

# AUSTRALIA'S GREAT SOUTHERN REEF

## THE GREAT SOUTHERN REEF ECOSYSTEM

### THE BIOPHYSICAL ENVIRONMENT

- **Rocky outcrops and boulders** are the main substrate (surface) for the GSR, interspersed with areas of marine sediment on the seafloor.
- The GSR ecosystem comprises extensive seaweed/kelp, sponge, seagrass, and other **biogenic habitats** such as those shown in **Figure 2**. These habitats support high levels of biodiversity that includes marine crustaceans such as crabs and lobsters; molluscs such as squids and snails, echinoderms such as starfish, sea urchins and fish.
- The nature of the substrate, water temperature, light, ocean currents and wave action determine the diversity of habitats at different locations on the reef. **Figure 3** shows how wave action alone can influence habitats in a small area.
- **Kelp** is the dominant habitat forming species on the Great Southern Reef. The kelp, a macroalgae, attaches itself to rocky outcrops and boulders where it creates a complex 3D living habitat much like a terrestrial forest. The main kelp species is "Golden Kelp" (*Ecklonia radiata*), sometimes called Common Kelp. This foundation species forms a forest canopy and provides the primary biomass and habitat for hundreds of other species. Other species such as Giant Kelp and Crayweed coexist with Golden Kelp. Kelp forests have been likened to a *'hipster beard'* on the chin of the Australian coastline.
- Other **habitat forming species** contribute to the complexity of the GSR, occupying niches less suited to kelp or found beneath the canopy of the kelp forest. For example, and sponges grow on deep rocky surfaces where there is less sunlight.

Learn more about seaweed/kelp, seagrasses, and sponges in **Fact Sheet on pages 60–61**.



Golden Kelp on the Great Southern Reef. Source: Shutterstock

### INTERCONNECTED HABITATS AND ECOSYSTEMS

Reef habitats are connected through ecological processes such as food chains, energy flows and nutrient cycles. Kelp produce food through photosynthesis and feed primary consumers such as fish and zooplankton across multiple habitats.

Sponges filter food and nutrients from the water, keeping the water clear for kelp.

Giant Australian Cuttlefish gather in kelp forests to breed while sharks and other marine mammals hunt in the corridors created by kelp plants.

**Connectivity** is an essential component of **ecosystem functioning** on rocky reefs and includes important connections to adjacent ecosystems such as seagrasses. 'Edge effects' benefit biodiversity across connected ecosystems and enhance their resilience. **Figure 4** is an example of a connection between kelp and adjacent seagrasses that helps fish biodiversity.

### BIODIVERSITY HOTSPOT

The GSR is a **global biodiversity hotspot** with species such as the Weedy Seadragon found nowhere else in the world and more seaweed species than any other location. The GSR had more **endemic** species than the Great barrier Reef.

*'The GSR is a global hotspot for marine biodiversity and endemic species, hosts the highest diversity of seaweeds on Earth (>1000 species) and is one of the most productive ecosystems on Earth. GSR kelp forests produce 65 tonnes of biomass per hectare per year.'*

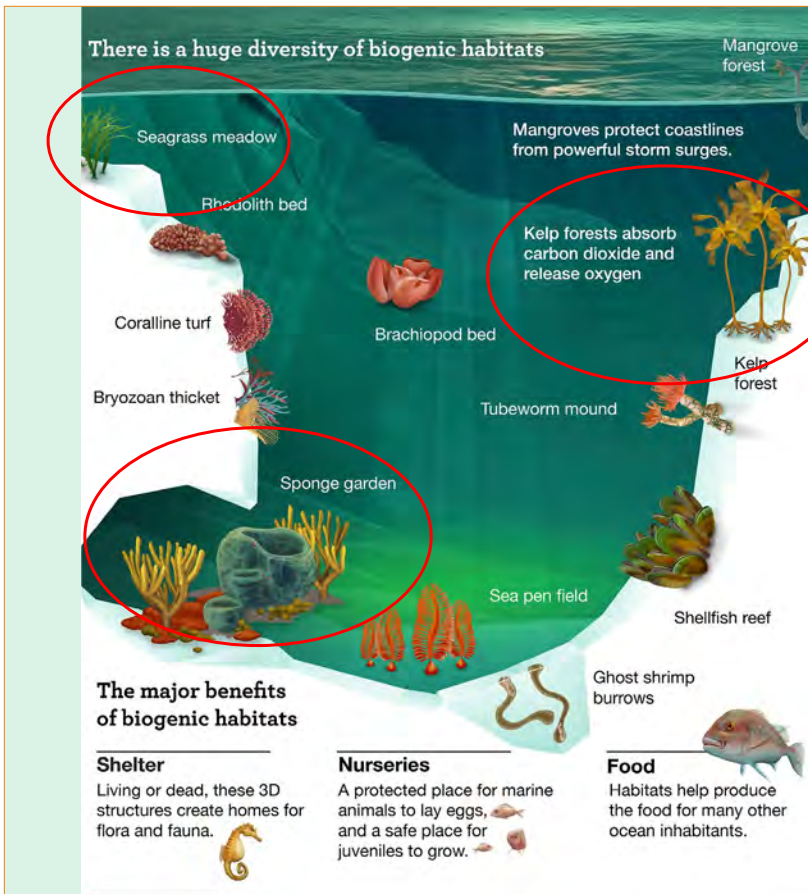
Source: <https://marinesocioecology.org/great-southern-reef-webinar-uncovering-the-value-of-australias-gsr/>



Sponge garden on the Great Southern Reef  
Source: Ocean Imaging | Great Southern Reef

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Figure 2: Biogenic habitats on rocky reefs



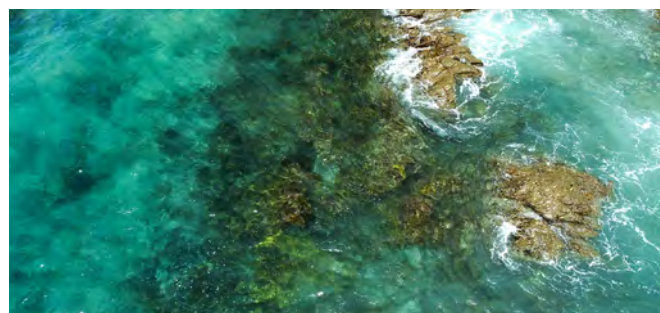
The habitats created by living organisms are called biogenic – ‘bio’ means life and ‘genic’ means formed by. **Biogenic** habitats are made of living things (such as kelp) or form from the activities of plants, animals, or other organisms (like the burrows that a crab makes). In a biogenic community one type of organism provides the structure for many other organisms to live.

Diagram source: Science Learning Hub – Pokapū Akoranga Pūtaiao, University of Waikato, <https://www.sciencelearn.org.nz/images/4599-biogenic-engineers-and-architects>

Figure 3: Influence of wave exposure on habitats within rocky reef ecosystems



Source: Science Learning Hub – Pokapū Akoranga Pūtaiao, University of Waikato, [www.sciencelearn.org.nz](http://www.sciencelearn.org.nz) and <https://www.sciencelearn.org.nz/images/4599-biogenic-engineers-and-architects>



Rocky outcrops are the foundation of the GSR.  
Source: Ocean Imaging | Great Southern Reef

Figure 4: Ecosystem connectivity



‘Along temperate coastlines, seagrass meadows and kelp forests are critical nursery habitats for fish’. Source: Olson, A. M., Hession-Lewis, M., Haggarty, D., and Juanes, F. (2019). Nearshore seascape connectivity enhances seagrass meadow nursery function. – <https://doi.org/10.1002/eap.1897>

