

**Approved Conservation Advice for
Giant Kelp Marine Forests of South East Australia**

(s266B of the *Environment Protection and Biodiversity Conservation Act 1999*)

This Conservation Advice has been developed based on the best available information at the time this Conservation Advice was approved; this includes existing plans, records or management prescriptions for this ecological community.

Description

Kelp forests are shallow coastal ecological communities of cold water regions organised around the structure and productivity of members of the order Laminariales (Tegner and Dayton, 2000). Giant kelp forests are phylogenetically diverse, structurally complex and highly productive components of cold-water rocky marine coastlines around the world (Stenek et al., 2002). The most dense forests and largest canopies are produced by kelp from the genus *Macrocystis*, which contains only one species: *Macrocystis pyrifera*, known as giant kelp or string kelp. Giant kelp forests in Australia are found in temperate south eastern waters on rocky reefs where conditions are cool and relatively nutrient rich (Womersley, 1945, 1957; Edyvane, 2003; Johnson et al., 2011). The Giant Kelp Forests of South East Australia ecological community is defined as giant kelp growing typically at depths greater than eight metres below sea level (bsl) and forming a closed or semi-closed surface or sub-surface canopy.

The Giant Kelp Marine Forests of South East Australia is a unique ecological community that extends from the ocean floor to the ocean surface and exhibits a 'forest-like' structure with a diverse range of organisms occupying its benthic, pelagic and upper-canopy layers. The ecological community is characterised by a closed to semi-closed surface or subsurface canopy of *M. pyrifera*. *M. pyrifera* is the only species of kelp able to provide this three dimensional structure from the sea floor to the sea surface, so if giant kelp plants are lost or removed, the ecological community no longer exists.

The key defining attributes of the ecological community are:

- *Macrocystis pyrifera* plants which form a forest with either a closed or semi-closed surface or sub-surface canopy;
- *Macrocystis pyrifera* plants growing at a depth generally greater than eight metres below sea level;
- A rocky substrate for *Macrocystis pyrifera* plants to attach to;
- A diversity of marine species on the seafloor, in the understory and throughout the water column. For example, other marine flora such as seaweeds and marine fauna including fish, molluscs (sea snails), bryozoans (lace corals), polychaetes (worms), crustaceans (crabs, isopods, amphipods), echinoderms (sea urchins, seastars) and sponges;
- Cold water with mean sea surface temperature between 5 °C and 20 °C;
- Moderate wave exposure; and
- Distribution restricted to waters off the coast of Tasmania particularly in the Bruny, Freycinet and Davey bioregions, but also the Boags and Franklin, Flinders and Otway bioregions, the coast of South Australia in the Otway and Coorong bioregions as far west

This Conservation Advice was approved by the Minister on: 14 August 2012

as Margaret Bock Reef and the coast of Victoria in the Otway, Flinders, Central Victoria and Twofold Shelf bioregions as far east as Gabo Island.

A more comprehensive description of the ecological community is contained in the Listing Advice (TSSC, 2012) which is available on the Internet at:

<http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>.

Conservation Status

The Giant Kelp Marine Forests of South East Australia ecological community is listed as **endangered**. This ecological community is eligible for listing as endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as, in 2012, the Minister considered the Threatened Species Scientific Committee's (TSSC) advice and amended the list under section 184 to include the Giant Kelp Marine Forests of South East Australia ecological community.

The TSSC determined that this ecological community met Criterion 1 of the eligibility criteria for listing as vulnerable because it has undergone a substantial decline in geographic distribution. The ecological community also met the relevant elements of Criterion 2 to make it eligible for listing as vulnerable under this criterion. The ecological community met Criterion 3 as endangered as it has undergone a severe decline of functionally important species and met the eligibility criteria as endangered for Criterion 4 due to the severe change in integrity experienced by the ecological community such that regeneration is unlikely within the near future, even with positive human intervention.

