

AUSTRALIA'S GREAT SOUTHERN REEF

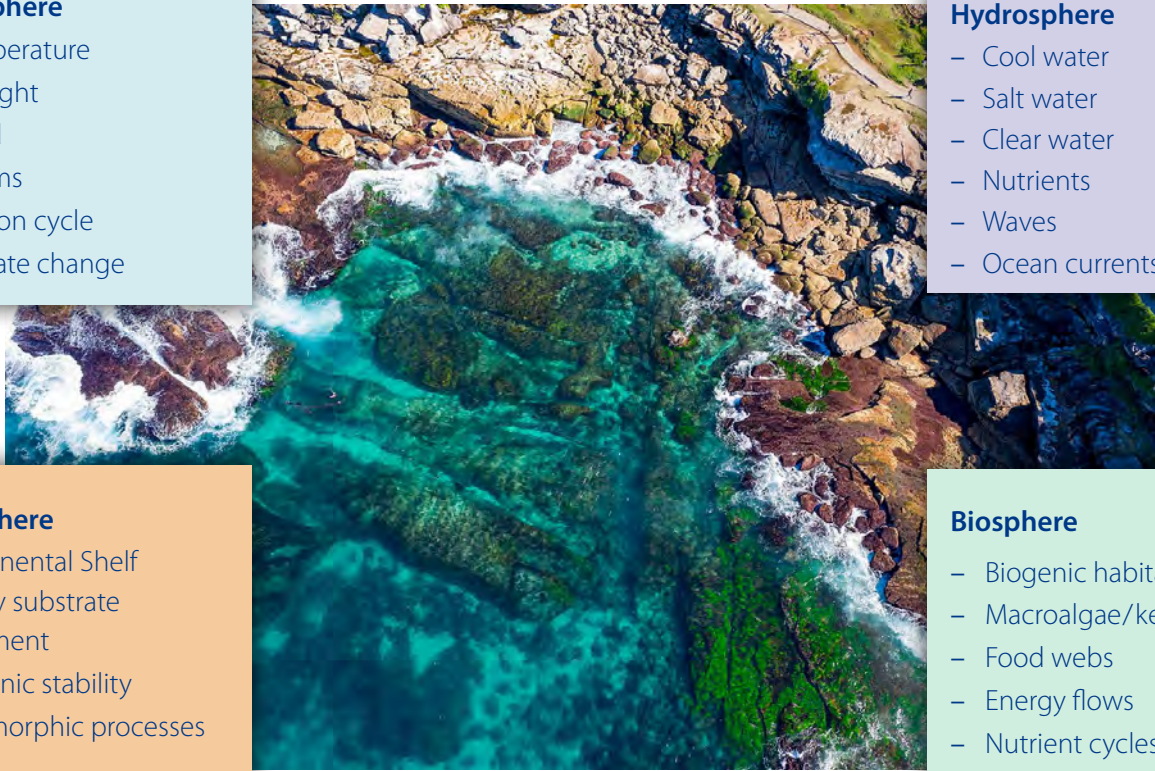
BIOPHYSICAL INTERACTIONS AND ECOSYSTEM FUNCTIONING

Atmosphere

- Temperature
- Sunlight
- Wind
- Storms
- Carbon cycle
- Climate change

Hydrosphere

- Cool water
- Salt water
- Clear water
- Nutrients
- Waves
- Ocean currents



Lithosphere

- Continental Shelf
- Rocky substrate
- Sediment
- Tectonic stability
- Geomorphic processes

Biosphere

- Biogenic habitats
- Macroalgae/kelp forests
- Food webs
- Energy flows
- Nutrient cycles

Photo John Turnbull #marineexplorer

The unique characteristics of the Great Southern Reef Kelp Forest ecosystem result from biophysical interactions between **abiotic** and **biotic** components of the natural environment. The lithosphere, atmosphere and hydrosphere create the conditions required for kelp to grow.

Kelp are the foundational species (primary biomass) of the ecosystem and critical to its functioning (food webs, energy flows and nutrient cycles). It is the high **primary productivity** of kelp that supports high levels of biodiversity and creates habitats.

Limiting conditions for kelp

- Rocky substrate as the essential solid foundation for kelp to establish
- Sunlight for photosynthesis to produce primary biomass
- Low turbidity to maximise sunlight penetration
- Cool water less than 20 °C is best (Maximum 26 °C)
- Normal seawater levels for pH (8.1 which means it is alkaline) and salinity (35,000 ppm compared to freshwater at less than 1,000 ppm).
- Nutrient rich water for high primary productivity
Seasonal upwelling events provide essential nutrients
- Low to moderate wave energy although some species can survive on high energy coasts.

These biophysical conditions are found on subtidal rocky reefs in Australia's temperate latitudes where kelp species are adapted to varying conditions within these limits.

Golden Kelp (*Ecklonia radiata*), the dominant species on the GSR, thrives in the subtidal zone to depths of approximately 30m and forms dense 'forests' in the most sheltered locations, however it is also known to grow to depths of 50 metres in Eastern Tasmania. Giant Kelp mostly grows on reefs exposed to moderate wave action in depths of eight metres and below and Bull Kelp is found in very high wave exposed locations such as Tasmania's west coast.



Golden Kelp. Source: Ocean Imaging | Great Southern Reef
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