Commonwealth Marine Economies Programme
Enabling safe and sustainable marine economies across Commonwealth Small Island Developing States
www.gov.uk/guidance/commonwealth-marine-economies-programme
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Funded by UK Government

2017-2018 Seagrass Surveys, Efate, Vanuatu

HIGHLIGHTS

- Under the auspices of the Commonwealth Marine Economies (CME) Programme, a team of marine scientists from Cefas travelled to Efate island during 2017 and 2018 to study seagrasses.
- The Cefas team found a total of five species of seagrass, all of which are already documented in Vanuatu: *Thalassia hemprichii*, *Cymodocea rotundata*, *Enhalus acoroides*, *Halodule uninervis* and *Halophila ovalis*.
- The condition of the seagrass deteriorated near Port Vila, while the meadows away from the town appear to be healthier and more diverse, particularly in the north.
- Seagrasses are very important, provide habitat for many marine creatures, keep the water clean and trap CO_2, but they are decreasing across the globe mainly due to pollution and climate change.

Cefas seagrass surveys in Port Vila, Erakor Lagoon, Fatumaru Bay, Moso Island, Eratap, Pango Vale Vale, Epau, Paonagisu, and Pele Island

The Commonwealth Marine Economies (CME) Programme is funded by the UK through the Conflict, Stability and Security Fund and led by the Foreign and Commonwealth Office. The Programme is delivered in partnership by the United Kingdom Hydrographic Office, the Centre for Environment, Fisheries and Aquaculture Science (Cefas), the National Oceanography Centre and a team from Atkins, working with governments of small island developing states in the Caribbean and Pacific to develop marine economy plans in a sustainable, resilient and integrated way. As part of a project linking water quality and habitat resilience in Vanuatu, marine scientists from Cefas studied the seagrasses of Efate island during 2017 and 2018. Seagrass is common in the islands of Vanuatu and grows on the soft sandy sediment of some coastal lagoons and bays. Seagrass meadows are rapidly decreasing in number and extent across the globe mainly due to the impact of human disturbances causing turbidity, siltation and pollution in coastal waters, a situation aggravated by rapidly changing climatic conditions like warming sea temperatures, rising sea levels and cyclones.

Seagrass meadows are globally important. They provide food and shelter for fish, turtles, dugongs and other marine creatures that are vital to the food security, culture and economy of coastal communities across the Pacific. Seagrasses contribute to good water quality by trapping sediments and pollutants. Finally, seagrasses are one of the main “blue carbon” habitats, together with mangroves and saltmarshes. They capture carbon dioxide (CO_2) from the atmosphere and store it inside the seagrass leaves and roots as well as in the sediment, for long periods of time. Blue carbon habitats may help to mitigate against climate change, however, degradation of these habitats can result in the emission of stored carbon and the loss this carbon capture service in the future. It is timely and imperative that every effort is made to understand the condition and extent of seagrasses in order to help countries like Vanuatu manage and protect this habitat. Joining in with other ongoing seagrass monitoring studies in Vanuatu, our study in Efate is assessing the health and diversity of the island’s intertidal seagrasses and trying to understand their vulnerability to human pressures as well as climate change.

