnerable.
- Hooded plover (*Thinornis rubricollis rubricollis*) – Vulnerable.
- Lesser sand plover (*Charadrius mongolus*) – Vulnerable.
- Red knot (*Calidris canutus*) – Endangered.
- Australian grayling (*Prototroctes maraena*) – Vulnerable.

The eastern curlew and the great knot are also listed as endangered on the IUCN Red List.

³ Note that the Bar-tailed godwit subspecies *Limosa lapponica menzbieri* is listed as critically endangered under the EPBC Act. While it is possible that this species may occur in the Ramsar site, the non-threatened sub species *baueri* is more prevalent on the east coast of Australia and likely to comprise the majority of records in Victorian Ramsar sites (Dan Weller, BirdLife personal communication).

Criterion 4

A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their lifecycles, or provides refuge during adverse conditions.

The basic description of this criterion implies a number of common functions and roles that wetlands provide including supporting fauna during migration and breeding. Over 35 waterbirds listed under international migratory agreements have been recorded within the Ramsar site. This number includes species that, in Australia, are residents (e.g. eastern great egret) and vagrant seabirds for which the site does not provide significant habitat (e.g. albatross species). There are 26 species of palaeartic migratory shorebirds, 16 of which are regularly supported (in two thirds of seasons) by the Corner Inlet Ramsar Site (Table 4). The extensive mudflats and intertidal marshes provide both feeding and high tide roost sites for these species.

In addition, over 20 species of wetland dependent bird species have been recorded breeding within the site. The site is specifically important for beach-nesting species: Australian pied oystercatcher (*Haematopus longirostris*), Australian fairy tern (*Sternula nereis nereis*), Caspian tern (*Hydroprogne caspia*), crested tern (*Thalasseus bergii*) and hooded plover (*Thinornis rubricollis*). These species use the beaches and islands within the site annually (BMT WBM 2011).

Table 4. Palaeartic migratory waders recorded in Corner Inlet and their frequency of occurrence (percentage of years observed). The 16 species that the site is considered to regularly support are highlighted in bold.

Common name	Species name	JAMBA	CAMBA	ROKAMBA	Frequency of occurrence
Bar-tailed godwit	<i>Limosa lapponica</i>	X	X	X	100
Black-tailed godwit	<i>Limosa limosa</i>	X	X	X	22
Common greenshank	<i>Tringa nebularia</i>	X	X	X	97
Common sandpiper	<i>Actitis hypoleucos</i>	X	X	X	3
Curlew sandpiper	<i>Calidris ferruginea</i>	X	X	X	100
Eastern curlew	<i>Numenius madagascariensis</i>	X	X	X	100
Great knot	<i>Calidris tenuirostris</i>	X	X	X	97
Greater sand plover	<i>Charadrius leschenaultii</i>	X	X	X	85
Grey plover	<i>Pluvialis squatarola</i>	X	X	X	100
Grey-tailed tattler	<i>Tringa brevipes</i>	X	X	X	71
Latham's snipe	<i>Gallinago hardwickii</i>	X	X	X	3
Lesser sand plover	<i>Charadrius mongolus</i>	X	X	X	77
Marsh sandpiper	<i>Tringa stagnatilis</i>	X	X	X	9
Oriental pratincole	<i>Glareola maldivarum</i>	X	X	X	-
Pacific golden plover	<i>Pluvialis fulva</i>	X	X	X	34
Pectoral sandpiper	<i>Calidris melanotos</i>	X	X	X	-

Common name	Species name	JAMBA	CAMBA	ROKAMBA	Frequency of occurrence
Red knot	<i>Calidris canutus</i>	X	X	X	100
Red-necked stint	<i>Calidris ruficollis</i>	X	X	X	100
Ruff	<i>Philomachus pugnax</i>	X	X	X	100
Ruddy turnstone	<i>Arenaria interpres</i>	X	X	X	100
Sanderling	<i>Calidris alba</i>	X	X	X	100
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	X	X	X	94
Terek sandpiper	<i>Xenus cinereus</i>	X	X	X	37
Wandering tattler	<i>Tringa incana</i>	X	X	X	3
Whimbrel	<i>Numenius phaeopus</i>	X	X	X	94
Wood sandpiper	<i>Tringa glareola</i>	X	X	X	3

Criterion 5

A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Counts of shorebirds have been consistently > 20,000 every year since 1981, except 2015, when total maximum shorebird count was 19,000 (data from BirdLife Australia; Figure 2). These counts do not include the substantial numbers of other waterbird species that are supported within the site. For example, between 1987 and 1992, when comprehensive counts of waterbirds were undertaken at the site, there were between 5000 and 10,000 non-wader species, including substantial numbers of black swan (*Cygnus atratus*) and chestnut teal (*Anas castanea*).

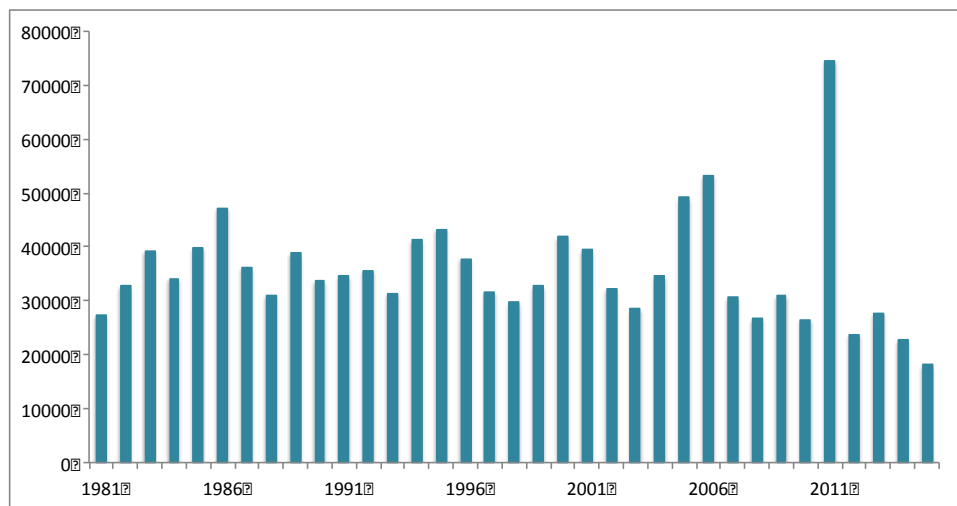


Figure 2. Palaeartic migratory waders recorded in Corner Inlet and their frequency of occurrence (percentage of years observed). The 16 species that the site is considered to regularly support are highlighted in bold.