Distribution and Habitat

The Giant Kelp Marine Forests of South East Australia ecological community occurs on rocky substrate, generally at greater than eight metres bsl, along the east and south coastlines of Tasmania (from Eddystone Point in the north east, along the east coast and around to Port Davey in the south) (Edgar, 1981; 1982; Sanderson, 1997; Barrett et al., 2001; Edyvane 2003). Some patches of the ecological community may also occur at greater than eight metres bsl in the coastal waters of western and northern Tasmania, south eastern South Australia as far west as Margaret Bock Reef near Robe and Victoria as far east as Gabo Island (Edyvane 1999; Edyvane and Bakker, 1999; Crozier et al., 2007; Millar pers. comm. 2011; Shepherd and Edgar, 2012). This distribution encompasses the Otway, Central Victoria, Two Fold Shelf, Flinders, Boags, Freycinet, Bruny, Davey and Franklin marine bioregions (DPIWE, 2001; Commonwealth of Australia, 2006).

The ecological community provides valuable habitat for a range of marine species. Patches of *M. pyrifera* included in the Giant Kelp Marine Forests of South East Australia ecological community act as habitat engineers by providing vertical structure to the water column and altering the immediate light and hydrological environment with their stipes and canopy (hence their likeness to terrestrial 'forests'). This habitat structure is inhabited by a diverse assemblage of animals and smaller seaweeds. The primary production of giant kelp is also utilised by a broad community of organisms (Hobday et al., 2006; Okey et al., 2006) making the ecological community a distinctive and important habitat type on shallow sub-tidal reefs in south eastern Australia (Johnson et al., 2011). The high primary and secondary productivity of the giant kelp forests create and provide a number of ecosystem services to the local environment including settlement habitat for juvenile life stages of commercially important fisheries, improvements in local water quality conditions and coastal protection via buffering strong wave conditions from reaching the shore.

Threats

The Giant Kelp Marine Forests of South East Australia ecological community is subject to many interrelated threatening processes. The key threats to the ecological community include increasing sea surface temperatures, changes in nutrient availability in warmer waters, changes in weather patterns and large scale oceanographic conditions, and associated range expansion of invasive species that can have a catastrophic impact on the ecological community. These are all driven by climate change. Other threats include impacts on water quality from land-based activities and aquaculture and potential loss from catastrophic storm events.

The key threats are impacting across much of the ecological community's range (eastern Victoria to the eastern coast of Tasmania) and coupled with secondary threats (e.g. land based pollution), will continue to have high level impacts if preventative actions do not occur.

Threat abatement is complex, due to the number of different threats involved and the high level nature of a threat such as climate change. Different combinations of threats across different sites and jurisdictions will require actions to be integrated across the range of the ecological community.

A more comprehensive analysis of threats to the ecological community is contained in the Listing Advice (TSSC, 2012) which is available on the Internet at:

<http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>.

Research Priorities

Research priorities that would inform future regional and local priority actions include:

- Undertake surveys across the range of the ecological community to:
 - i. identify sites of high conservation priority
 - ii. gain a better understanding of its variation and dynamics in understory algal species and associated fauna species across its range.
 - iii. locate additional remnants and identify threatened species that may require specific conservation measures.
- Support and enhance existing programs to map remnants of the ecological community.
- Determine optimal management strategies for high quality remnants and support and enhance existing management programs such as state marine bioregional plans.
- Support ongoing research aimed at determining and managing the vulnerability of the ecological community to climate change.
- Investigate the potential and efficacy of reforestation programs or other approaches for restoration of the ecological community.
- Support ongoing research and experimental trials to identify patterns of connectivity for giant kelp across the south eastern marine provinces.
- Support ongoing research into effective control methods for invasive species such as *Centrostephanus rodgersii* (black sea urchin).

Priority Actions

The following priority recovery and threat abatement actions can be done to support the recovery of the Giant Kelp Marine Forests of South East Australia ecological community.

Habitat Loss, Disturbance and Modification

- Ensure that remnants that are of particularly high quality or important for connectivity are considered for inclusion in reserve tenure or other marine conservation measures.
- Avoid any changes to hydrology in corresponding coastal regions that may result in changes to the natural hydrological regime, including drainage and increase or decrease in run-off, salinity, or pollution.
- Monitor known remnants to identify key threats and their impacts.
- Manage threats to remnants of the ecological community.
- Monitor the progress of recovery, through improved mapping, estimates of extent and condition assessments of the ecological community, and effective adaptive management actions.
- Liaise with local councils and State authorities to ensure new coastal development, forestry development or other activities involving substrate or vegetation disturbance in areas where the ecological community occurs downstream or in close proximity to the coastline do not adversely impact on known remnants.
- Liaise with planning authorities to ensure that planning takes the protection of remnants into account, with due regard to principles for long-term conservation. This may particularly apply where the ecological community occurs in or near to coastal urban centres.
- Promote the need for changes in large and small scale changes in the human activities that are contributing to global climate change.

