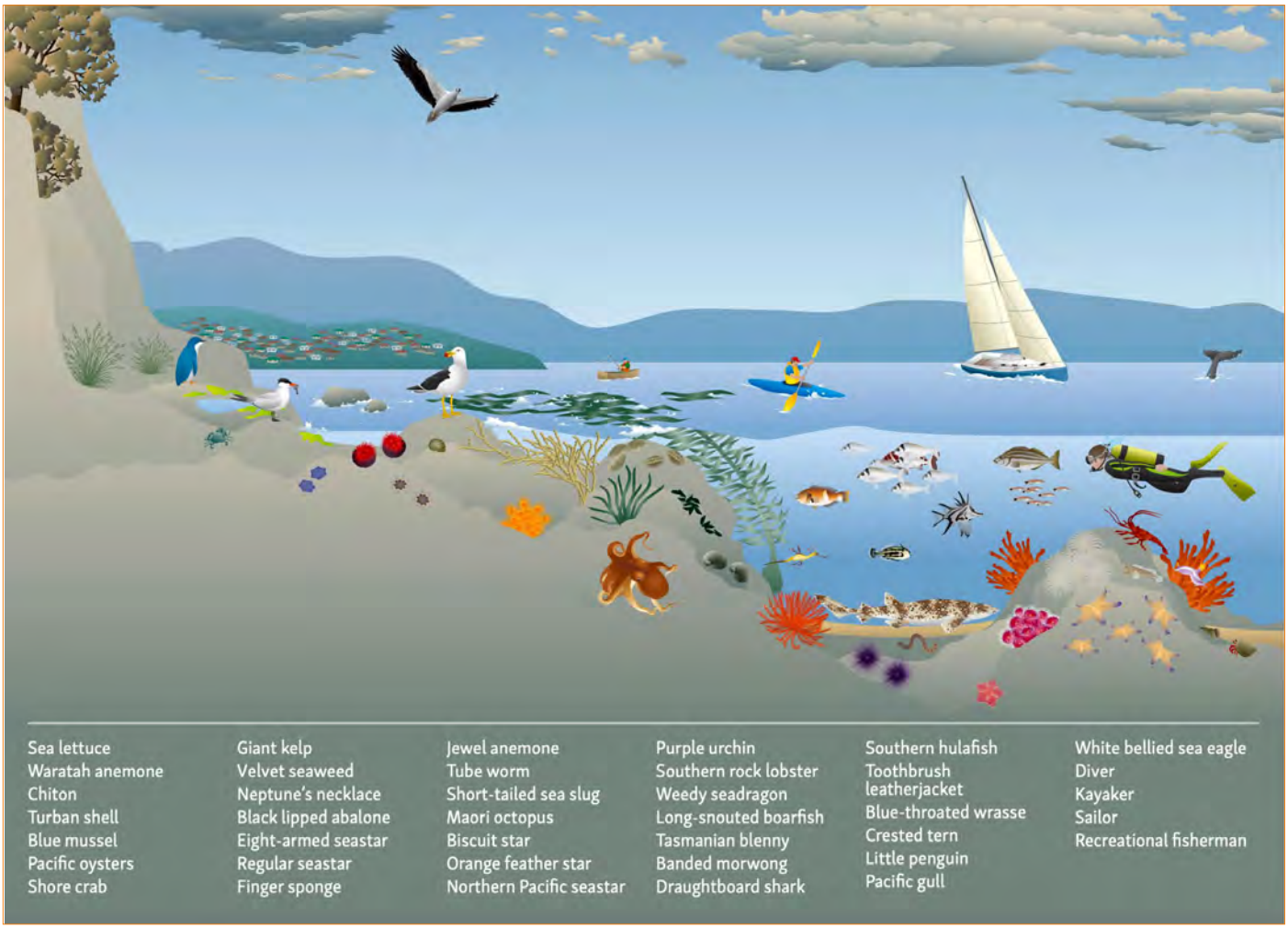
Figure 6: Diagram of a rocky reef in southern Tasmania, supporting a diversity of habitats such as kelp and sponges, and multiple species of organisms across a small area.



Use the INTERACTIVE DIAGRAM to identify species here: https://www.derwentestuary.org.au/rocky-reefs-kelp-beds-and-inter-tidal-zone/

THE LITHOSOPHERE

A stable coast

At the continental scale, The Great Southern Reef is located on the landward edge of Australia's continental shelf where coastal landforms extend below sea level in **a mosaic of rocky reefs and soft sediments.**

Marine ecosystems such as the GSR have developed into complex systems with high levels of **biodiversity** and **endemism** over very long periods of time. This can be explained by:

- Australia's tectonic stability due to its location within the Indo-Australia plate
- low sediment loads from coastal rivers due to the dry climate
- a lack of continental glaciation to cause isostatic movement

'… thousands of kilometres of the present rocky coast of eastern and southwestern Australia largely retain the outline created more than 30 Ma.'