Criterion 6

A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Assessment of this criterion is made using the most recent official population estimates (Wetlands International 2012). Data presented in Minton et al. (2011) DELWP Flora and Fauna Database and provided by BirdLife Australia, indicate that nine species met this criterion over a baseline period around the time of listing: 1981- 1994 (Table 5) and that eight species meet this criterion over the 1981-2015 period (Table 6).

Comprehensive count records are not available for Pacific gull and fairy tern and evidence is lacking to determine if these species now meet the criterion.

Data from BirdLife Australia indicates that at the time of listing, Corner Inlet periodically supported > 1% of the population of double-banded plover (*Charadrius bicinctus*). From 1981 to 1994, maximum annual counts exceeded the 1% population threshold of 500 on four occasions in 1982, 1986, 1988 and 1989 (less than two thirds of seasons). Numbers of this species have increased at Victorian Ramsar sites in recent years and the 1% population threshold was exceeded in four of the past five years (data from BirdLife Australia). Whether this is a sustained trend is not known, so it is recommended that the criterion 6 be re-assessed for this species in the next revision of the Ramsar Information Sheet for the site.

Table 5. Species for which Corner Inlet regularly supported > 1% of the population over the 1981 – 1994 period (using Wetlands International 2012 estimates).

Common name	Species name	Mean max. count	% of pop.
Australian fairy tern	<i>Sternula nereis nereis</i>	49	3
Australian pied oystercatcher	<i>Haematopus longirostris</i>	890	8
Bar-tailed godwit	<i>Limosa limosa</i>	9700	6.5
Chestnut teal	<i>Anas castanea</i>	1900	1.9
Curlew sandpiper	<i>Calidris ferruginea</i>	3960	2.5
Eastern curlew	<i>Numenius madagascariensis</i>	1300	4
Red-necked stint	<i>Calidris ruficollis</i>	11,700	3.5
Red knot	<i>Calidris canutus</i>	4000	7
Sooty oyster catcher	<i>Haematopus fuliginosus</i>	230	5.5

Table 6. Species for which Corner Inlet regularly supports > 1% of the population (using Wetlands International 2012 estimates⁴) over the period 1981 –2015.

Common name	Species name	Mean max. annual count 1981-2015	Pop. estimate	% of pop. 1981-2015
Australian pied oyster-catcher	<i>Haematopus longirostris</i>	939	11000	8.5
Bar-tailed godwit	<i>Limosa lapponica</i>	10346	279000	3.7
Chestnut teal	<i>Anas castanea</i>	1083	100000	1.1
Curlew sandpiper	<i>Calidris ferruginea</i>	2030	135000	1.5
Eastern curlew	<i>Numenius madagascariensis</i>	1128	32000	3.5
Red-necked stint	<i>Calidris ruficollis</i>	14414	315000	4.6
Red knot	<i>Calidris canutus</i>	2421	99000-122000 (mean=110500)	2.2
Sooty oyster- catcher	<i>Haematopus fuliginosus</i>	304	4000	7.6

Criterion 8

A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Corner Inlet provides important habitats, feeding areas, dispersal and migratory pathways, and spawning sites for numerous fish species of direct and indirect fisheries significance. These fish have important fisheries resource values both within and external to the site. BMT WBM (2011) identifies the key species for which the site meets this criterion.

4. Critical components, processes and services

The Corner Inlet ECD identified two components, a process and two services that are critical to the ecological character of the Ramsar site. Detailed descriptions of these critical CPS can be found in that ECD (BMT WBM 2011):

- Marine and estuarine wetland habitats – ECD section 3.3.1:
 - Marine subtidal aquatic beds.
 - > seagrass

⁴ A recent paper by Hansen et al. (2017) provides revised population estimates for Bar-tailed godwit (325,000), curlew sandpiper (90,000), eastern curlew (35,000), red-necked stint (475,000) and red knot (110,000) but the authors emphasize that “any differences between these estimates and previous estimates cannot be used to draw conclusions about population change.” These estimates have not been used to identify if species meet the 1% criterion because Ramsar Convention guidance states that:

“To ensure international comparability, where possible, Contracting Parties should use the international population estimates and 1% thresholds published and updated every three years by Wetlands International as the basis for evaluating sites for the List using this Criterion.”

However, using the estimates in Hansen et al, the 1995 – 2015 average maximum annual counts for these species meet this criterion: Bar-tailed godwit (3.2%), curlew sandpiper (2.3%), eastern curlew (3.0%) and red knot (2.2%).

- Permanent shallow marine waters
 - > without seagrass
- Intertidal and shallow subtidal sand or mud flats.
 - > intertidal flats.
- Intertidal and fringing forested wetlands.
 - > mangrove forest.
 - > saltmarsh.
- Abundance and diversity of waterbirds – ECD section 3.3.2.
- Waterbird breeding – ECD section 3.5.1.
- Presence of threatened species – ECD section 3.7.1 (see update below).
- Fisheries resource values – ECD section 3.7.2.

Changes to the listed threatened species under the EPBC Act, have resulted in an update of the critical service: “presence of threatened species” which is described below. In addition, a review of evidence for two species (growling grass frog and orange-bellied parrot) as being critical has concluded these species are not critical services for the Ramsar site as outlined in Section 3.1.

4.1 Changes to existing critical CPS “presence of threatened species”

Recent additions to the list of threatened species in Australia and more comprehensive migratory bird data have resulted in the following bird species being added to the critical service “presence of threatened species” in addition to the Australian fairy tern and Australian grayling.

