
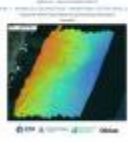
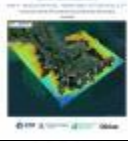
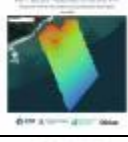
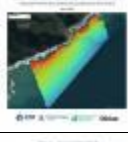
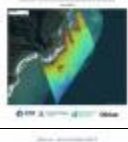
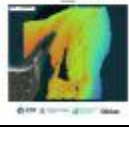


Kaikoura 2016 earthquake

Following the Kaikoura 2016 earthquake LINZ (in partnership with Fisheries New Zealand) commissioned a multibeam hydrographic survey from Cape Campbell to Kaikoura coastline. LINZ updated local charts to keep navigation safe in the area. Scientists still use the data from the survey to understand the impacts of earthquakes on marine ecosystems. This data provides a baseline to gauge the consequences of the earthquake and subsequent recovery of marine resources.

Portfolios of each scientific survey region visualising different data layers like bathymetry, backscatter, slope, aspect, rugosity, benthic terrain classification, seafloor classification and more:

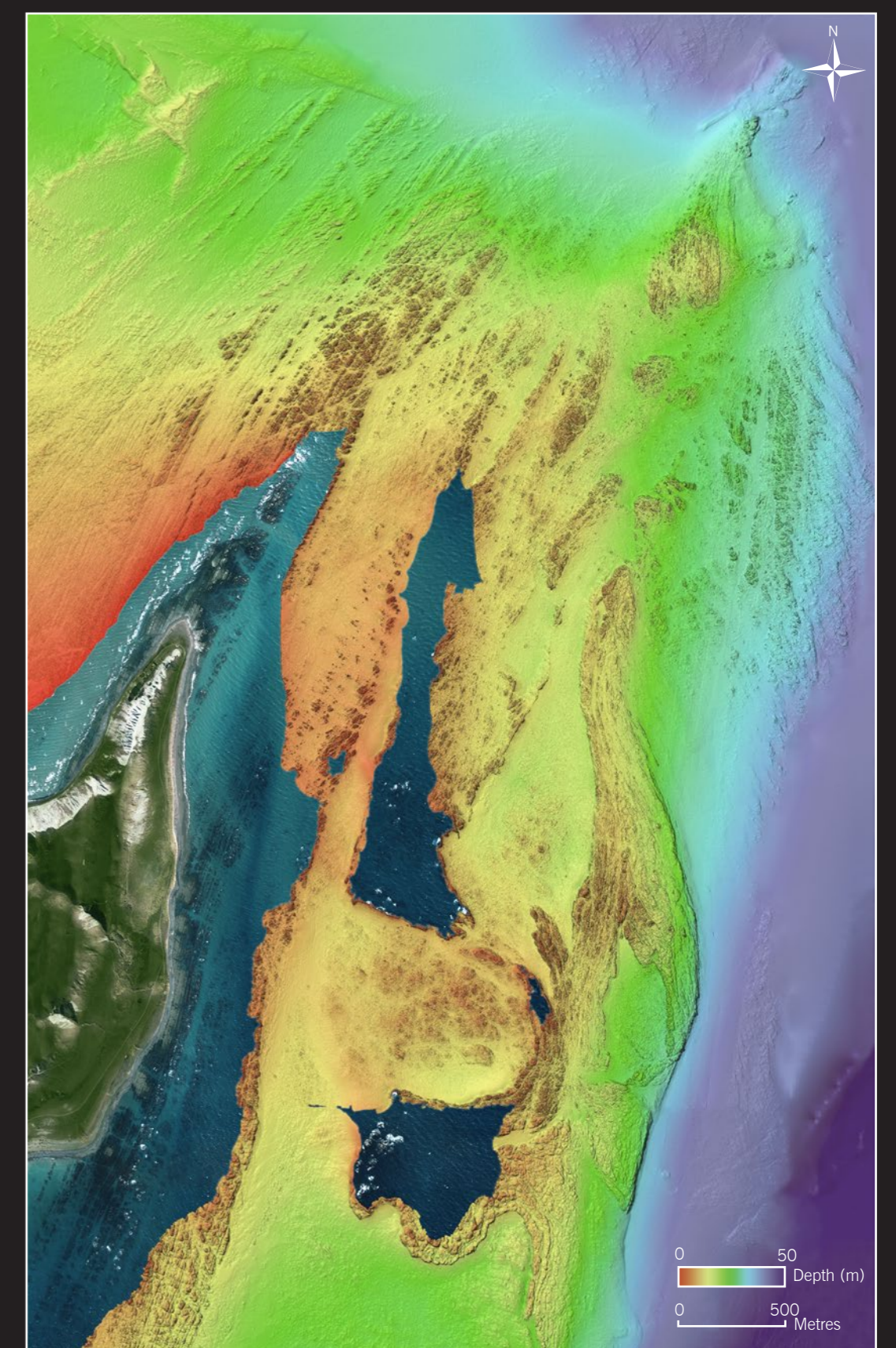
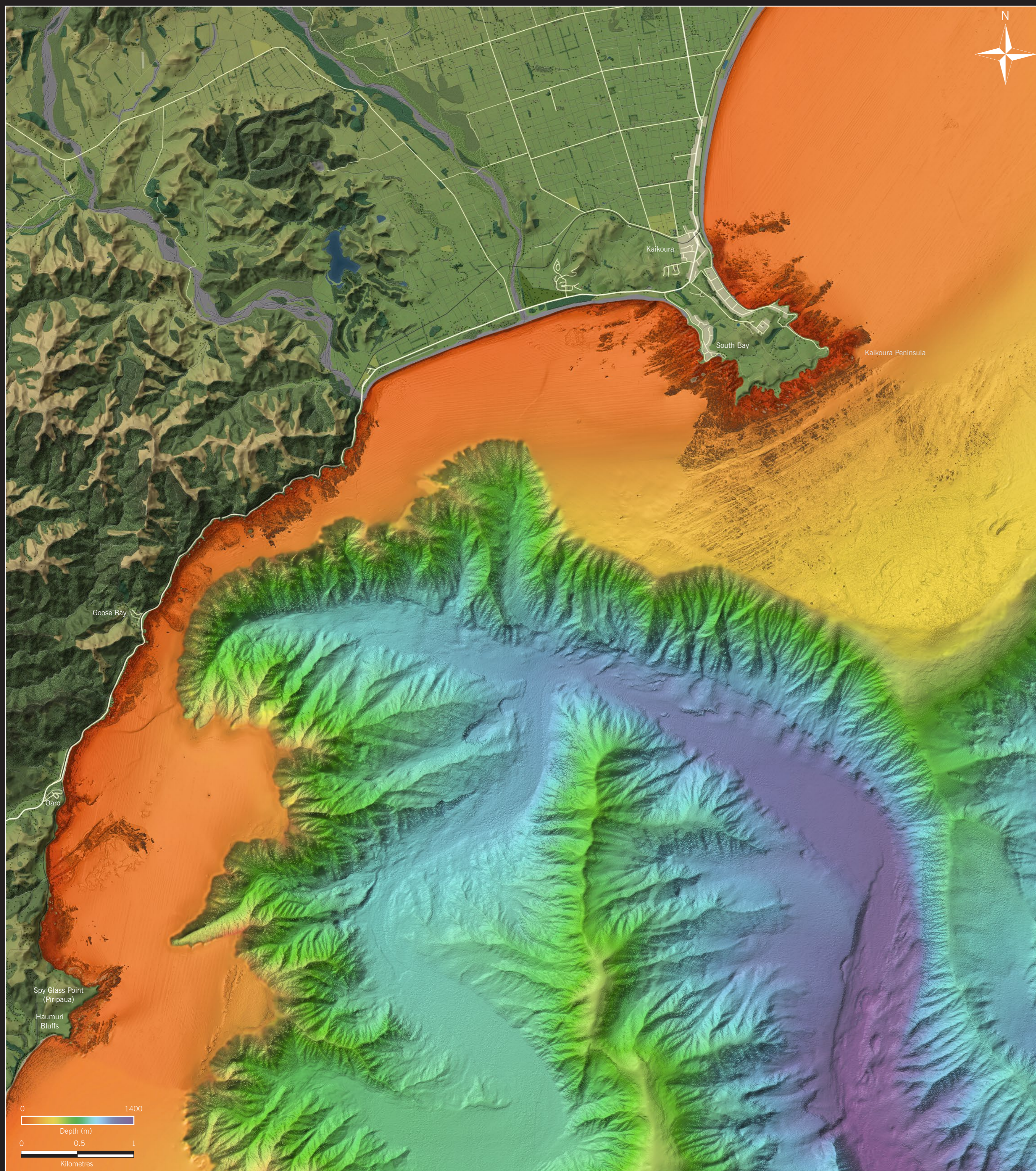
<ul style="list-style-type: none">• Haumuri Bluffs to Oaro	
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<ul style="list-style-type: none">• Kaikoura Peninsula	
<ul style="list-style-type: none">• Rakautara	
<ul style="list-style-type: none">• Ohau Point	
<ul style="list-style-type: none">• Waipapa Bay	
<ul style="list-style-type: none">• Cape Campbell	

