

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

Seagrass Surveys Efate, Vanuatu (2017-2018)



BACKGROUND

During 2017 and 2018, a team of marine scientists from Cefas worked in the island of Efate, Vanuatu, studying seagrasses. Seagrasses are underwater plants that evolved from land plants. Seagrass meadows are globally important for a number of reasons: they are highly productive ecosystems and provide many ecological services as well as acting as a natural carbon sink, absorbing large amounts of carbon dioxide and storing it as organic carbon for long periods of time.

Disturbance and loss of these habitats can result in large emissions of carbon dioxide back into the atmosphere. Seagrass meadows are rapidly decreasing in number and extent across the globe, and Vanuatu is no exception.

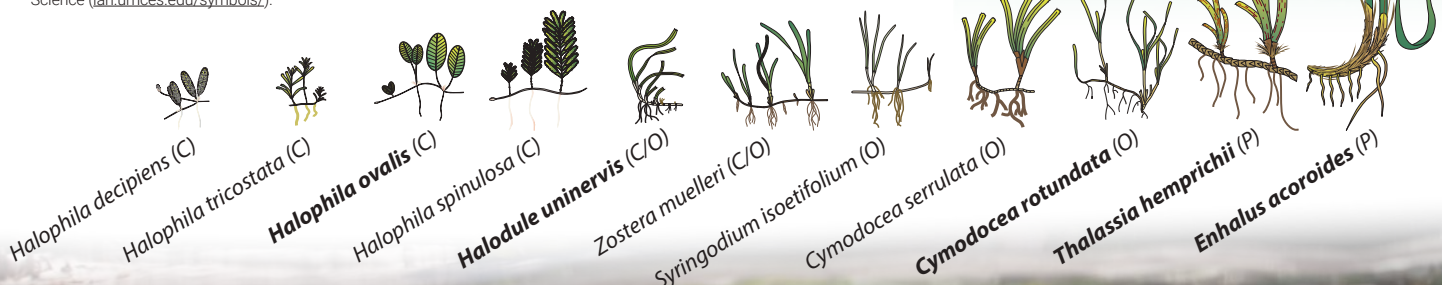
This loss is mainly due to the impact of encroaching urban developments and activities like fishing, dredging, anchoring and poor land management causing turbidity and siltation in coastal waters. In addition, changing climatic conditions like like warming seas, rising sea level, and cyclone damage are aggravating widespread habitat degradation.

Shallow intertidal seagrasses are likely to be more vulnerable to climate impacts, particularly those nearer to populated areas, while deeper and more remote subtidal seagrasses will be more resilient although they may experience changes in distribution and composition of species in the future as sea level rises.

Common tropical Indo-Pacific seagrass species categorised according to life history traits based on their ability to resist or recover from disturbance¹ – persistent (P) or colonising (C), or a mix of these: opportunistic (O). Species observed in the 2017-18 surveys are shown in **bold**.

1. After Kilminster et al. (2015). <https://www.sciencedirect.com/science/article/pii/S0048969715005124>.

Symbols courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/).



SEAGRASS IN VANUATU

Seagrass beds are common in the islands of Vanuatu, with the largest and denser meadows found in sheltered shallow lagoons and bays with sandy sediments. There have been two assessments of seagrasses in Vanuatu as part of wider biodiversity surveys published in 1990 and 2011², and nine species have been identified, but a complete scientific evaluation of seagrasses in Vanuatu has not been conducted. Therefore, the total area of seagrass beds and the level of threat to both dugongs and seagrasses remain unknown.

2. <http://www.dugongconservation.org>

Photo: Ethan Daniels | Alamy

Enhalus acoroides

Importance of seagrass

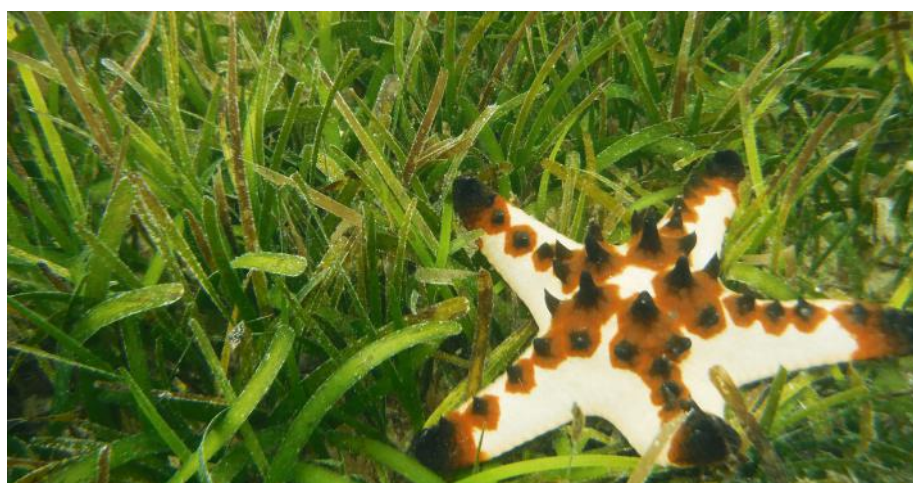
Seagrass meadows are globally important for a number of reasons. They provide habitat for many fish as well as molluscs and sea cucumbers that are vital to the food security and the economy of coastal communities across Pacific island countries like Vanuatu. Seagrasses contribute to maintain good water quality by trapping sediments and pollutants. Seagrass meadows provide grazing and shelter for sea turtles and dugongs; the protection and conservation of seagrasses is crucial to the survival of these vulnerable species.

