

Corner Inlet Ramsar site

Ecological Character Description

June 2011

Chapter

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Guidance on the development of Ecological Character Descriptions, including Limits of Acceptable change, are areas of active policy development. Accordingly there may be differences in the type of information contained in this Ecological Character Description, to those of other Ramsar wetlands.

This information does not create a policy position to be applied in statutory decision making. Further it does not provide assessment of any particular action within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*, nor replace the role of the Minister or his delegate in making an informed decision on any action.

This report is not a substitute for professional advice rather it is intended to inform professional opinion by providing the authors' assessment of available evidence on change in ecological character. This information is provided without prejudice to any final decision by the Administrative Authority for Ramsar in Australia on change in ecological character in accordance with the requirements of Article 3.2 of the Ramsar Convention. Users should obtain any appropriate professional advice relevant to their particular circumstances.

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**Use of terms and information sources:** All definitions and terms used in this report were correct at the time of production in November 2010. Refer to Section 7 for works cited and Section 8 for a list of key terms and terminology used.

**Citation:** When finalised, this report can be cited as follows:

BMT WBM (2011). Ecological Character Description of the Corner Inlet Ramsar Site – Final Report. Prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities. Canberra.

List of Abbreviations

|  |  |
| --- | --- |
| ABS | Australian Bureau of Statistics |
| ANZECC/ARMCANZ: | Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand |
| ARI: | Arthur Rylah Institute for Environmental Research |
| CAMBA: | China-Australia Migratory Bird Agreement |
| CMA: | Catchment Management Authority |
| CMS: | Convention on Migratory Species |
| CSIRO: | Australian Commonwealth Scientific and Research Organization |
| DEM: | Digital Elevation Model |
| DEWHA: | Department of the Environment, Water, Heritage and the Arts (now DSEWPaC) |
| DoD: | Department of Defence |
| DSE: | Department of Sustainability and Environment (Victoria) |
| ECD: | Ecological Character Description |
| EPBC: | Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* |
| ESO: | Environmental Significance Overlay |
| EVC: | Ecological Vegetation Class |
| EWR: | Environmental Water Reserve |
| FIS: | Flora Information System |
| GAP: | Global Action on Peatlands |
| GCB: | Gippsland Coastal Board |
| GMA: | Groundwater Management Area |
| HAT: | Highest Astronomical Tide |
| IMCRA: | Integrated Marine and Coastal Regionalisation of Australia |
| IUCN: | International Union for Conservation of Nature |
| JAMBA: | Japan-Australia Migratory Bird Agreement |
| LAC: | Limit(s) of Acceptable Change |
| MAFRI: | Marine and Freshwater Resources Institute |
| NLWRA | National Land and Water Resources Audit |
| NRM: | Natural Resource Management |
| RIS: | Ramsar Information Sheet |
| ROKAMBA: | Republic of Korea- Australia Migratory Bird Agreement |
| SEPP: | State Environment Protection Policy |
| DSEWPaC | Australian Government Department of Sustainability, Environment, Water, Population and Communities |
| sp.: | Species (singular) |
| spp.: | Species (plural) |
| VWCS | Victorian Wetland Classification Scheme |
| VWSG: | Victorian Wader Study Group |
| WGCMA: | West Gippsland Catchment Management Authority |
| WWTP: | Wastewater Treatment Plant |

# 

Executive Summary

Corner Inlet is a large tide-dominated embayment located adjacent to the southernmost tip of the Australian mainland. The inlet consists of a submerged plain covered by sand or mud flats with well developed seagrass beds, and large sand islands. A radiating system of deeper channels supports efficient tidal exchange over the flats and the areas between the islands. Due to its large area and the diversity of habitats present, Corner Inlet supports internationally significant populations of a number of aquatic and semi-aquatic species. The inlet was listed as a Wetland of International Importance under the Ramsar Convention in 1982.