To get copies of the portfolios contact hydro@linz.govt.nz.

Posters created for a public event in Kaikoura to showcase collected data:

Beneath the waves

Kaikoura–Cape Campbell



Cape Campbell

Here we see in unprecedented detail the nearshore rocky reefs and platforms rising above the flat seafloor around Cape Campbell, an area with high biodiversity and biological productivity. Many earthquakes over time have uplifted, faulted and folded the rocks resulting in the complex patterns we see today. The larger map to the left also shows rocky reefs around the Kaikoura coastline. As well, sediment erosion, transport and deposition within the offshore canyons is evident. Seven key areas were mapped specifically to identify the distribution and extent of rocky reefs. Shallow boulders and gravel, and undisturbed deeper, soft muddy substrates were also revealed.

Overview

Following the Kaikoura 2016 earthquake Land Information New Zealand (LINZ) commissioned a multi-beam hydrographic survey of the Cape Campbell to Kaikoura coastline, in partnership with Fisheries New Zealand. Mapping the seafloor from Kaikoura to Cape Campbell comprised over 140 days on the water. Multibeam echosounders were used to reveal the shape and depth of the seafloor. The echosounders produce a fan-shaped array of acoustic beams that reflect off the seafloor, enabling the surveyors to precisely map the seascape in detail. This survey has gathered more than 18 billion depth-data points over 400 km². Knowledge of the seafloor provides valuable information about the physical benthic habitats aiding evidence-based, sustainable management of this iconic seafloor.



Variable Uplift

Some areas were largely unaffected by the earthquake whilst other areas were uplifted by up to 6m. Sometimes this variation occurred over short distances across a bay. Perhaps unsurprisingly, the shallowest areas were most affected by the death of intertidal organisms as a consequence of the elevation changes and recovery may take a long time.