- Bar-tailed godwit (*Limosa lapponica baueri*) - Vulnerable⁵
- Curlew sandpiper (*Calidris ferruginea*) – Critically endangered
- Eastern curlew (*Numenius madagascariensis*) – Critically endangered
- Great knot (*Calidris tenuirostris*) – Critically endangered
- Greater sand plover (*Charadrius leschenaultii*) - Vulnerable
- Hooded plover (*Thinornis rubricollis rubricollis*) – Vulnerable
- Lesser sand plover (*Charadrius mongolus*) – Vulnerable
- Red knot (*Calidris canutus*) – Endangered.

Bar-tailed godwit, curlew sandpiper, eastern curlew and red knot

Bar-tailed godwit (*Limosa lapponica baueri*), curlew sandpiper (*Calidris ferruginea*), eastern curlew (*Numenius madagascariensis*) and red knot (*Calidris canutus*) are international migratory species that spend the non-breeding season in the southern hemisphere. They arrive in late spring, spend the summer feeding on invertebrates in intertidal mudflats and depart for the northern hemisphere in February to March. Juveniles of all species who arrive in the Ramsar site spend their first one or two winters before heading to the northern hemisphere to breed. Although the species have similar life histories, they are physically very different. The eastern curlew is the largest of the shorebirds with a wingspan of over one metre and a weight of nearly one kilogram. The red knot and bar-tailed godwits are smaller,

⁵ Note that the Bar-tailed godwit subspecies *Limosa lapponica menzbieri* is listed as critically endangered under the EPBC Act. While it is possible that this species may occur in the Ramsar site, the non-threatened sub species *baueri* is more prevalent on the east coast of Australia and likely to comprise the majority of records in Victorian Ramsar sites (Dan Weller, BirdLife personal communication).

but still large shorebirds. In contrast the curlew sandpiper is a small bird, with a weight of just 60 grams (Higgins and Davies 1996).

All species are now listed as threatened under the EPBC Act due to declines in their global populations. Plots of Exponentially Weighted Moving Averages (EWMA) are designed to reflect long term changes in systems. EWMA for maximum annual counts (1981 to 2015) of the four species in Corner Inlet indicate a strong and sustained decline in curlew sandpiper and red knot numbers from peaks in the 1990s (Figure 3). A similar, but less marked decline can also be observed for eastern curlew numbers at the site (Figure 4). The bar-tailed godwit, however, shows no signs of a decline in numbers at the Corner Inlet Ramsar Site (Figure 5).

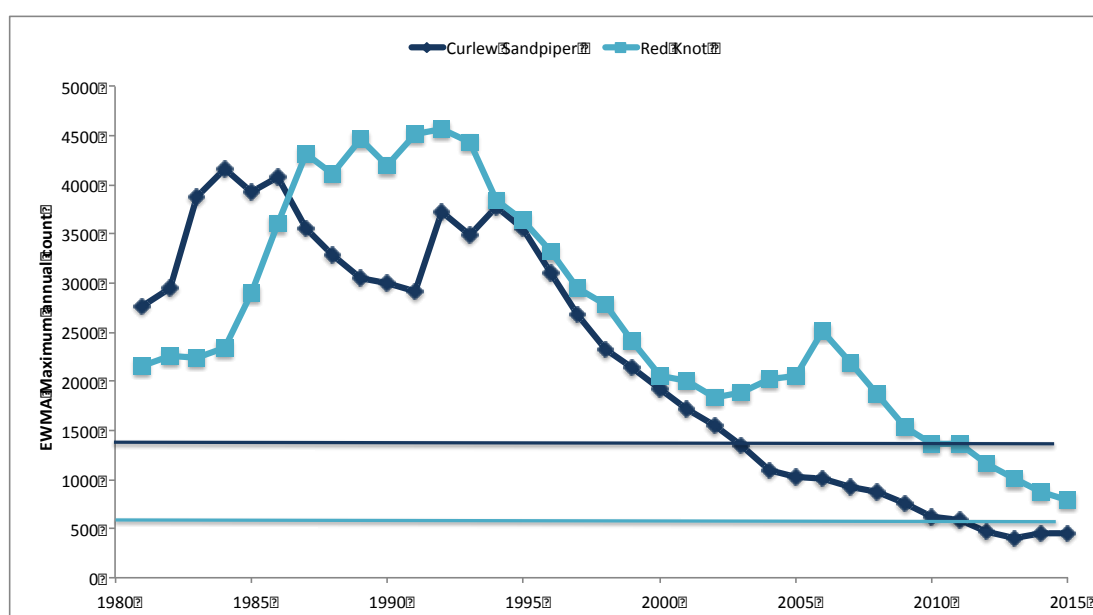


Figure 3. Exponentially weighted moving average (EWMA) of curlew sandpiper and red knot in Corner Inlet from 1981 to 2015 (data from BirdLife Australia). Straight lines represent the 1% population thresholds for each species (1400 for curlew sandpiper and 560 for red knot).

The reasons for the decline in the three species are beyond the boundaries of the Ramsar site. There have been a large number of investigations into the decline of shorebirds in the East Asian-Australasian Flyway, with habitat declines particularly at staging areas in the Yellow Sea recognised as the most significant impact factors (MacKinnon et al. 2012, Murray et al. 2015, Piersma et al. 2015, Hua et al. 2015).

Interestingly, numbers of bar-tailed godwits have not declined at the Corner Inlet Ramsar Site. The sub-species that occurs most prevalently in Victorian coastal regions, migrates from west Alaska to Australia and New Zealand. This sub-species migrates from breeding grounds to Australia via stop overs in the Pacific Islands, only utilising the Yellow Sea staging areas on the return journey (Gill Jr et al. 2005, Battley et al. 2012). Perhaps this lower reliance on impacted staging areas has contributed to more stable numbers reaching Corner Inlet.