As part of its role as a Contracting Party to the Ramsar Convention on Wetlands, Australia is expected to manage its Ramsar sites so as to maintain the ecological character of each site and notify the Ramsar Secretariat of any change. Ecological character is defined by the Ramsar Convention as the combination of the ecosystem components, processes and benefits/services that characterise the wetland at a given point in time.

This report provides the Ecological Character Description (ECD) for the Corner Inlet Ramsar site, prepared in accordance with the *National Framework and Guidance for Describing the Ecological Character of Australia’s Ramsar Wetlands* (DEWHA 2008) (the National ECD Framework). In parallel with the preparation of the ECD, the Ramsar Information Sheet (RIS) for the site has been updated for submission to the Australian Government and Ramsar Secretariat. This report updates and replaces an unpublished draft ECD document for the site prepared by the Ecos Consortium in 2008 hereafter referenced as Ecos (unpublished).

Major topics covered include the background context and purpose of the ECD, relevant treaties, legislation and regulations, a site description and justification for the existing Ramsar listing of the inlet, project methodology, and a description of the critical components, processes and services/benefits supported by the site. Furthermore, a conceptual model of interactions between critical components, processes and services/benefits operating in the inlet is presented. The ECD also covers identification of any changes to the ecological character of the inlet since its Ramsar listing in 1982, natural variability and limits of acceptable change (LACs), likely threats and impacts, knowledge gaps, key monitoring needs and important communication, education, participation and awareness messages.

The major features of Corner Inlet that form its ecological character are its large geographical area, the wetland types present (particularly the extensive subtidal seagrass beds), diversity of aquatic and semi-aquatic habitats and abundant flora and fauna (including significant proportions of the total global population of a number of waterbird species). The critical and supporting components, processes and benefits/services that were determined as having a high influence on the ecology of Corner Inlet are presented in Table E‑1. The way in which these components, processes and services/benefits interact is presented in this document through the use of a conceptual model.

The study has sought to define the natural variability and LACs for the critical components and services/benefits identified. A summary of the LACs is shown in .

Table E‑ Summary of Critical Components, Processes and Services/Benefits

| **Critical Components** | **Critical Processes** | **Critical Services/Benefits** |
| --- | --- | --- |
| **C1.** Several key **wetland mega-habitat types** are present:   * seagrass * intertidal sand or mud flats * mangroves * saltmarshes * permanent shallow marine water   **C2.** Abundance and diversity of **waterbirds** | **P1. Waterbird breeding** is a key life history function in the context of maintaining the ecological character of the site, with important sites present on the sand barrier islands | **S1.** The site supports **nationally threatened fauna species** including:   * orange-bellied parrot * growling grass frog * fairy tern * Australian grayling   **S2.** The site supports **outstanding fish habitat values** that contribute to the health and sustainability of the bioregion |
| **Supporting Components** | **Supporting Processes** | **Supporting Services/Benefits** |
| Important **geomorphological features** that control habitat extent and types include:   * sand barrier island and associated tidal delta system * the extensive tidal channel network * mudflats and sandflats.   **Invertebrate megafauna** in seagrass beds and subtidal channels are important elements of biodiversity and control a range of ecosystem functions.  The **diverse** **fish communities** underpin the biodiversity values of the site | **Climate**, particularly patterns in temperature and rainfall, control a range of physical processes and ecosystem functions  Important **hydraulic and hydrological processes** thatsupport the ecological character of the site includes**:**   * Fluvial hydrology. Patterns of inundation and freshwater flows to wetland systems * Physical coastal processes. Hydrodynamic controls and marine inflows that affect habitats through tides, currents, wind, erosion and accretion. * Groundwater. For those wetlands influenced by groundwater interaction, the level of the groundwater table and groundwater quality.   **Water quality** underpins aquatic ecosystem values within wetland habitats. The key water quality parameters for the site are salinity, turbidity, dissolved oxygen and nutrients  Important **biological processes** include nutrient cycling and food webs. | The site supports **recreation and tourism values** (scenic values, boating, recreational fishing, camping, etc.) that have important flow-on economic effects for the region.  The site provides a range of values important for **scientific research**, including a valuable reference site for future monitoring. |