Finally, seagrasses are one of the main “blue carbon” habitats, together with mangroves and saltmarshes, so called because they sequester carbon dioxide from the atmosphere and store it in its organic form for very long periods of time unless disturbed. Disturbance and loss of these habitats can result in the remineralisation of the stored organic carbon and the emission of potentially very large amounts of carbon dioxide back into the atmosphere.



Photo: Dieter Tracey

Seagrass meadows provide valuable nursery habitat to many fish species.



Seagrass meadows are important for their ability to sequester and store carbon from the atmosphere.



Photo: Louise Murray | Alamy

Seagrass meadows provide food for dugongs, so the protection and conservation of seagrasses is crucial to the survival of this vulnerable species.

Partners in seagrass mapping

This work would not have been possible without the enthusiastic support of many Vanuatu collaborators.

SPREP¹ provided invaluable assistance with logistics, regional networking and data collection. Through the kindness of our contacts at the USP² Emalus campus in Port Vila, Efate, Cefas had access to dedicated laboratory and storage areas, as well as the support of students and staff who provided essential assistance during field and laboratory activities. We worked closely with DoWR³ building capacity and skills in aspects of water quality, and officers from DoWR were instrumental to our research, acted as local guides and helped in the field and in the laboratory throughout the project. Colleagues from VESS⁴ carrying out SeagrassWatch⁵ monitoring surveys in various islands in Vanuatu were happy to share knowledge and data to help

validate our remote sensing satellite mapping of intertidal seagrasses in Efate and other islands. C20⁶ marine champions associated to the C20 RESCCUE project are currently working to support adaptation to climate change through integrated coastal management and sustainable fisheries; they accompanied us during our surveys in the northern, more remote seagrass sites.

Finally, we are grateful for the support of the Government of Vanuatu as co-leaders with the UK of the Commonwealth Clean Oceans Alliance. The Vanuatu Department of Environmental Protection and Conservation has kindly approved a research permit for Cefas to collect seagrass to carry out this study.



Cefas scientists with collaborators from the DoWR and USP carrying out field work on the seagrass meadows Paoganisu (top) and Pango Vale Vale (bottom) in, Efate, Vanuatu.

1. The Secretariat of the Pacific Regional Environment Programme (<http://www.sprep.org/>)
2. University of the South Pacific (<https://www.usp.ac.fj/?id=7158>)
3. Vanuatu Department of Water Resources (<https://mol.gov.vu/index.php/en/water/226-water>)
4. Vanuatu Environmental Science Society (<https://www.vanuatuconservation.org/about-vess/>)
5. SeagrassWatch (<http://www.seagrasswatch.org/home.html>)
6. Coasts Climate Oceans Consulting (<https://www.c2o.net.au/people>)

Survey results (2017-2018)

Our results suggest that the health and diversity of seagrasses, as well as their capacity to store carbon, are linked to the water quality. Higher values of carbon storage resulted from samples from seagrass growing in shallow, calm lagoon areas where the sandy sediment is deeper. Near Port Vila the seagrass appeared covered by epiphytes and the carbon content of the seagrass plants was lower. Epiphytes are bacteria and algae growing on the surface of the seagrass leaves. An excess of epiphytes suggests eutrophication.