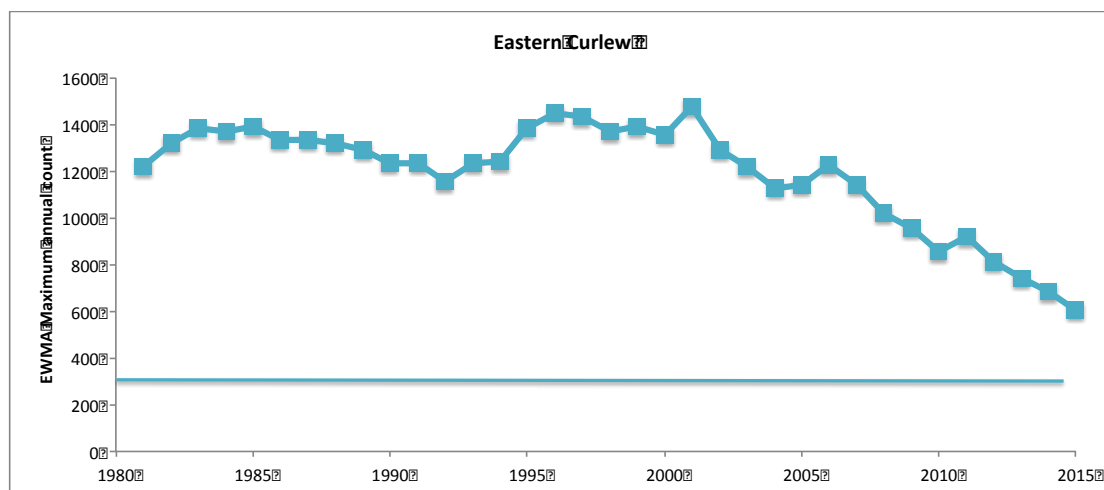


Figure 4. Exponentially weighted moving average (EWMA) of eastern curlew in Corner Inlet from 1981 to 2015 (data from BirdLife Australia). Straight line represents the 1% population threshold of 320.

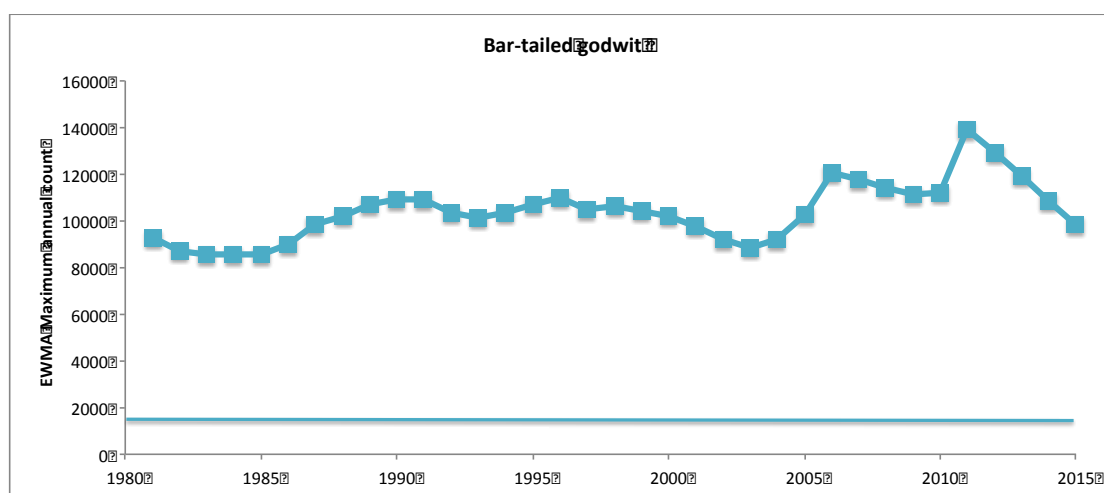


Figure 5. Exponentially weighted moving average (EWMA) of bar-tailed godwit in Corner Inlet from 1981 to 2015 (data from BirdLife Australia). Straight line represents the 1% population threshold of 320.

Great knot, greater sand plover and lesser sand plover

Great knot (*Calidris tenuirostris*), greater sand plover (*Charadrius leschenaultii*) and lesser sand plover (*Charadrius mongolus*) are also members of the East Asian-Australasian Flyway, breeding in the northern hemisphere and spending the non-breeding season feeding in Australia. Although they are frequent visitors to the Corner Inlet Ramsar Site (recorded in 68 – 100 percent of years), they do not occur in sufficient numbers for trend analysis. Like the curlew sandpiper, red knot and eastern curlew, they have declining populations, which have been attributed to loss of habitat in staging areas such as the Yellow Sea (MacKinnon et al. 2012, Murray et al. 2015, Hua et al. 2015).

Australian fairy tern

Australian fairy tern (*Sternula nereis nereis*) is an Australian resident, fish eating bird species. They feed close inshore upon small schooling fish and in the Ramsar site, anchovies and pilchards are likely to comprise the majority of their diet. They breed on sand beaches within the Ramsar site in a scrape in the ground, suitable habitat devoid of dense vegetation is essential (Higgins and Davies 1996).

There are insufficient regular counts of fairy tern from Corner Inlet to assess trends over time. A recent study of fish eating birds in Corner Inlet and Western Port (Menkhorst et al. 2015)

grouped data for little tern and fairy tern on the basis that they are difficult to distinguish from each other at a distance. They concluded that the populations of the two species combined were stable in Corner Inlet from 1987 to 2012.

Hooded plover

Hooded plover (*Thinornis rubricollis*) is an Australian resident, invertebrate eating bird species. The site supports a small number of breeding pairs (Mead et al. 2012) and extensive feeding habitat for this species. Annual maximum counts provided by BirdLife Australia indicate a small number of hooded plover are within the site each year, with no indication of a change in abundance of this species at the site (Figure 6). It should be noted that these counts are from select shorebird areas within the site and data collected during nesting seasons consistently results in higher counts 25 – 31 (Mead et al. 2013, Driessen and Maguire 2014), but spans a small number of years.