Table E‑ Limits of Acceptable Change for each Critical Component and Service/Benefit – Corner Inlet Ramsar Site

| **Number** | **Indicator for Critical Component / Process/Service for the LAC** | **Relevant timescale[[1]](#footnote-1)** | **Limit(s) of Acceptable Change** | **Spatial scale/temporal scale of measurements** | **Underpinning baseline data** | **Secondary critical C,P,S addressed through LAC** |
| --- | --- | --- | --- | --- | --- | --- |
| **Critical Components** | | | | | | |
| C1 | Seagrass extent | Long Term | * Total mapped extent of dense *Posidonia* will not decline by greater than 10 percent of the baseline value outlined by Roob et al. (1998) at a whole of site scale (baseline = 3050 hectares; LAC = mapped area less than 2745 hectares) on any occasion. (Note: the small degree of allowable change recognises that this seagrass species is a critical habitat resource and generally shows low natural variability.) * Total mapped extent of the dense and medium density Zosteraceae will not decline by greater than 25 percent of the baseline values outlined by Roob et al. (1998) at a whole of site scale on two sampling occasions within any decade. * Dense *Zostera* - Baseline = 5743 hectares (LAC = mapped area less than 4307 hectares) * Medium *Zostera* - Baseline = 1077 hectares (LAC = mapped area less than 807 hectares)   (Note: the moderate degree of allowable change recognises that these seagrass species generally show moderate degrees of natural variability) | Sampling to occur at least twice within the decade under consideration.  Note that the seagrass assessment by Hindell (2008) did not produce mapping but did use similar sampling sites to Roob *et al*. | Recent quantitative data describes seagrass condition at various sites but over a limited timeframe. It is thought that the Roob *et al*. (1998) study under-estimated the total available seagrass habitat (J. Stevenson, Parks Victoria, pers. comm. February 2011), hence a 10 per cent change from this baseline value would represent a larger actual change from the true baseline.  Note: Prior to declaration, *Posidonia* covered approximately 44 per cent (11 900 hectares) of the site (Poore 1978). Morgan (1986) estimated that *Posidonia* meadows covered 11 900 hectares in 1965 and 9000 to 9500 square kilometres in 1983–84. There is uncertainty regarding these mapping data and therefore empirical LACs have not been developed from these data. | S2 |
| Mangrove forest extent | Long term | * Based on EVC mapping, it is estimated that mangroves presently cover an area of 2137 hectares within the site (see Section 3.3.1). A 10 percent 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). (Note: the small degree of allowable change recognises that mangroves are a critical habitat resource and generally shows low natural variability) | Sampling to occur at least twice within the decade under consideration. | No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. Note that there are uncertainties regarding the quality of existing mapping, and therefore the baseline value should be considered as indicative only. | S2 |
|  | Saltmarsh extent | Long term | * Based on EVC mapping, it is estimated that intertidal saltmarsh presently covers an area of 6500 hectares within the site (see Section ). A 10 percent 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). (Note: the small degree of allowable change recognises that saltmarsh is a critical habitat resource and generally show low natural variability) | Sampling to occur at least twice within the decade under consideration. | No available data to determine changes in extent over time. It is unlikely that this has changed markedly since Ramsar listing. The note regarding data quality for mangroves applies also to saltmarsh. | S2 |
| Shallow subtidal waters | Long term | * A greater than 20 percent reduction in the extent of subtidal channel (areas mapped by NLWRA = 16 349 hectares), observed on two sampling occasions within any decade, will represent a change in ecological character (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) | Sampling to occur at least twice within the decade under consideration. | NLWRA mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only.  Note: there is a need to develop a condition-based LAC for this critical component. While some water quality data exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality represents a true change in ecological character of the wetland) | S2 |
| Inlet waters (intertidal flats) | Long term | * A greater than 20 percent reduction in the extent of permanent saline wetland – intertidal flats (areas mapped by DSE = 40 479 hectares, see Figure 3-1), observed on two sampling occasions within any decade, will represent a change in ecological character (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) | Sampling to occur at least twice within the decade under consideration. | VMCS mapping data describes wetland extent. This is coarse scale mapping and should be considered as indicative only.  Note: there is a need to develop a condition-based LAC for this critical component. While some water quality data exists, this is presently insufficient to derive a LAC (i.e. whether a change in water quality represents a true change in ecological character of the wetland) | S2 |