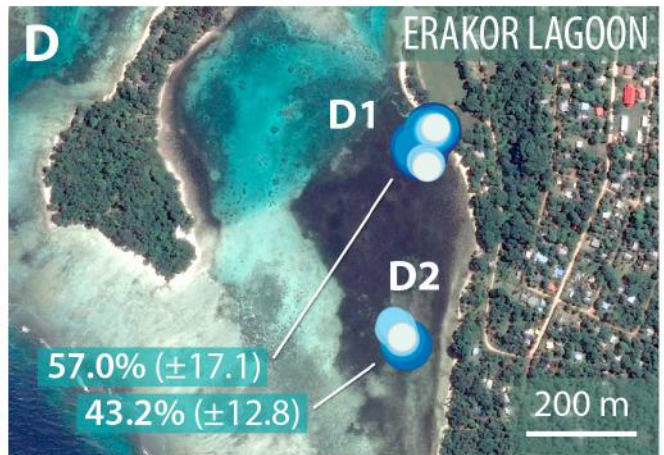
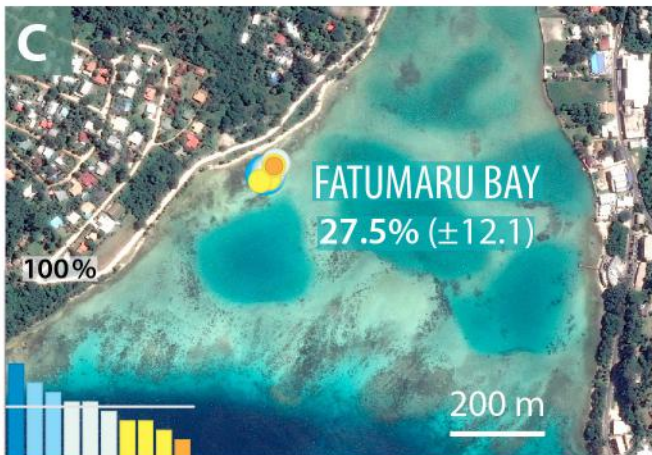
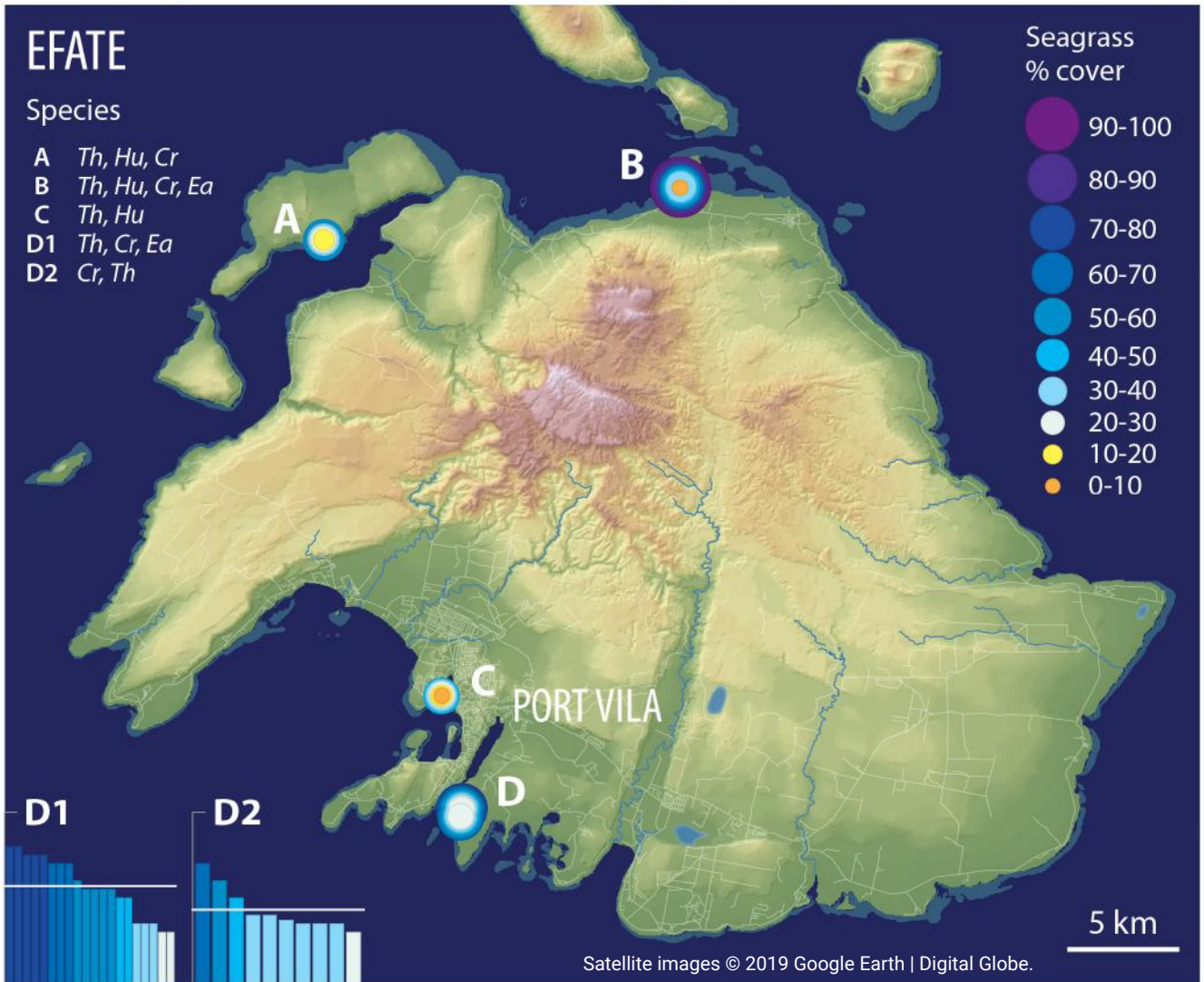
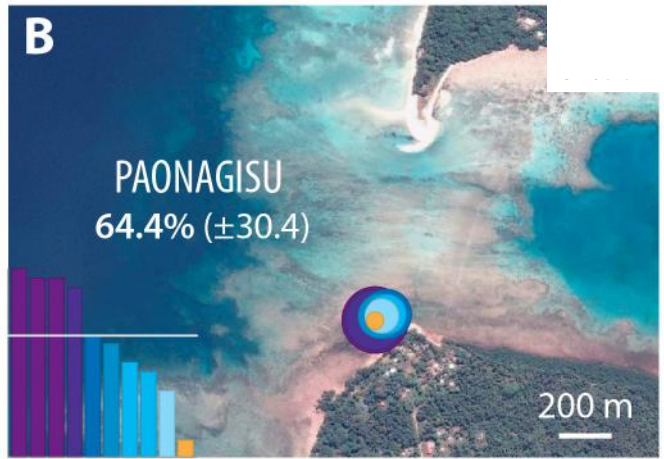
Further research is needed to understand to what extent these differences are influenced by environmental factors such as nutrient load in the water or sediment type. From the 2017 samples we calculated the average carbon stocks to be 107 tonnes of carbon per hectare, lower than the current global average (140 tonnes per hectare). This may be due to the fact that in Efate the seagrass generally grows on a shallow layer of sediment (less than 50 cm deep) over a base of rock and coral, which limits the storage of carbon below-ground.

The proportion of organic carbon to total carbon was 1.68%, only slightly lower than the global average. To our knowledge these are the first measurements of carbon stored by seagrass in Vanuatu. While we continue to analyse the 2018 seagrass data, overall they confirm that the type of sediment, the morphology of the coast, and the relative distance to the island's urban areas, has an effect on the seagrass and its capacity for carbon storage.