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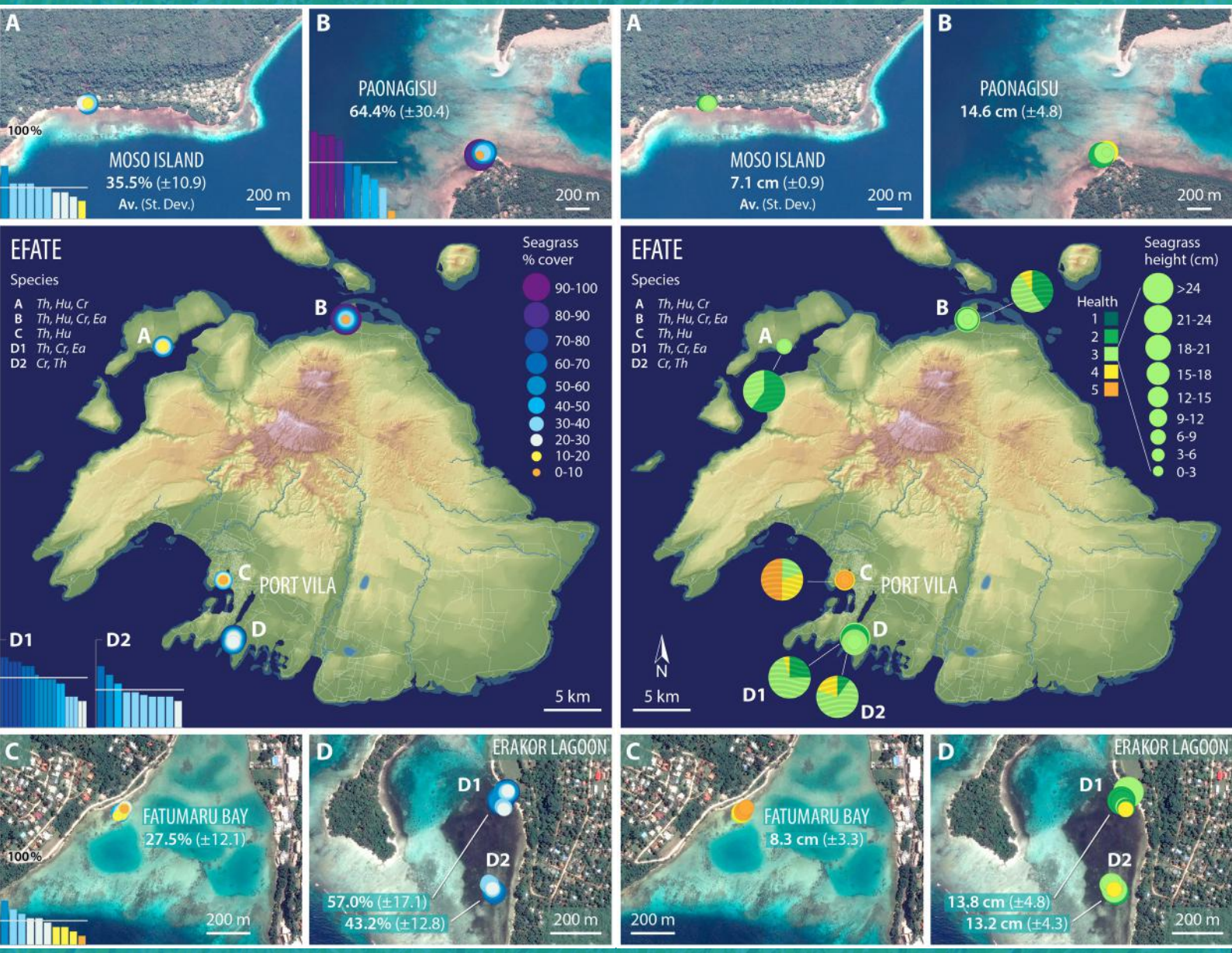
2017 Results

In 2017 we studied the seagrasses in Erakor Lagoon and Fatumaru Bay in the southwest of the island, near the capital Port Vila, as well as Moso Island and Paonagisu in the north. We found a total of five species of seagrass, all of which are already documented in Vanuatu: *Thalassia hemprichii*, *Cymodocea rotundata*, *Enhalus acoroides*, *Halodule uninervis* and *Halophila ovalis*.



In Fatumaru Bay, nearest to Port Vila, the seagrass appeared covered by epiphytes. Epiphytes are bacteria and microalgae that attach to the surface of the leaves proliferate in conditions of high nutrient concentrations in the water, smothering the seagrass and reducing the amount of light and nutrients that reaches the leaves, potentially slowing their growth. The seagrass in Fatumaru was also found to be sparser than in the other locations, and the plants generally shorter.