| C2 | Abundance and of waterbirds | Short term (All species) | * Mean annual abundance of migratory bird species - Birds Australia (2009c) notes that there is a maximum annual abundance of migratory species of 42 811 birds, with a mean annual abundance of migratory species being 31 487 birds (deriving from 28 years of data collection to September 2008). 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. (Note: the large degree of allowable change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data) | At least four annual surveys (summer counts) within the decade under consideration. | Bird count data are available from a variety of programs, most notably Birds Australia monitoring programs | P2 |
| Short term (individual species) | * 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. These values are follows:   + curlew sandpiper – baseline = 2588 birds, LAC = 1294 birds   + bar tailed godwit – baseline = 9727 birds, LAC = 4863 birds   + eastern curlew – baseline = 1971 birds, LAC = 985 birds   + pied oystercatcher – baseline = 893 birds, LAC = 446 birds   + sooty oystercatcher – baseline = 285 birds, LAC = 142 birds   + double-banded plover– baseline = 523 birds, LAC = 261 birds   There are insufficient baseline data to determine long-term average abundance of fairy tern and Pacific gull.  (Note: the large degree of allowable change recognises that these species can show high levels of natural variability, and that limitations of existing baseline data) | At least five annual surveys (summer counts) within the decade under consideration. | Bird count data are available from a variety of programs, most notably Birds Australia monitoring programs | P2 |
| Critical Processes | | | | | | |
| P1 | Waterbird breeding | Short Term | A greater than 50 per cent decrease in nest production at two or more monitoring stations (based on two sampling episodes over a five year period) within any of the following locations and species:   * Clomel Island - fairy tern, hooded plover, Caspian tern, crested tern * Dream Island - fairy tern, hooded plover, crested tern * Snake Island and Little Snake Island - pied oystercatcher | Recommended baseline monitoring program should comprise a minimum two annual sampling periods separated by at least one year (and within a five year period). | The use of the site by these species is well documented. However, there are no empirical data describing nest or egg production rates. Baseline data will need to be collected to assess this LAC. | C2 |
| **Critical Services/Benefits** | | | | | | |
| S1 | Threatened Species | N/A  Short Term | For orange-bellied parrot and growling grass frog, an unacceptable change will have occurred should the site no longer support these species.  For Australian grayling, an unacceptable change will have occurred should all of the drainages that drain into Corner Inlet no longer support this species. | Based on multiple targeted surveys at appropriate levels of spatial and temporal replication (at least four annual surveys in preferred habitats) over a 10 year period.  Based on four annual surveys in a 10 year period at multiple sites located in all major catchments. | Most site records are based on opportunistic surveys  This species has been recorded in the major drainages that drain into the site. There are no data describing the population status of this species in the site. Abundance data are available for drainages that discharge into the site (Ecowise 2007; O’Connor *et al*. 2009). O’Connor *et al*. (2009) notes that collection of this species is difficult and requires targeted survey techniques. Few targeted empirical surveys have been undertaken in the site’s drainages to date | P1, C3  P1, C1, C2 |
| S2 | Fish abundance (using fish catch of key species as a surrogate) | Medium term | 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 – see Table 3-8):   |  |  | | --- | --- | | Australian salmon | 379 | | rock flathead | 316 | | southern sand flathead | 373 | | greenback flounder | 514 | | southern garfish | 1452 | | yelloweye mullet | 740 | | gummy shark | 167 | | King George whiting | 1347 | | Annual fish catch measured over a greater than five year period. | Commercial fish catch data. Note that there are presently no fisheries-independent baseline data (collected using empirical, systematic methods) describing patterns in the distribution and abundance of key species. Therefore, the limits of acceptable change should be treated with caution, noting socio-economic factors should be taken into account when assessing catch data underpinning this LAC. | S2 |