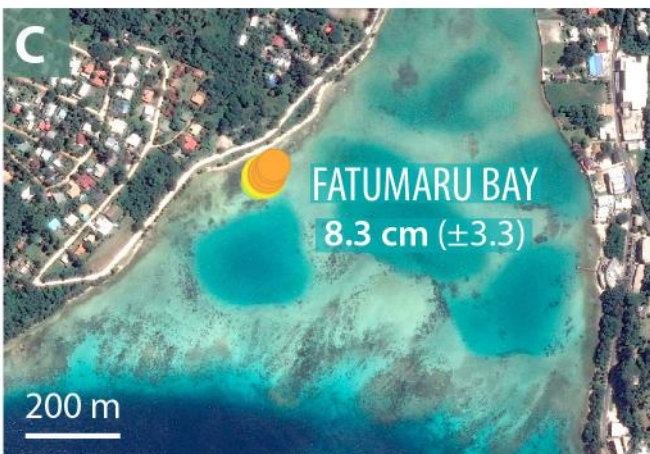
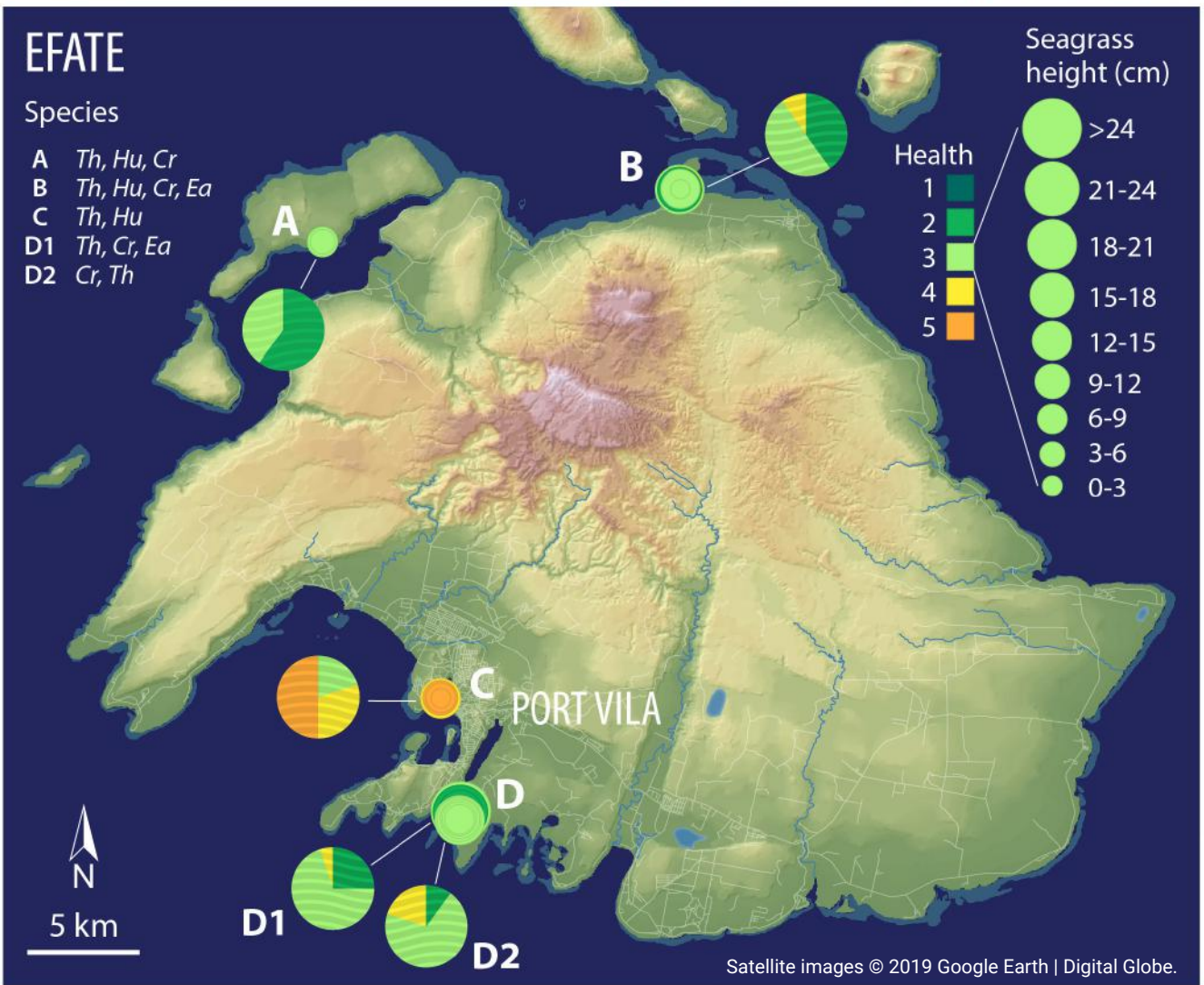
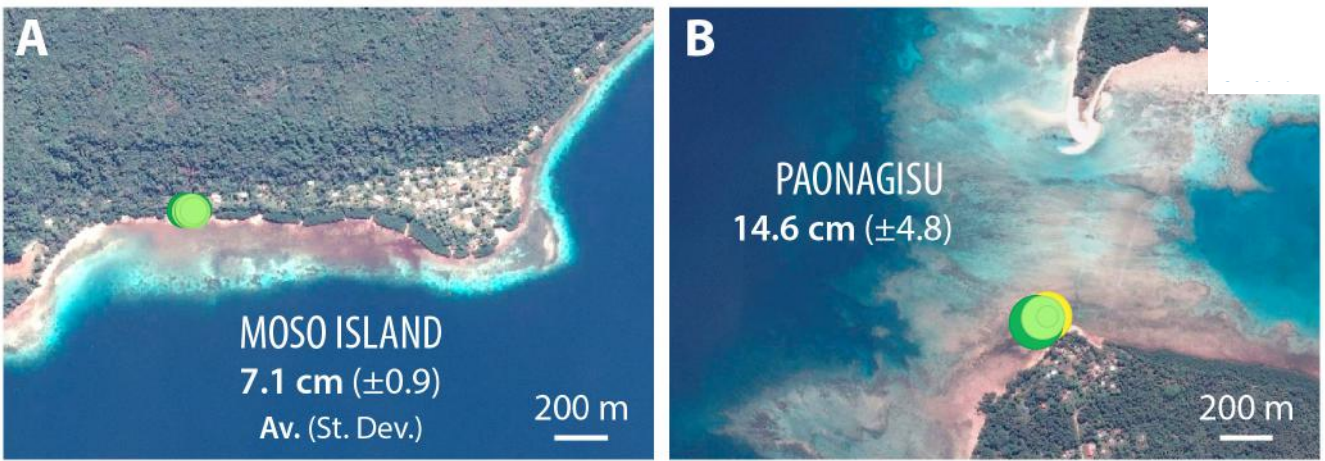