Invasive Species

- Manage sites to prevent introduction or further spread of new invasive exotic species, and support targeted control of existing key species which threaten the ecological community, using appropriate methods.
- Manage shipping and aquaculture practices to minimise potential invasion of exotic species.

Conservation Information

- Raise public awareness about the Giant Kelp Forests South East Australia ecological community.
- Establish and/or maintain liaisons with researchers and marine managers in areas which remnants occur.
- Publish fact sheets and information guides about the ecological community and the implications of EPBC listing.

This list does not necessarily encompass all actions that may be of benefit to the Giant Kelp Forests of South East Australia ecological community, but highlights those that are considered to be of highest priority at the time of preparing the Conservation Advice.

Existing Plans/Management Prescriptions that are Relevant to the Ecological Community

South Australia

Commonwealth of Australia (2011). Assessment of the South Australian Sea Urchin Fishery Available at www.environment.gov.au/coasts/fisheries/sa/sea-urchin/pubs/assessment-2011.pdf

Commonwealth of Australia (2009). Assessment of the the South Australian Abalone Fishery Available at www.environment.gov.au/coasts/fisheries/sa/abalone/pubs/assessment-report-june09.pdf

Fisheries Division of Primary Industries and Resources South Australia (2008). Ecological Assessment of the South Australian Rock Lobster (*Jasus edwardsii*). Fishery Reassessment Report. South Australian Fisheries Management Series. Prepared for the Department of Environment, Water, Heritage, and the Arts For the purposes of Part 13 and 13(A) of the Environment Protection and Biodiversity Conservation Act 1999 Available at www.environment.gov.au/coasts/fisheries/sa/rock-lobster/pubs/reassessment-report.pdf

Victoria

Commonwealth of Australia (2011). Assessment of the Victorian Sea Urchin Fishery. Available at www.environment.gov.au/coasts/fisheries/vic/sea-urchin/pubs/assessment-2011.pdf

Commonwealth of Australia (2009) Assessment of the Victorian Abalone Fishery. Available at www.environment.gov.au/coasts/fisheries/vic/abalone/pubs/assessment-report-june09.pdf

Department of Primary Industries (2009). Victorian Rock Lobster Fishery Management Plan 2009. Fisheries Victoria Management Report Series No. 70. Available at www.dpi.vic.gov.au/fisheries/about-fisheries/managing-fisheries/victorian-rock-lobster-management-plan/victorian-rock-lobster-fishery-management-plan

Tasmania

Commonwealth of Australia (2011). Tasmanian Commercial Dive Fishery Available at: www.environment.gov.au/coasts/fisheries/tas/commercial-dive/pubs/assessment-2011.pdf

Department of Primary Industries, Parks, Water and Environment (2011) Tasmanian Abalone Fishery - Progress in implementing the Department of Sustainability, Environment, Water, Population and Communities' recommendations made in the 2007 assessment of the Tasmanian abalone fishery, available at www.environment.gov.au/coasts/fisheries/tas/abalone/submission-2011.html

Tasmanian Department of Primary Industries, Parks, Water and Environment (2011). Tasmanian Rock Lobster Fishery Environmental assessment under the EPBC Act. Progress in implementing the Department of Sustainability, Environment, Water, Population and Communities' recommendations made in the 2007 assessment of the Tasmanian rock lobster fishery. Available at www.environment.gov.au/coasts/fisheries/tas/rocklob/submission-2011.html

National

Department of the Environment and Heritage (2005). Recovery Plan for the following species of handfish: Spotted handfish – *Brachionichthys hirsutus*, Red handfish – *Brachionichthys politus*, Ziebell's handfish – *Sympterichthys* sp. [CSIRO #T6.01], Waterfall Bay handfish – *Sympterichthys* sp. [CSIRO #T1996.01]. Available at www.environment.gov.au/biodiversity/threatened/publications/recovery/4-handfish/pubs/4-handfish.pdf

