

Documenting Kelp Forest Ecosystem Shifts in Wellington Harbour

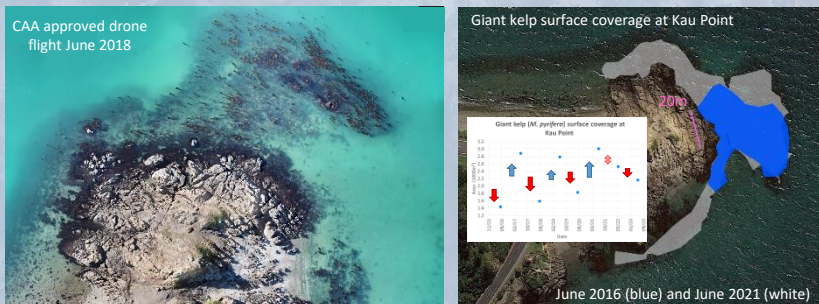
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Kelp forests are a key ecosystem of Te Whanganui-a-tara

Within a narrow stripe around the shore these highly productive underwater forests sustain a high biodiversity and important kai moana species. In the harbour, ecosystems are exposed to a wide range of stressors. **Kina grazing pressure** poses an **immediate threat** to existing kelp forests and is a **barrier to the regeneration** of lost habitats.

Temperature response of giant kelp

Wellington Underwater Club members started **monitoring** kelp forests in 2016 with a focus on **giant kelp** (*Macrocystis pyrifera*) which forms floating canopies and is at its northern limit in the Wellington region.



Summer water temperatures below 19°C (blue arrows) resulted in an increase of surface area covered mid-year, warmer summer water resulted in a decline. Reports with temperature data and monitoring methods are available on adventure360.co.nz/wellingtonharbour.

Kina barren formation

After observing dense kina patches on the edge of *carpophyllum* forests in 2019, divers started to document kina and barren areas at the site.

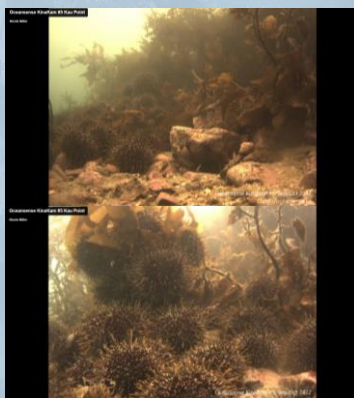
We **counted kina** along transects at 4m & 6m and estimated a population of **13,500** kina. To identify kina hotspots and engage more divers we designed and ran the 10 min kina count.

We **documented the impact of kina grazing** on the kelp forest using the **Oceansense KinaKam** and GPS tracked **monitoring transects**. Between March 2021 and April 2022 kina grazing turned a 5m wide band of kelp forest into rock barren.



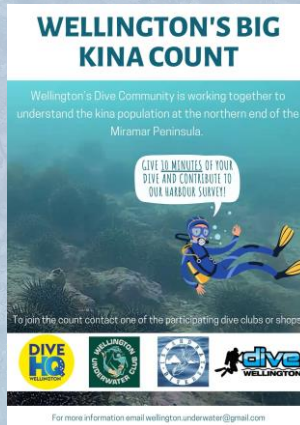
vimeo.com/791511856

Kina grazing time-lapse video created with the Oceansense KinaKam 5 in Sep-Oct 2022



vimeo.com/812665335

Video of the kelp forest loss between March 2021 and April 2022 due to kina grazing

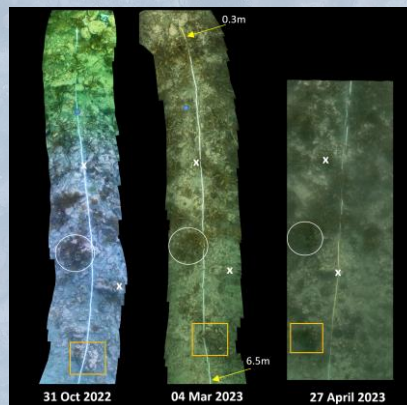


Kina removal & kelp forest regeneration

Volunteers **removed approx. 12,500 kina** between December 2022 and February 2023 from Kau Point as part of the *Ko te kaiwhakahaere o kina o Whanganui-a-Tara* project (read more on kinaowhanganuiatara.nz). Divers have documented the regeneration of the barren areas since.



Time-lapse video of growing *carpophyllum* captured by Oceansense KinaKam 6, 19 Mar to 28 May 2023



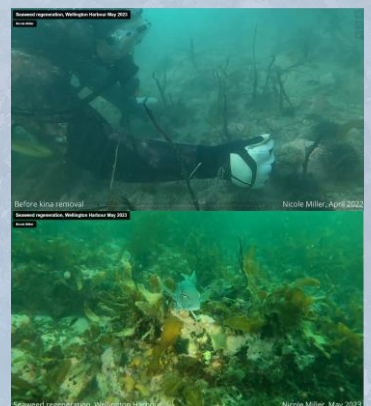
The **diversity of marine life** captured on photos in 10 min intervals by the **Oceansense KinaKam** while monitoring the growth of *carpophyllum* was **surprising** (above). Change in seaweed coverage over time is also visible on **photomosaics** of monitoring transects.

It is difficult to **capture the scale of change** underwater and **engage the public and decision makers**. **Videos** are a particularly effective way to document and **communicate change and its impact**. The video on the right shows how seaweed regrows five months after kina removal.

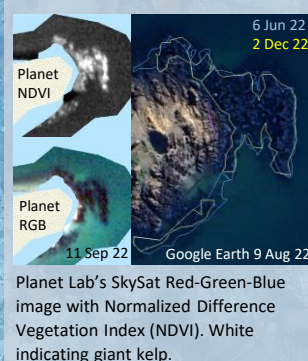


vimeo.com/823689688

Video showing seaweed growth five months after kina removal



Remote sensing – monitoring biodiversity from space



Planet Lab's SkySat Red-Green-Blue image with Normalized Difference Vegetation Index (NDVI). White indicating giant kelp.

High frequency and **high resolution satellite data** is becoming more widely available. Increasingly **sensitive sensors** and **image classification** algorithms could become **powerful tools** for monitoring a wide range of seaweed species and to **report on and verify biodiversity** changes. Once developed, algorithms could be **applied at scale**, retrospectively and **inform future policy and restoration projects**.

If you like to join or support citizen science - get in touch. You can find out more about the discovery of **sponge gardens** and other marine habitats on www.adventure360.co.nz/BlueWellington.