Cefas scientists and collaborators carrying out quadrat observations of intertidal seagrass in Efate, Vanuatu.

% COVER AND SPECIES (2017)

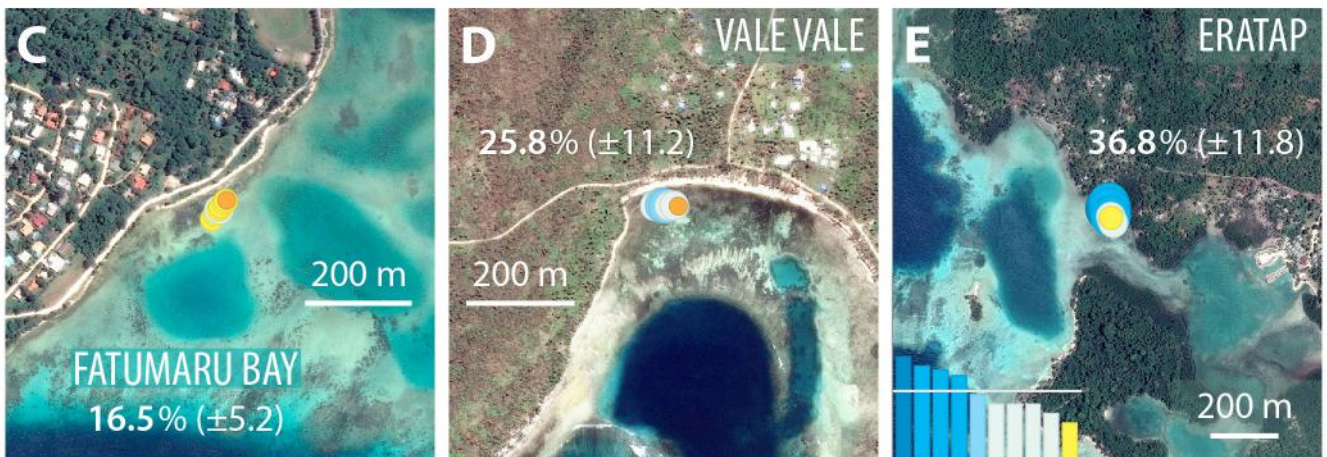
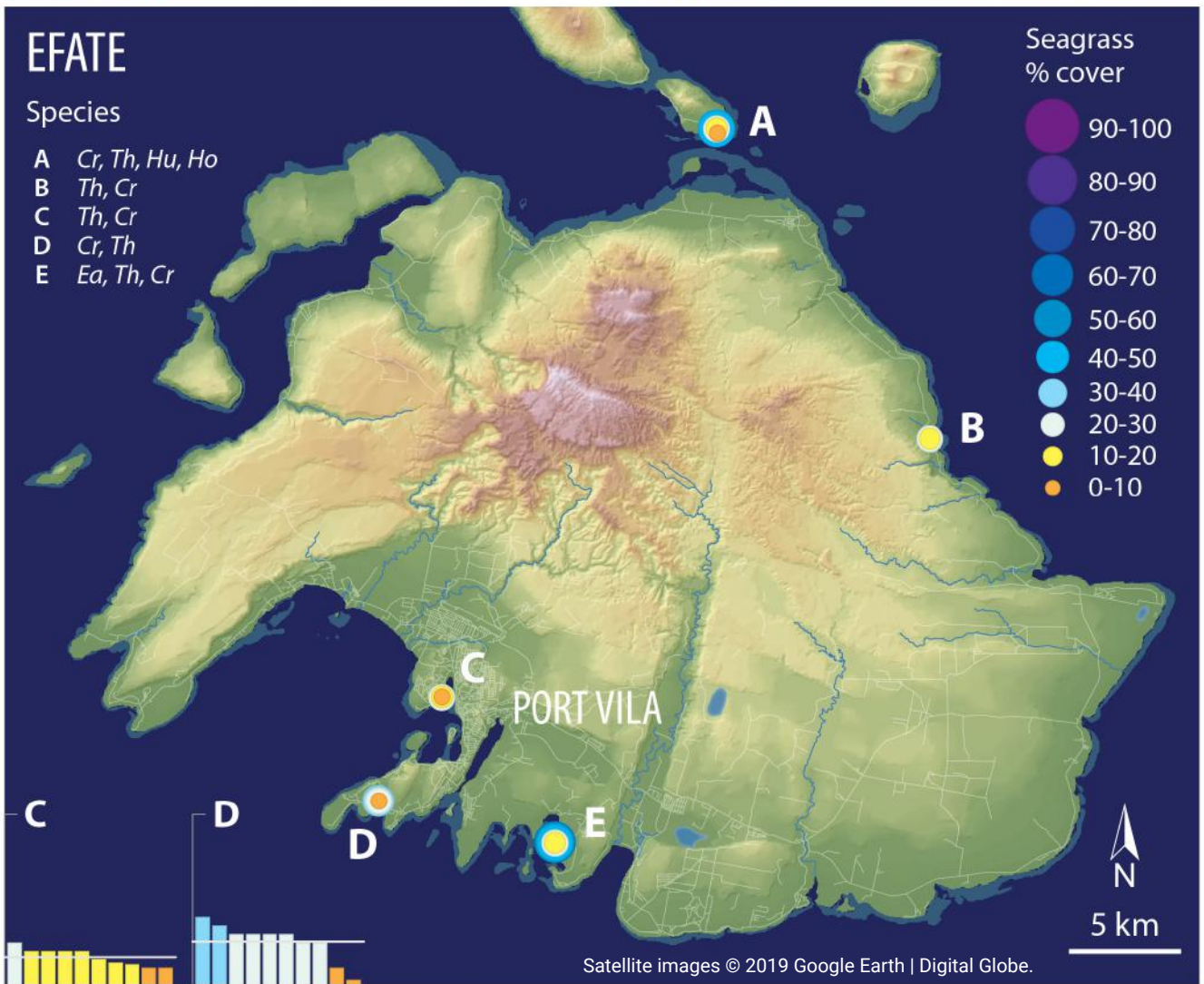
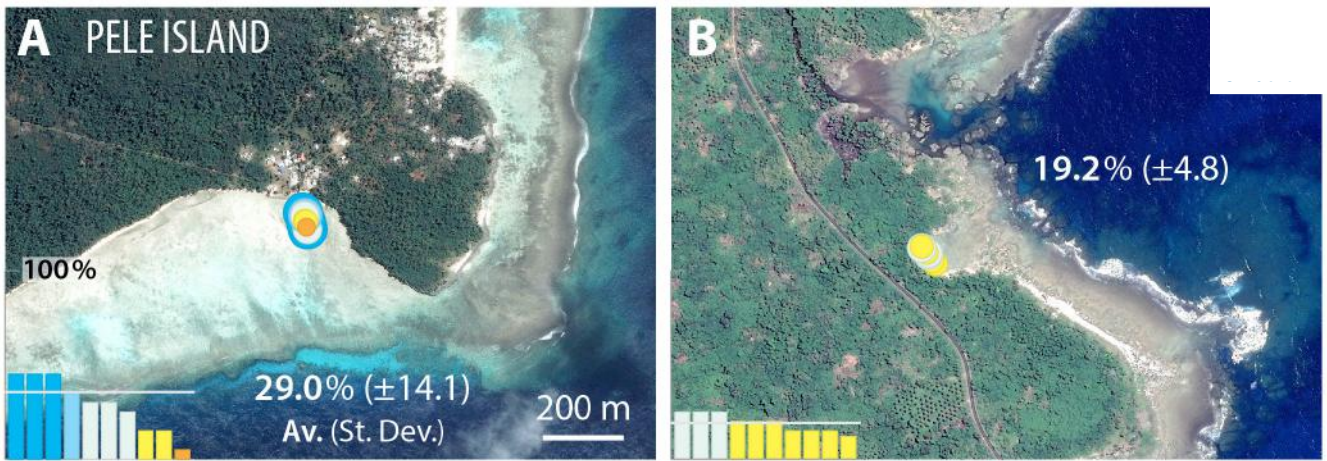