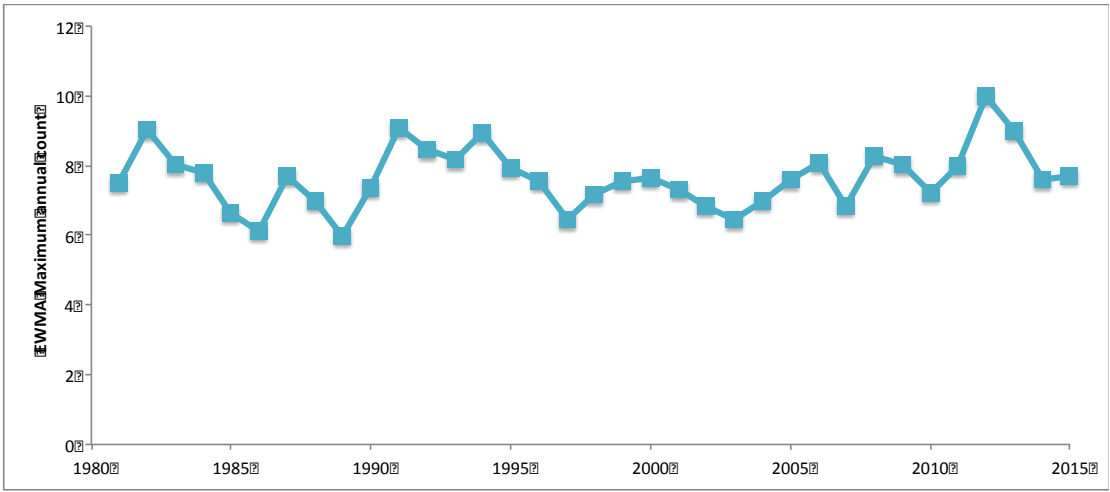


Figure 6. Exponentially weighted moving average (EWMA) of hooded plover in Corner Inlet from 1981 to 2015 (data from BirdLife Australia).

5. Limits of Acceptable Change

5.1 Summary of changes to LAC

LAC for the Corner Inlet Ramsar Site were reviewed with site managers and relevant technical experts. LAC fell into one of four categories as described below.

1. The critical service “shallow subtidal waters” has been renamed to “permanent shallow marine waters” to accord with the name assigned to the wetland type and the critical service in BMT WBM Section 3.3.1.
2. New mapping of some wetland types resulted in revisions to the areas for:
 - permanent shallow marine waters and
 - intertidal flats.
3. A change was made to the wording to make the LAC more easily assessable for
 - waterbird breeding.
4. New information resulted in a refinement / significant change to the LAC for
 - seagrass
 - saltmarsh
 - mangrove
 - waterbird abundance and
 - threatened species.

5.2 Revised Limits of Acceptable Change

The revised LAC are set out in the Table 7. The complete set of LAC for the site are shown in Table 8 **Error! Reference source not found.**

Confidence levels have been reviewed for revised LAC (2 and 4 above). These are assigned as follows:

- High – Quantitative site-specific data; good understanding linking the indicator to the ecological character of the site; LAC is objectively measurable.
- Medium – Some site-specific data or strong evidence for similar systems elsewhere derived from the scientific literature; or informed expert opinion; LAC is objectively measurable.
- Low – No site-specific data or reliable evidence from the scientific literature or expert opinion, LAC may not be objectively measurable and/or the importance of the indicator to the ecological character of the site is unknown.

Table 7. Revised LAC for the Corner Inlet Ramsar Site.

Critical CPS	Existing LAC	Evidence	Revised LAC	Confidence
Permanent shallow marine waters	A greater than 20 percent reduction in the extent of sub tidal channel (areas mapped by NLWRA = 16 349 hectares), observed on two sampling occasions within any decade (LAC – mapped area less than 13 079 hectares). (Note: the moderate degree of allowable change recognises that shallow subtidal waters represent a critical habitat resource, generally show low natural variability, but data reliability is low)	<p>Although no new mapping of shallow sub-tidal waters has been undertaken since 1998, the area has been revised to accommodate more recent mapping of other wetland types which were formerly mapped as this wetland type.</p> <p>The LAC is set to allow for a moderate degree of change, recognising that shallow subtidal waters represent a critical habitat resource, generally show low natural variability.</p> <p>As mapping resolution for permanent shallow marine waters is coarse, the confidence of the LAC has been assigned as medium.</p>	A greater than 20 percent reduction in the extent of sub tidal channel (10,520 hectares), observed on two sampling occasions within any decade (LAC – mapped area less than 8,416 hectares).	Medium
Intertidal flats	A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (areas mapped by DSE = 40 479 hectares, (LAC – mapped area less than 36 431 hectares). (Note: the moderate degree of allowable change recognises that intertidal flats represent a critical habitat resource and generally show low natural variability. A loss of intertidal flat would also result in changes in seagrass)	<p>Although no new mapping of intertidal flats has been undertaken since 1998, the area has been revised to accommodate more recent mapping of other wetland types which were formerly mapped as this wetland type.</p> <p>The LAC is set to allow for a moderate degree of change, recognising that intertidal flats represent a critical habitat resource and generally show low natural variability. A loss of intertidal flat would also result in changes in seagrass.</p> <p>As mapping resolution for intertidal flats is coarse, the confidence of the LAC has been assigned as medium.</p>	A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (24,950 hectares, (LAC – mapped area less than 19,960 hectares).	Medium

Critical CPS	Existing LAC	Evidence	Revised LAC	Confidence
Seagrass	<p>Total mapped extent of dense <i>Posidonia</i> will not decline by greater than 10 percent (baseline = 3050 hectares; LAC = mapped area less than 2745 hectares) on any occasion.</p> <ul style="list-style-type: none"> • Total mapped extent of the dense and medium density <i>Zosteraceae</i> will not decline by greater than 25 percent at a whole of site scale on two sampling occasions within any decade. • Dense <i>Zostera</i> - Baseline = 5743 hectares (LAC = mapped area less than 4307 hectares) • Medium <i>Zostera</i> - Baseline = 1077 hectares (LAC = mapped area less than 807 hectares) 	<p>In 2011, a new baseline for benthic habitat was mapped over approximately 50% of the Corner Inlet Ramsar Site (Pope et al. 2013). This study calculated the 1998 total extent of the two groups of seagrass within the defined study area as:</p> <p><i>Posidonia</i> – 1828 hectares <i>Zosteraceae</i> – 7082 hectares</p> <p>They determined that the accuracy of mapped seagrass at the site was 73 – 83%.</p> <p>Given that it is the intent that the 2011 layer form the new baseline and will be monitored over time, it is better that the area over which the LAC is assessed matches the mapped area, even though it is not the entire site. In addition, the LAC cannot be set at a percent change that is within the accuracy of the mapping technique. Further, seagrass extent and density is highly variable over time, and a change in character would not be indicated by a small, transient change in seagrass extent.</p> <p>Consistent with LAC for seagrass extent at other Victorian Ramsar sites, a change of 50 % over two successive decades is proposed.</p>	<p>Seagrass extent will not decline below 900 hectares for <i>Posidonia</i> and 3500 hectares for <i>Zosteraceae</i> (within the study area defined by Pope et al. 2013) for a period of greater than 20 continuous years.</p>	High