TSSC (2009). Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases. Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee on a public nomination of a Key Threatening Process under the Environment Protection and Biodiversity Conservation Act 1999. Available at www.environment.gov.au/biodiversity/threatened/ktp/greenhouse.html

Information Sources:

- Barrett N, Sanderson JC, Lawler M., Halley V and Jordan, A (2001). Habitat mapping of inshore marine habitats in south eastern Tasmania for marine protected area planning and marine management. Marine Research Laboratories, Tasmanian Aquaculture and Fisheries Institute, University of Tasmania. Technical Report Series Number 7.
- Edyvane K (2003). Conservation, Monitoring and Recovery of Threatened Giant Kelp (*Macrocystis pyrifera*) Beds in Tasmania – Final Report (to Environment Australia). Department of Primary Industries, Water and Environment, Tasmania.
- Edyvane KS (1999). Conserving Marine Biodiversity in South Australia. Part 2. Identification of areas of High Conservation Value in South Australia. Final Report for Environment Australia on Project OR52. South Australian Research and Development Institute.
- Edyvane KS and Baker JL (1999). Marine Benthic Survey of the south-east coast (Murray mouth – Portland). Report to Environment Australia (Marine Protected Areas Program). Project D801 (Stage 4) SARDI Aquatic Sciences, Adelaide.
- Hobday AJ, Okey TA, Poloczanska ES, Kunz TJ and Richardson AJ (eds) (2006). Impacts of climate change on Australian marine life. Report to the Australian Greenhouse Office. Canberra. Australia.
- Johnson CR, Banks SC, Barrett NS, Cazassus F, Dunstan P, Edgar GJ, Fruscher SD, Gardner C, Haddon M, Helidoniotis F, Hill KL, Holbrook NJ, Hosie GW, Last PR, Ling SD, Melbourne-Thomas J, Miller K, Pecl GT, Richardson AJ, Ridgeway KR, Rintoul SR, Ritz DA, Ross DJ, Sanderson CJ, Shepherd SA, Slotwinski A, Swadling KM, Taw N (2011). Climate change cascades: Shifts in oceanography, species' range and subtidal marine community dynamics in eastern Tasmania. *Journal of Experimental Marine Biology and Ecology*. Iss 400 pp 17-32.
- Okey TA, Engstrom N and Babcock R (2006). Impacts of climate change on kelp. pp 44-52 in Hobday AJ, Okey TA, Poloczanska ES, Kunz TJ and Richardson AJ (eds) *Impacts of Climate Change on Australian Marine Life: Part C Literature Review*. Report to the Australian Greenhouse Office, Canberra, Australia.
- Sanderson JC (1997). Subtidal Macroalgal Assemblages in Temperate Australian Coastal Waters. State of the Environment Technical Paper Series. Estuaries and the Sea. Department of Environment. Canberra.

This Conservation Advice was approved by the Minister on: 14 August 2012

Shepherd SA and Edgar GJ (2012). Living Reefs: the Ecology of southern Australian Reefs. CSIRO Publishing (in preparation).

Steneck RS, Graham MH, Bourque BJ, Corbett D, Erlandson JM, Estes JA and Tegner MJ (2002). Kelp forest ecosystems: biodiversity, stability resilience and future. *Environmental Conservation* 29 (4): pp 436-459.

Tegner MJ and Dayton PK (2000). Ecosystem effects of fishing in kelp forest communities. *International Council for the Exploration of the Sea, Journal of Marine Science* 57: pp 579-589.

TSSC (2012). Advice to the Minister for Sustainability, Environment, Water, Population and Communities from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Giant Kelp Marine Forests of South East Australia ecological community.

Womersley HBS (1954). The Species of *Macrocystis* with special reference to those on southern Australian coasts. *Univ. Calif.Pubs. Bot.* 27: 109-132.

Womersley HBS and Edmonds SJ (1957). A general account of the intertidal ecology of south Australian coasts. *Australian Journal of Marine and Freshwater Research* Vol 9 number 2 pp 216-259.

Information on State Marine Parks and State Marine Bioregional Planning

South Australia Marine Parks

www.environment.sa.gov.au/Conservation/Coastal_Marine/Marine_Parks

Tasmanian Marine Reserves www.parks.tas.gov.au/index.aspx?base=397

Victorian Marine Parks www.coastlinks.vic.gov.au/marineparks.htm