Source: http://press-files.anu.edu.au/downloads/press/p194981/pdf/chapter-6.pdf

Geomorphic processes

The rocky outcrops and boulders that form the Great Southern Reef are a result of the weathering and erosion of the continent. They may be extensions of rock platforms, remnants of coastal cliffs and headlands or isolated rocky outliers.

Weathering and ***erosion*** continuously shape the GSR, changing the availability of rock surfaces for kelp colonisation and forming crevices, channels and overhangs that support a diversity of non-kelp species. Loose substrate *deposited* on the seabed between the rocky outcrops, adds complexity to the ecosystem and the biodiversity it supports.

Lithosphere – hydrosphere interactions

Coastal geology (rock type and structure) and exposure to wave energy influence the physical features of rocky reefs. Fast eroding granite produces uneven surfaces and crevices that become habitat for a diversity of species such as eels and octopus while sandstone reefs have more smooth surfaces on which kelp attaches and overhangs where sponges will thrive.

The coastal sandstone around Sydney is exposed to moderate wave energy with cliff retreating at a rate of around 1 mm/year.

Along the Great Australian bight, soft limestone is exposed to very high wave energy and average cliff retreat rate of around 25 mm/year. The rate of retreat influences current and future characteristics of the Great Southern Reef.

Lithosphere – biosphere interactions

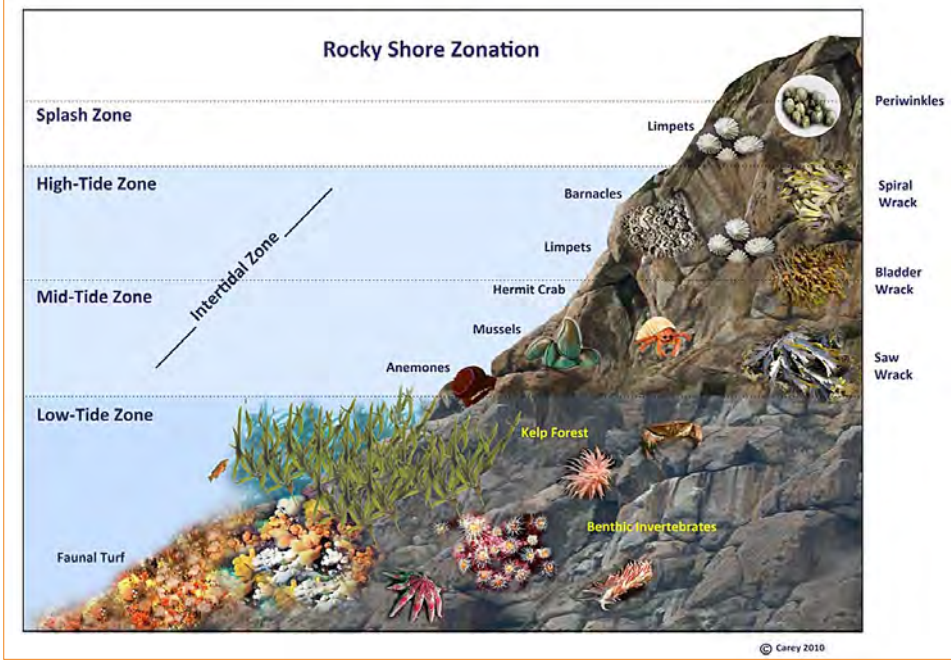
Variations in the seafloor and water depth contribute to the high level of species diversity. **Figure 7** shows **zonation of species** on a rocky surface.

Marine organisms are adapted to conditions in the water column from sea level to sea floor. Kelp forests grow in the subtidal zone where biophysical conditions create a stable environment for organisms with fewer natural stresses than in the tidal zone. For example, there are no strong fluctuations in temperature, water pressure and sunlight; organisms do not dry out and they extract essential nutrients such as nitrogen and phosphorous from the water. As a result, kelp grows quickly within the **photic zone** here, can grow to great lengths, and produce high primary biomass. As the water gets deeper and the light fades kelp gives way to faunal turfs such as sponges, soft corals and sea fans.

Great Australian Bight, WA.
Source: Shutterstock.

Cabbage Tree Bay, NSW Northern beaches
Source: https://www.northernbeaches.nsw.gov.au/things-to-do/recreation-area/cabbage-tree-bay-aquatic-reserve

Figure 7: Rocky shore zonation



Tidal zones

Mostly shelled organisms and wrack

Wrack is organic material washed onto beaches and rocks by tides and waves. It breaks down and is recycled back into the marine ecosystem.

Subtidal zone

Mostly soft bodied organisms and algae

Other species will grow on soft sediment between rocky outcrops shown in Figure 1

Image source: https://gcs.instructure.com/courses/37951/assignments/115556