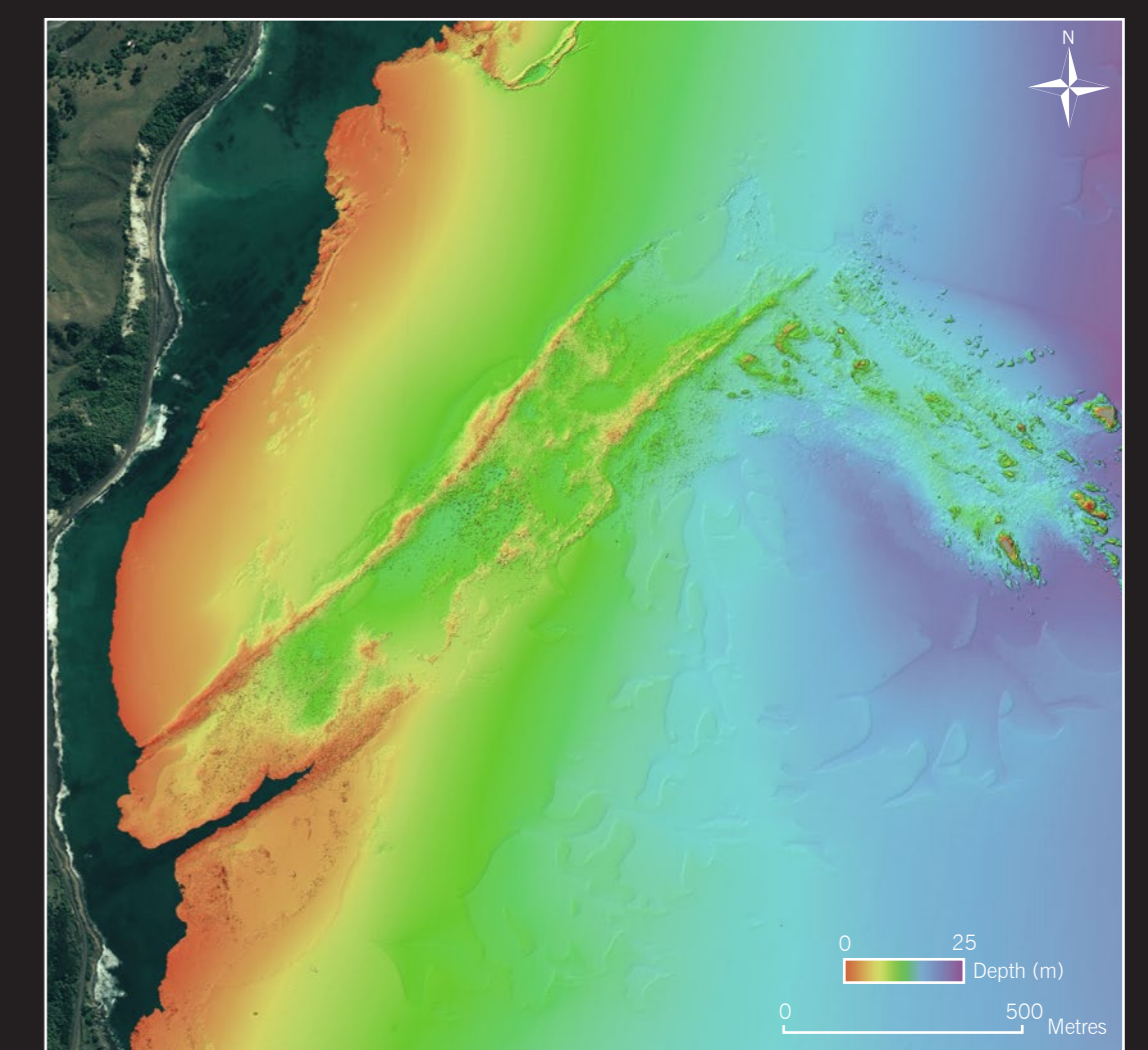
Biological Impact

Rocky reefs provide complex habitats that support dense macroalgal stands that are ideal habitats for paua, crayfish, butterflyfish and a diversity of sponges and other encrusting invertebrates. In the most affected areas there were large scale die-offs of a range of algae and invertebrates including bull kelp and paua, and subsequent blooms of green algae.