Critical CPS	Existing LAC	Evidence	Revised LAC	Confidence
Saltmarsh	A 10% reduction in the total mapped saltmarsh area, observed on two sampling occasions within any decade, is an unacceptable change (LAC – mapped area less than 5850 hectares).	<p>Based on the work of Boon et al. (2011), a re-assessment of the 2005 EVC mapping (upon which the LAC was based) indicates there are approximately 3500 hectares of saltmarsh in the site (considerably different to the figure in the ECD).</p> <p>As natural variability of saltmarsh extent is low and the recovery of saltmarsh from disturbance is known to be slow (Saintilan 2009), the LAC is based on the 2011 extent.</p> <p>The LAC has been set to be consistent with that for other Victorian Ramsar sites supporting saltmarsh – a 25% decline from the time of listing. LAC for condition of saltmarsh is also desirable and Boon et al. (2011) suggested EVC benchmarks for the community. However, there is no benchmark of condition against which change could be assessed.</p>	Total saltmarsh extent will not decline below 2625 hectares.	Medium
Mangrove	A 10% reduction in the total mapped mangrove area, observed on two sampling occasions within any decade, is an unacceptable change. (LAC – mapped area less than 1924 hectares).	<p>Based on the work of Boon et al. (2011), a re-assessment of the 2005 EVC mapping (upon which the LAC was based) indicates there are approximately 3000 hectares of mangroves in the site (considerably different to the figure in the ECD).</p> <p>As assessment against this LAC is likely to be via remote sensing, the LAC must be set at a level that can be detected reliably. A 10% change is very small and unlikely to represent a change in character across the Ramsar site. A LAC of a 25% decline, from the time of listing, was considered to adequately represent a potential change in character.</p>	Total mangrove extent will not decline below 2250 hectares.	Medium

Critical CPS	Existing LAC	Evidence	Revised LAC	Confidence
Waterbird abundance	<p>The annual abundance of migratory shorebirds will not decline by 50 per cent of the long-term annual mean value (that is, must not fall below 15,743 individuals) in three consecutive years.</p> <p>Mean annual abundance of migratory species that meet the one per cent criterion will not be less than 50 per cent of the long-term annual mean value in five years of any ten year period. The LAC are as follows:</p> <ul style="list-style-type: none"> o curlew sandpiper > 1294 o bar tailed godwit > 4863 o eastern curlew > 985 o pied oystercatcher > 446 o sooty oystercatcher > 142 o double-banded plover > 261 birds 	<p>The LAC for the annual abundance of migratory waterbirds is now expressed as a rolling five year average of maximum annual count.</p> <p>The LAC for migratory species that meet the one per cent criterion is set at absolute numbers, and does not take into account population declines (or increases) that may occur due to actions outside the Ramsar site in staging areas or breeding habitat. An approach based on the latest waterbird population estimates, which are updated every five years, would arguably be better for assessing potential impacts from changed conditions within the Ramsar site boundary.</p> <p>The LAC for these species has been calculated based on the annual maximum counts from 1981 to 1994, a 13 year period that should reflect conditions at the time of listing. At this time, the site supported the following numbers (% of population):</p> <ul style="list-style-type: none"> Australian fairy tern – 49 (3%) Australian pied oystercatcher – 890 (8%) Bar-tailed godwit – 9700 (6.5%) Chestnut teal – 1900 (1.9%) Curlew sandpiper – 3960 (2.5%) Eastern curlew – 1300 (4%) Red-necked stint – 11,700 (3.5%) Red knot – 4000 (7%) Sooty oystercatcher – 230 (5.5%) 	<p>Abundance of waterbirds will not decline below the following (calculated as a rolling five year average of maximum annual count; percentages calculated based on the latest Wetlands International Waterbird Population Estimates):</p> <p>Total waterbirds - 15,000</p> <p>Australian fairy tern – 1.5% of population</p> <p>Australian pied oyster catcher – 4% of population</p> <p>Bar-tailed godwit – 3% of population</p> <p>Chestnut teal – 1%</p> <p>Curlew sandpiper – 1% of population</p> <p>Eastern curlew – 2% of population</p> <p>Red knot – 3.5% of population</p> <p>Red-necked stint – 2% of population</p> <p>Sooty oystercatcher – 3% of population</p>	Medium

Critical CPS	Existing LAC	Evidence	Revised LAC	Confidence
Waterbird breeding	Abandonment or significant decline (greater than 50 per cent) in the productivity of two or more representative breeding sites (based on two sampling episodes over a five-year period) within any of the following site groupings: <ul style="list-style-type: none"> • Clomel Island - fairy tern, hooded plover, Caspian tern, crested tern • Dream Island - fairy tern, hooded plover, crested tern 	The LAC is difficult to assess against, as measures of nest success and abandonment are not routinely monitored and are difficult to collect. A baseline of numbers of nests and variability in nesting is required before a quantitative LAC can be derived. LAC is set based on presence of species nesting.	Nesting of the following species recorded in at least 50% of years: <ul style="list-style-type: none"> Australian fairy tern Caspian tern Crested tern Hooded plover Australian pied oystercatcher 	Low
Threatened species: birds	An unacceptable change will have occurred should the site no longer supports orange-bellied parrot.	The LAC for waterbird abundance adequately captures five of the threatened bird species that occur at the site: Australian fairy tern, bar-tailed godwit, curlew sandpiper, eastern curlew and red knot. Counts of great knot, greater sand plover, hooded plover and lesser sand plover indicate moderate to low, but persistent numbers within the site. LAC is based on continued presence.	Great knot, greater sand plover, hooded plover and lesser sand plover recorded within the site in three out of five seasons.	Medium

6. Threats to ecological character

The 2011 ECD and the 2015 management plan for Corner Inlet Ramsar Site, contained within the West Gippsland Waterway Strategy (West Gippsland CMA 2014) contains a comprehensive risk assessment and identification of priority threats for management. DELWP reassessed threats at the site in 2016 as part of an assessment of ecological character status. No additional threats beyond those identified in the 2011 ECD have been identified. Details on threats to the site can be found in the ECD (section 5) and the Appendix 10 of the management plan (West Gippsland CMA 2014).