Seagrass cover (%) and species composition in intertidal locations in Efate, Vanuatu during the 2017 surveys. Seagrass species ID key: **Th** – *Thalassia hemprichii*; **Cr** – *Cymodocea rotundata*; **Ea** – *Enhalus acoroides*; **Hu** – *Halodule uninervis*; **Ho** – *Halophila ovalis*.

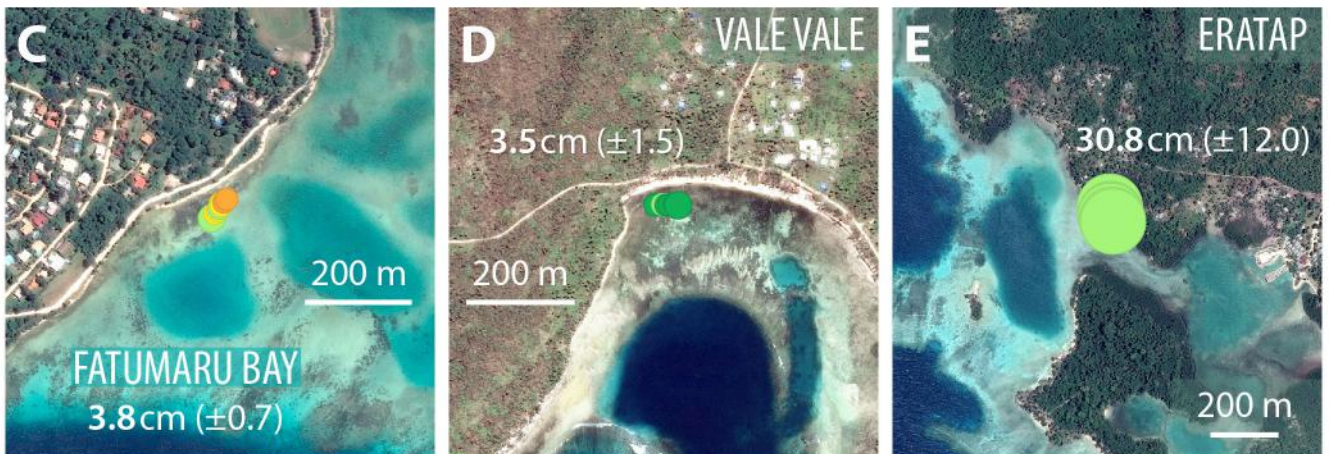
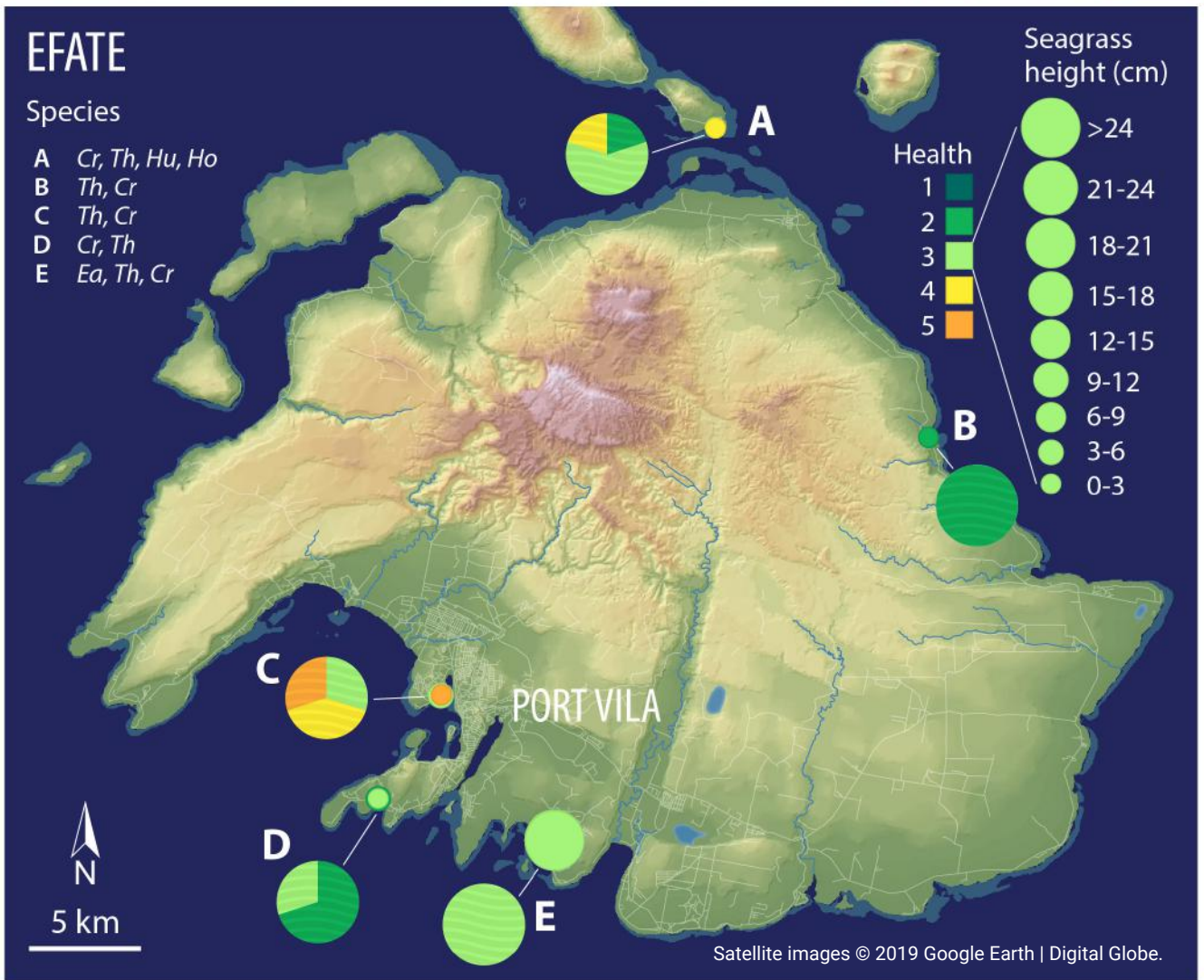