The condition of the seagrass improved towards the north, with Paonagisu showing the highest diversity and better healthy appearance, followed by Moso Island and Erakor Lagoon.

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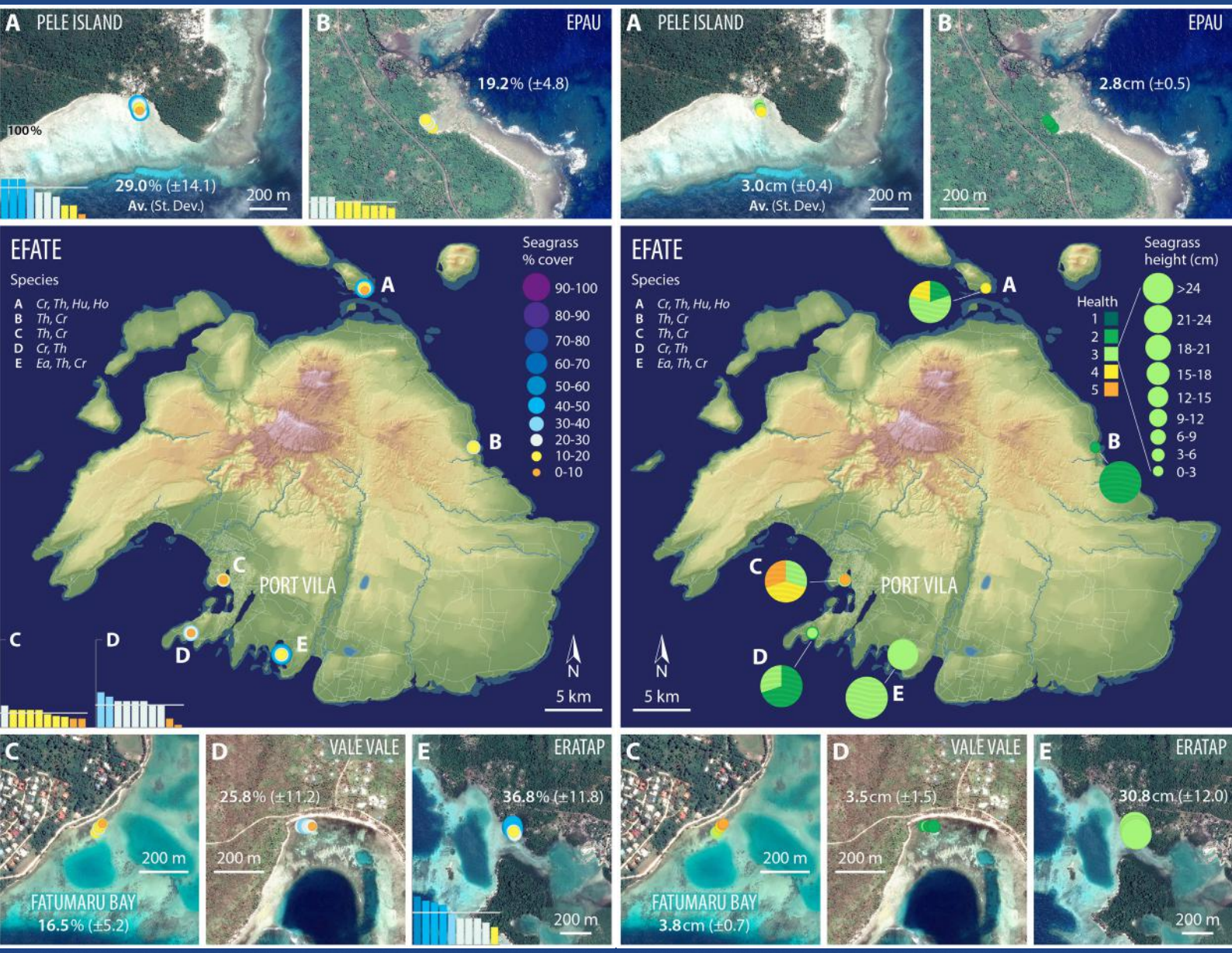
2018 Results

In 2018, as well as repeating the Fatumaru Bay surveys, we visited four new locations: Eratap and Pango Vale Vale in the southwest, Epau on the east coast and Pele Island in the north. We found the same species as in 2017. Diversity was highest at Pele Island — offshore from Paonagisu, the most diverse site surveyed in 2017. This area may be a hotspot for seagrass diversity.



