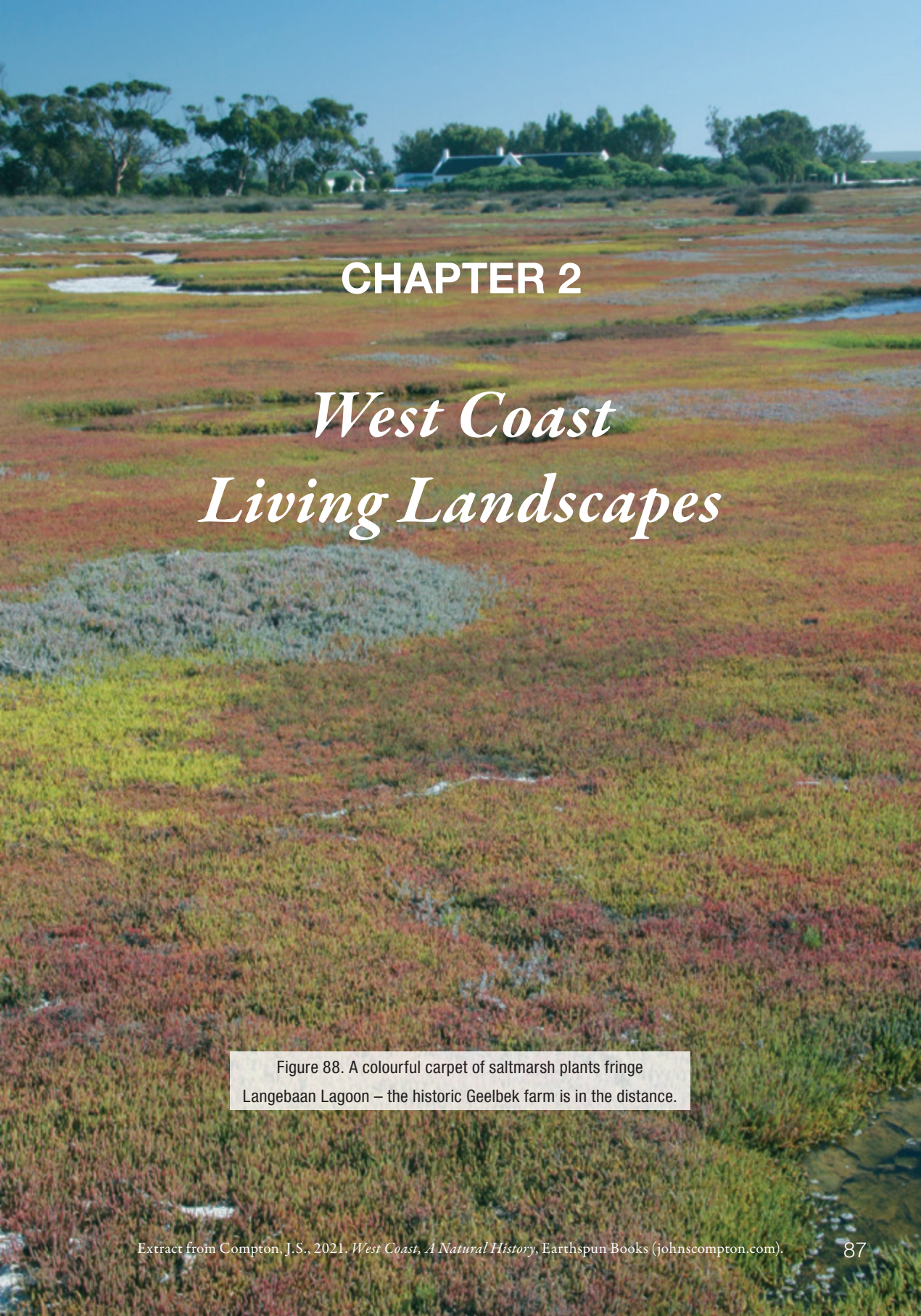

CHAPTER 2

West Coast Living Landscapes

Figure 88. A colourful carpet of saltmarsh plants fringe Langebaan Lagoon – the historic Geelbek farm is in the distance.

A thin veneer

The tectonic forces that shuffle continents around are generated by turnover in the deep, hot Earth as the planet continues to cool down from its magma ball origin 4.5 billion years ago. In contrast to the flow of heat that continues to arrive from below, a far greater stream of energy comes from above: in just two hours the Sun provides more energy than the entire world population consumes each year from fossil and nuclear fuels.[1] It is this considerable flow of energy from the Sun that ultimately generates wind, rain, the currents that mix the ocean, and Earth's thin veneer of life (Fig. 88). The flux of energy, both from above and below, that stir up Earth's crust, ocean and atmosphere would exist whether life had evolved on Earth or not, along with the many landscape features of the West Coast described in Chapter 1. The fact that life exists at all on Earth speaks to one of the most fundamental aspects of the power of place: Earth, the third rocky planet orbiting the Sun, sits comfortably within the 'habitable zone', the orbital band about a star that is neither too hot nor too cold for life. Shrouded in a thick vapour of CO_2 gas, Venus is hot enough to melt lead, while the outer planets are enormous dirty snowballs. Only Earth has oceans of liquid water and swirling white clouds that give our planet its distinctive blue marble colours visible from space (Fig. 89). It was in the ocean that life first evolved under the influence of tectonic forces and sunlight.

Life was established surprisingly early, perhaps by 3.7 – and more certainly by 3.4 – billion years ago.[2] The first life forms were relatively simple: single-celled chemosynthetic bacteria thriving off chemical reactions taking place at hot spring vents along mid-ocean ridges. Soon after it emerged, life found its way to the sunlit surface waters of the ocean where photosynthesis allowed it to thrive on an abundance of sunshine. It would take a long time before bigger, more complex life forms appeared, with the earliest enigmatic animal fossils of the Ediacaran fauna found in rocks between 580 and 555 million years old that include the Nama Group in Namibia (Fig. 12). The Ediacaran animals were then largely replaced by a wide assortment of marine creatures such as trilobites, brachiopods and the earliest fish-like animals between 540 and 500 million years ago, corresponding to when Cape granite was busy intruding into Malmesbury shale. The emergence of such a rich diversity of larger animals was possible because oxygen, a by-product of photosynthesis, had for the first time reached levels in the atmosphere comparable to today.

The evolution of life was powerfully shaped by the physical realm, which was in turn influenced by life. Nearly all chemical reactions at or near Earth's surface are facilitated by bacteria, omnipresent in their invisible multitudes. In addition to maintaining our oxygen-rich atmosphere, life provides rapid, large feedbacks to changes in climate by the uptake of the greenhouse gas CO_2. Although life constitutes only a thin green veneer,

Extract from Compton, J.S., 2021. *West Coast, A Natural History*, Earthspun Books (johnscompton.com).

Figure 89. Our blue marble planet.

it provides many other feedbacks critical to keeping Earth habitable. Plants accelerate soil formation and confine rivers to flow in channels; animals churn the soil and can build structures from termite mounds to enormous carbonate reefs. Most of the physical aspects of the West Coast described in Chapter 1 – the mountains, beaches, wind and waves – would exist without life and yet, amazingly, life evolved and has added a whole new dimension to our planet. In this chapter, the intimate links that exist between the rich diversity of life and the physical features of the West Coast are explored.