In the context of changes to ecological character of the site, the study has examined:

* current and future threats to ecological character
* changes that have been observed or documented since listing of the site as a wetland of International Importance in 1982.

A range of threats to the ecological character of Corner Inlet were identified as follows:

* poor water quality (nutrients, sediment loads, suspended sediments and water-column turbidity)
* invasive plants including spartina (*Spartina angelica* and *Spartina x townsendii*) and the green macroalga (*Codium fragile* ssp *tomentosoides*)
* invasive animals including the northern Pacific seastar (*Asterias amurensis*), European shore crab (*Carcinus maenas*), and Mediterranean fanworm (*Sabella spallanzanii*)
* oil spills
* land use and development
* flow modifications
* recreational impacts
* rising sea levels and increased frequency in storm surges
* changes in rainfall and runoff.

It is concluded that no changes to the ecological character of the site have occurred since listing, although some habitats, such as *Posidonia* seagrass meadows, appear to have suffered ongoing losses due to water quality degradation.

The ECD preparation process promotes the identification of information or knowledge gaps about the Ramsar site that are principally derived through interrogation of the nominated ecosystem components, processes and services/benefits and associated understanding of natural variability and limits of acceptable change.

In analysing the information gaps identified in the ECD, the following thematic information gaps are identified as priority areas for future investment:

* baseline water quality characteristics within representative habitats throughout the site. This is considered to represent the most critical information gap in terms of identifying potential future impacts to most critical services and components
* additional research and monitoring expenditure to establish an ecological character baseline for the key waterbodies/wetland habitats, with a priority on habitats such as seagrass and fringing littoral vegetation, which support important flora and fauna species, habitats and life-history functions (for example, breeding sites, roosting sites, spawning sites, etc.) that are at most risk of future ecological change
* the need for better information and data sets about the presence and natural history of critical wetland species and their habitat; and more systematic surveys of important avifauna and fish species and populations
* better information and understanding about the natural variability of critical wetland fauna populations and key attributes and controls on those populations (including whether or not any non-avian fauna species meet the one per cent population requirement in Ramsar nomination criterion 9)
* the ecological character thresholds of particular habitats and communities for changes in key attributes/controls such as water quality and hydrology need additional investigation. Noting that any interim limits of acceptable change stated in the ECD should be revised as improved information becomes available
* resilience of habitats, community structure and key species to acute or prolonged impacts from water quality degradation such as nutrient enrichment, increased levels of salinity and sedimentation/turbidity (for example similar to the approach in ANZECC for toxicants). This is important in the context of defining threshold-based limits of acceptable change
* more specific assessment of the vulnerability of the site to the impacts of climate change and adaptation options that could be explored to reduce the impacts.

Monitoring recommendations that would fill these information gaps and identify unacceptable changes to character are provided.

A combined set of communication, education, participation and awareness messages relevant to the ECD have been presented and can be used to communicate the importance of the site, why it was listed, possible changes to ecological character, the threats to the site and future actions required. These messages should be considered as part of existing objectives and strategic actions about community awareness in the Ramsar Strategic Management Plan (DSE 2003).

1. Short Term – measured in years; Medium Term – five to 10 year intervals; Long term – 10+ year intervals. [↑](#footnote-ref-1)