Baseline Monitoring

Paua take several years to reach maturity, and require suitable habitat through their lifecycle. In particular, during early development juveniles need suitable algae to feed upon, and in some places today these are absent. For the time being, shellfish and kelp fisheries (excluding rock lobster and scampi) are closed. Research is ongoing across a range of habitats and species important to the Kaikoura community, from whales to rocky reef communities. These results will help us understand recovery and establish baselines in order to inform future management.



Rocky Reefs

The consequences of earthquakes on marine ecosystems are not well understood. This survey data will serve as a baseline to gauge impact and subsequent recovery from the 2016 earthquake, as well as underpin ongoing monitoring and management of marine resources. The newly acquired multibeam bathymetry maps allow for the identification and description of rocky reef habitats, areas essential for ecosystem recovery. These reefs extend out from the shoreline and are highly complex. Their rugged hard substrates are often surrounded by patchy boulder and gravel aprons, which are overlain by rippled sands or fine muddy sediments.

Bibliographic Reference

Neil H.L., Mackay K., Mackay E.J., Kane T., Wilcox S., Smith R. 2018. Beneath the waves: Kaikoura–Cape Campbell. NIWA Chart, Miscellaneous Series 108. Published by the National Institute of Water and Atmospheric Research Ltd.

For more information visit www.niwa.co.nz



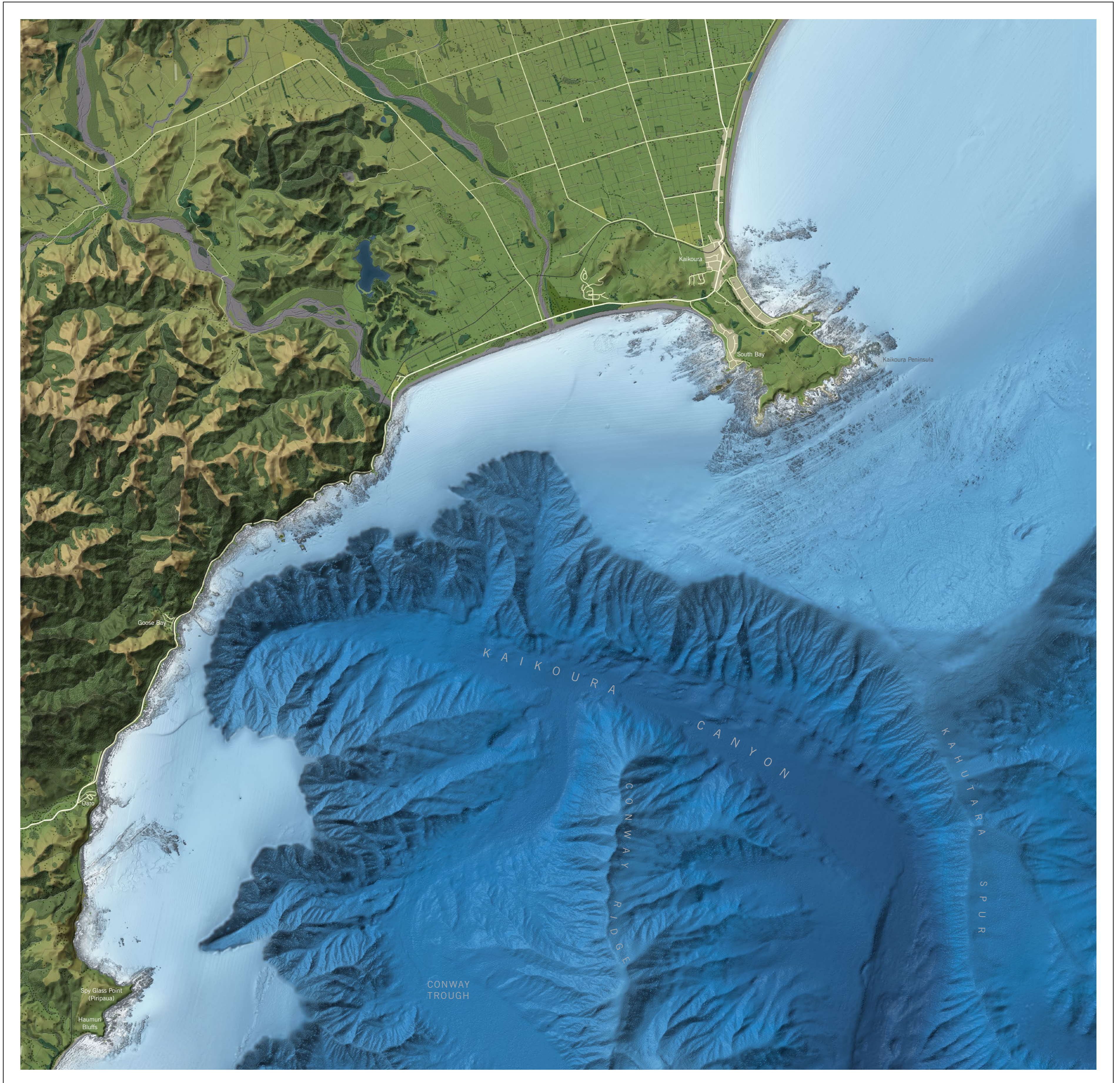
Acknowledgments

Seabed representation derived from a comprehensive seabed survey of the Kaikoura to Cape Campbell coastline during 2017 and 2018, with Land Information New Zealand (LINZ) partnering with Fisheries New Zealand. Survey requirements were met by an iXblue and Discovery Marine Limited (DML) partnership, with National Institute for Water and Atmospheric Research Limited (NIWA) providing scientific input. Additional bathymetry sourced from NIWA. Onland representation by Geographx. Aerial imagery © DigitalGlobe, Inc. All Rights Reserved.