In general, the seagrasses measured in August 2018 were shorter than in 2017, which may partly reflect a difference in species composition in the 2018 sites compared to the 2017 sites. The denser seagrass was found in Eratap followed by Pele and Pango, while Fatumaru Bay was sparser and with shorter plants than the previous year.

The poor health of the seagrass in Fatumaru Bay found in both surveys could be due to high nutrient concentrations. Seagrasses typically grow on nutrient-poor sediments so under high-nutrient conditions plants will initially increase their growth rate. However prolonged excess nutrients also stimulate epiphytes to grow on the seagrass smothering the plants. Other causes for poor seagrass health in Fatumaru Bay can be light limitation and fluctuations in salinity from freshwater flows.

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2018 Results, continued...

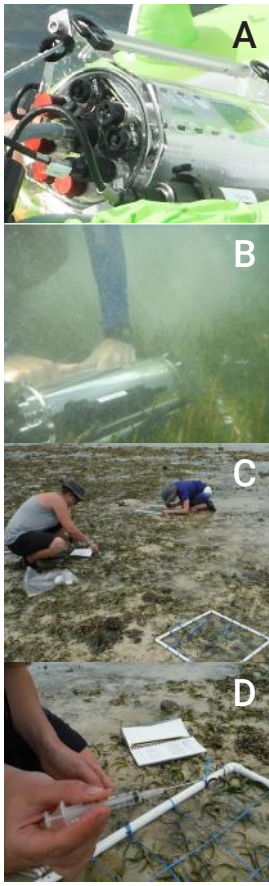
We measured the photosynthetic activity of live seagrass plants in all these locations using a submersible fluorimeter, and we carried out seagrass growth measurements also in location, during a two-week experiment in Fatumaru and Pango. The experiment revealed that the plants in Fatumaru required one day longer to create new leaves compared to those in Pango.

This adds further evidence that the seagrass beds we examined in Fatumaru Bay are experiencing challenging conditions, likely related to water quality in the vicinity of the main town.

We measured the carbon content in the seagrass plants and roots and the sediment underneath, to estimate the "blue carbon" potential of these seagrass meadows. We found the higher values of carbon storage in the seagrass growing on deeper soft sediment, like Erakor and Paonagisu. The lowest values of carbon storage were measured in Fatumaru Bay.

We estimated that the average seagrass carbon stock for Efate is around 107 tonnes of carbon per hectare, which is lower than the current global average (140 tonnes per hectare). To our knowledge these are the first measurement of carbon stored by seagrass in Vanuatu. Even though limited to the island of Efate, our study contributes vital data to blue carbon research worldwide and provides a baseline for future work.

Our data, and data kindly shared by our VESS collaborators, is being used to validate satellite data to produce a map of the distribution of intertidal and subtidal seagrasses in Vanuatu. This information does not exist to date and it will help establishing a baseline in order to accurately monitor and understand future changes and allow effective management and protection.



Photos, right: A) and B) Measuring live photosynthesis on seagrass plants using a submersible fluorimeter.
C) and D) Marking seagrass plants during the growth experiment by puncturing the leaf sheath.

Acknowledgements

This work would not have been possible without the contribution of many collaborators including University of South Pacific, Secretariat of the Pacific Regional Environment Programme, Vanuatu Environmental Science Society, C2O RESCCUE, Vanuatu Department of Water Resources. The Department of Environmental Protection and Conservation kindly approved a research permit for Cefas to collect field samples.

All photos by the Cefas team except: Page 1 — Fish swimming over seagrass, by Dieter Tracey.

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