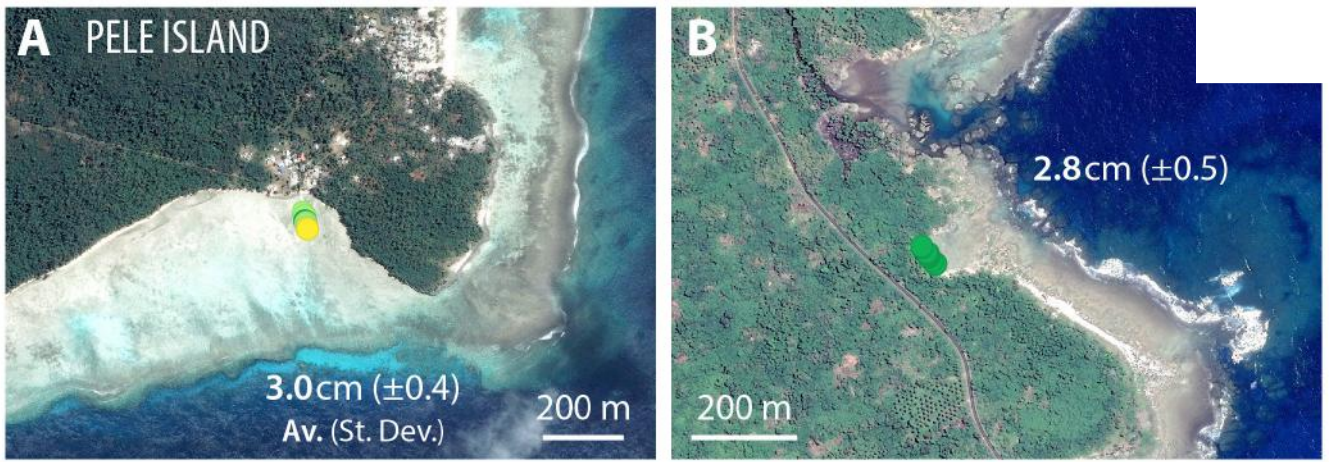


Seagrass plant height (cm), health and species composition in intertidal locations in Efate, Vanuatu during the 2017 surveys. Seagrass species ID key: **Th** – *Thalassia hemprichii*; **Cr** – *Cymodocea rotundata*; **Ea** – *Enhalus acoroides*; **Hu** – *Halodule uninervis*; **Ho** – *Halophila ovalis*.