7. Changes since listing

The results of a 2016 assessment of the status of the critical CPS against the updated LAC is set out in Table 8.

The LAC are met except for waterbird abundance in relation to three species: curlew sandpiper, eastern curlew and red knot. The populations of these three species are known to be in decline, with speculation that this is a result of habitat loss in staging areas in their migration route within the flyway (MacKinnon et al. 2012, Murray et al. 2015, Hua et al. 2015). This exceedance of a LAC is not related to conditions in the Corner Inlet Ramsar Site and is not considered to be a potential change in ecological character.

Table 8. Summary of assessment against LAC for the Corner Inlet Ramsar Site.

Critical CPS	Limit of Acceptable Change	2016 Assessment
Seagrass	Seagrass extent will not decline below 900 hectares for <i>Posidonia</i> and 3500 hectares for <i>Zosteraceae</i> (within the study area defined by Pope et al. 2013) for a period of greater than 20 continuous years.	Seagrass extent was most recently measured in the study area in 2011. At this time the total extent was 5695 hectares for <i>Posidonia</i> and 8626 hectares for <i>Zosteraceae</i> (Pope et al. 2013). LAC is met.
Saltmarsh	Total saltmarsh extent will not decline below 2625 hectares.	The most recent assessment of saltmarsh extent in Western Port (Boon et al. 2011) indicates 3510 hectares. There is no evidence of a significant decline in saltmarsh extent. LAC is met.
Mangrove	Total mangrove extent will not decline below 2250 hectares.	The most recent assessment of mangrove extent in Western Port (Boon et al. 2011) indicates 3000 hectares. LAC is met.
Permanent shallow marine waters	A greater than 20 percent reduction in the extent of sub tidal channel (10,520 hectares), observed on two sampling occasions within any decade (LAC – mapped area less than 8,416 hectares).	No recent mapping of this habitat. Insufficient data to assess the LAC
Intertidal flats	A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (24,950 hectares, (LAC – mapped area less than 19,960 hectares).	No recent mapping of this habitat. Insufficient data to assess the LAC

Critical CPS	Limit of Acceptable Change	2016 Assessment
Waterbird abundance	<p>Abundance of waterbirds will not decline below the following (calculated as a rolling five-year average of maximum annual count; percentages calculated based on the latest Wetlands International Waterbird Population Estimates):</p> <p>Total waterbirds - 15,000</p> <p>Australian fairy tern – 1.5% of population</p> <p>Australian pied oyster catcher – 4% of population</p> <p>Bar-tailed godwit – 3% of population</p> <p>Chestnut teal – 1%</p> <p>Curlew sandpiper – 1% of population</p> <p>Eastern curlew – 2% of population</p> <p>Red knot – 3.5% of population</p> <p>Red-necked stint – 2% of population</p> <p>Sooty oystercatcher – 3% of population</p>	<p>Data provided by BirdLife Australia indicate that mean maximum counts for the past five years (2011 – 2015) are as follows:</p> <p>Total shorebirds – 36,000</p> <p>Australian fairy tern – data deficient</p> <p>Australian pied oystercatcher – 950 (9%)</p> <p>Bar-tailed godwit – 10,800 (7%)</p> <p>Chestnut teal – data deficient</p> <p>Curlew sandpiper – 340 (< 1%)</p> <p>Eastern curlew – 550 (1.7%)</p> <p>Red knot – 566 (1.5%)</p> <p>Red-necked stint – 16,000 (5%)</p> <p>Sooty oystercatcher – 360 (9%)</p> <p>LAC is exceeded for curlew sandpiper, eastern curlew and red knot. There is insufficient count data to assess Australian fairy tern or chestnut teal. LAC for abundance of other species is met.</p>
Waterbird breeding	<p>Nesting of the following species recorded in at least 50% of years:</p> <p>Australian fairy tern</p> <p>Caspian tern</p> <p>Crested tern</p> <p>Hooded plover</p> <p>Australian pied oystercatcher</p>	<p>Breeding records are not consistently kept. The 2014 biennial hooded plover count also recorded observation of breeding terns, with all targeted species observed breeding within the Ramsar site in 2014 (Driessen and Maguire 2014).</p> <p>LAC is met.</p>
Threatened species: birds	<p>Great knot, greater sand plover, hooded plover and lesser sand plover recorded within the site in three out of five seasons.</p>	<p>Hooded plover have been recorded annually within the site 2010 – 2014 (Mead et al. 2013, Driessen and Maguire 2014).</p> <p>Data from 2010 – 2014 indicate presence of the three species (BirdLife Australia):</p> <p>Great knot – four years</p> <p>Greater sand plover – five years</p> <p>Lesser sand plover – three years</p> <p>LAC is met.</p>
Threatened species: fish	<p>Australian grayling continues to be supported in one or more of the catchments draining into Western Port.</p>	<p>Data from the Bunyip River (2008 – 2010) indicates that the Australian grayling are present, spawning and migrating through this system (Koster and Dawson 2010).</p> <p>LAC is met.</p>