Photo credits: Baseline Monitoring (Robyn Dunmore of Cawthron Institute). Variable Uplift and Biological Impact (Marine Ecology Research Group, University of Canterbury).



KAIKOURA



Bibliographic Reference

Neil H.L., Mackay K., Mackay E.J., Kane T., Wilcox S., Smith R. 2018. Kaikoura. NIWA Chart, Miscellaneous Series 107. Published by the National Institute of Water and Atmospheric Research Ltd. Seabed representation derived from a comprehensive seabed survey of the Kaikoura to Cape Campbell coastline during 2017 and 2018, with Land Information New Zealand (LINZ) partnering with Fisheries New Zealand. Survey requirements were met by an iXblue and Discovery Marine Limited (DML) partnership, with National Institute for Water and Atmospheric Research Limited (NIWA) providing scientific input. Additional bathymetry sourced from NIWA. Onland representation by Geographix. For more information visit www.niwa.co.nz

The variability and complexity of the Kaikoura seafloor is revealed in this map. Sediment erosion, transport and deposition within the offshore canyons is evident. However, here we also see in unprecedented detail the nearshore rocky reefs and platforms. Seven key areas were mapped specifically to identify the distribution and extent of rocky reef habitats. As a result of the Kaikoura 2016 earthquake the seabed rose up to 6 metres along the Kaikoura and Marlborough coasts, posing a hazard to safe navigation and impacting the marine environment. Mapping the seafloor from Kaikoura to Cape Campbell comprised over 140 days on the water. Multibeam echosounders were used to produce a fan-shaped array of acoustic beams

that reflect off the seafloor, enabling the surveyors to precisely calculate the depth of the seafloor, and map the seascape in detail. This survey has gathered more than 18 billion depth-data points over 400 km². LINZ will use the information to produce world-class nautical charts, making it safer for the vessels that use these waterways. The survey also provides Fisheries New Zealand, the Department of Conservation and Regional Councils with a data-rich appraisal of the coastal marine area to assist decision makers and the community to better understand, sustainably manage and protect the important coastal ecosystems.