% COVER AND SPECIES (2018)



Seagrass cover (%) and species composition in intertidal locations in Efate, Vanuatu during August 2018. Seagrass species ID key: Th – *Thalassia hemprichii*; Cr – *Cymodocea rotundata*; Ea – *Enhalus acoroides*; Hu – *Halodule uninervis*; Ho – *Halophila ovalis*.



Seagrass plant height (cm), health and species composition in intertidal locations in Efate, Vanuatu during August 2018. Seagrass species ID key: **Th** – *Thalassia hemprichii*; **Cr** – *Cymodocea rotundata*; **Ea** – *Enhalus acoroides*; **Hu** – *Halodule uninervis*; **Ho** – *Halophila ovalis*.

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Conclusions

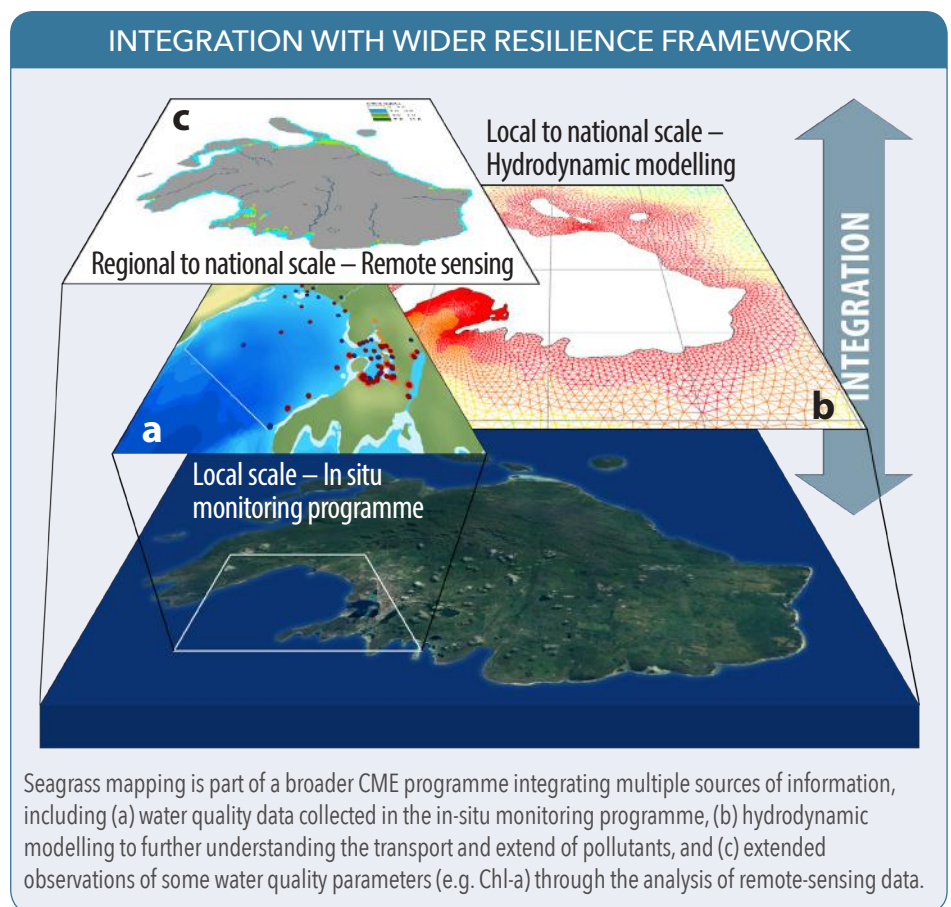
The Commonwealth Marine Economies (CME) Programme in the Pacific has worked across several Pacific countries, with Cefas contributing or leading work in Vanuatu, Solomon Islands, Fiji and Kiribati.

The CME Programme supports small island developing states by building the capacity of the islands to manage their marine resources and develop their national maritime economies. It is also helping to address climate change, including the UN Sustainable Development Goal 14 (to conserve and sustainably use the oceans, seas and marine resources for sustainable development).

The CME Programme in Vanuatu focused on the collection of water quality, human health, seagrass and blue carbon data to inform an ongoing risk assessment and identify key issues facing Vanuatu's communities and marine ecosystems. The full work package in Vanuatu includes assessments of coastal water quality, human health, seagrass habitat mapping and carbon measurements with the aim of providing a holistic assessment of environmental quality for Vanuatu.

Data collected from 2016 to 2018 offer an insight into the status of the marine environment and will be used in mapping the resilience of the marine ecosystems to climate change and coastal pollution. The combination of coastal water quality assessments, climate reporting and

modelling provides key information to policy makers on how cumulative pressures of a changing climate, and coastal water quality issues, can impact the valuable marine services in Pacific, whilst information on carbon storage and seagrass habitats can help mitigate these impacts.



Produced by the **Centre for Environment, Fisheries and Aquaculture Science (Cefas)** funded under the **Commonwealth Marine Economies (CME) Programme**¹

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All photos by the Cefas team except where indicated otherwise.

¹<https://www.gov.uk/guidance/commonwealth-marine-economies-programme>

For more information about the CME Programme contact: CME.ProgrammeEnquiries@fco.gov.uk / @CME_Prog