Critical CPS	Limit of Acceptable Change	2016 Assessment
Fish	<p>An unacceptable change will have occurred if the long term (greater than five years) median catch falls below the 20th percentile historical baseline values in standardised abundance or catch-per unit effort of five or more commercially significant species (relative to baseline) due to altered habitat conditions within the site. The 25th percentile pre-listing baseline commercial catch per unit effort values for the site are as follows (units are tonnes per annum per number of boats):</p> <ul style="list-style-type: none"> o Australian salmon 379 o Rock flathead 316 o Southern sand flathead 373 o Greenback flounder 514 o Southern garfish 1452 o Yelloweye mullet 740 o Gummy shark 167 o King George whiting 1347 	<p>Most recent assessments of CPUE are from 2012 (DEDJTR personal communication). The following is CPUE (kg per boat) for the period 2007-2012 (Department of Primary Industries 2012):</p> <ul style="list-style-type: none"> o Australian salmon 944 o Rock flathead 3900 o Southern sand flathead 400 o Greenback flounder 600 o Southern garfish 2100 o Yelloweye mullet 850 o Gummy shark 590 o King George whiting 3400 <p>LAC is met</p>

8. References

- Battley, P.F., Warnock, N., Tibbitts, T.L., Gill, R.E., Piersma, T., Hassell, C.J., Douglas, D.C., Mulcahy, D.M., Gartrell, B.D., Schuckard, R., and others. (2012). Contrasting extreme long-distance migration patterns in bar-tailed godwits *Limosa lapponica*. *Journal of Avian Biology* **43**(1): 21–32.
- BMT WBM. (2011). Corner Inlet Ramsar Site Ecological Character Description. Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Boon, P.I., Allen, T., Brook, J., Carr, G., Frood, D., Hoyer, J., Harty, C., McMahon, A., Mathews, S., Rosengren, N.J., Sinclair, S., White, M., and Yogovic, J. (2011). *Mangroves and Coastal Saltmarsh of Victoria: Distribution, Condition, Threats and Management*. Victoria University, Melbourne.
- Commonwealth of Australia (2006). *A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0*. Department of the Environment and Heritage, Canberra, Australia.
- Department of Environment, Land, Water and Planning. 2016. National Recovery Plan for the Orange-bellied Parrot *Neophema chrysogaster*. Australian Government, Canberra.
- Department of Primary Industries. (2012). *Fisheries Victoria Commercial Fish Production Information Bulletin 2012*. Fisheries Victoria, Queenscliff, Victoria.
- Department of the Environment, Water, Heritage and the Arts. (2008). National framework and guidance for describing the ecological character of Australian Ramsar Wetlands: module 2 of the National Guidelines for Ramsar Wetlands - implementing the Ramsar Convention in Australia. Dept. of the Environment, Water, Heritage and the Arts, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities (2012). *Australian Ramsar Site Nomination Guidelines. Module 4 of the National Guidelines for Ramsar Wetlands—Implementing the Ramsar Convention in Australia*. Australian Government Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- Driessen, J. and Maguire, G. (2014). Report on the 2014 Biennial Hooded Plover Count. Birdlife Australia, Carlton, Victoria.
- Gill Jr, R.E., Piersma, T., Hufford, G., Servranckx, R., and Riegen, A. (2005). Crossing the ultimate ecological barrier: evidence for an 11 000-km-long nonstop flight from Alaska to New Zealand and eastern Australia by bar-tailed godwits. *The Condor* **107**(1): 1–20.
- Hansen, B.D., Fuller, R.A., Watkins, D., Rogers, D.I., Clemens, R.S., Newman, M., Woehler, E.J. and Weller, D.R. (2016) Revision of the East Asian-Australasian Flyway Population Estimates for 37 listed Migratory Shorebird Species. Report for the Department of the Environment. BirdLife Australia, Melbourne.
- Higgins, P.J. and Davies, S. (1996). *Handbook of Australian, New Zealand & Antarctic birds: Volume 3: Snipe to Pigeons*. Oxford University Press, Melbourne.
- Hua, N., Tan, K., Chen, Y., and Ma, Z. (2015). Key research issues concerning the conservation of migratory shorebirds in the Yellow Sea region. *Bird Conservation International* **25**(01): 38–52.
- Koster, W. and Dawson, D. (2010). Investigation of Australian grayling spawning in the Yarra and Bunyip rivers. Unpublished report to Melbourne Water, Arthur Rylah Institute for Environmental Research, Victoria: 14.
- MacKinnon, J., Verkuil, Y.I., and Murray, N. (2012). IUCN situation analysis on East and Southeast Asian intertidal habitats, with particular reference to the Yellow Sea (including the Bohai Sea). Occasional paper of the IUCN species survival commission **47**.
- Mead, R., Yarwood, M., Cullen, M., and Bacher, G.L. (2012). Report on the 2012 Biennial Hooded Plover Count. Birdlife Australia, Melbourne, Australia.
- Mead, R., Yarwood, M., Cullen, M., and Maguire, G. (2013). Report on the 2012 Biennial Hooded Plover Count. Birdlife Australia, Carlton, Victoria.
- Menkhorst, P., Loyn, R., Liu, C., Hansen, B., McKay, M., and Dann, P. (2015). Trends in numbers of piscivorous birds in Western Port and West Corner Inlet, Victoria, 1987–2012 Report for Melbourne Water. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Murray, N.J., Ma, Z., and Fuller, R.A. (2015). Tidal flats of the Yellow Sea: A review of ecosystem status and anthropogenic threats. *Austral Ecology* **40**(4): 472–481.

OBPRT (2006) Background and Implementation Information for the Orange-bellied Parrot Recovery Plan. [Online]. Orange-bellied Parrot Recovery Team. Hobart, Department of Primary Industries and Water (DPIW).

Piersma, T., Lok, T., Chen, Y., Hassell, C.J., Yang, H.-Y., Boyle, A., Slaymaker, M., Chan, Y.-C., Melville, D.S., Zhang, Z.-W., and others. (2015). Simultaneous declines in summer survival of three shorebird species signals a flyway at risk. *Journal of Applied Ecology*.

Pope, A., Monk, J., and Ierodiaconou, D. (2013). Corner Inlet and Nooramunga Marine Habitat Mapping Project: Part II. Deakin University, Warrnambool, Victoria.

Saintilan, N. (2009). *Australian Saltmarsh Ecology*. CSIRO Publishing, Collingwood.

West Gippsland CMA. (2014). *West Gippsland Regional Waterway Strategy 2014-2022*. State of Victoria.

Wetlands International. (2012). *Waterbird Population Estimates, Fifth Edition*. Wetlands International, Wageningen, The Netherlands.

