Effects of the Kaikōura earthquake on sperm whales

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Sperm whales off Kaikōura

- The Kaikōura Canyon
  - Very close to shore
  - Exceptional productivity
  - Year-round foraging area for male sperm whales (Pāraoa)

- Sperm whale population
  - Important ecological role as top predators
  - Significant cultural value
  - Key asset for local tourism

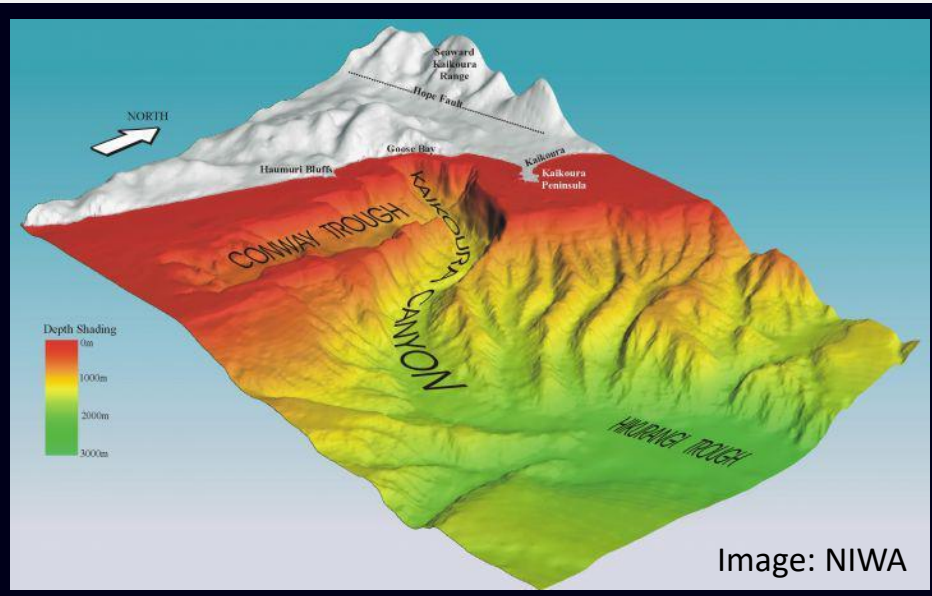
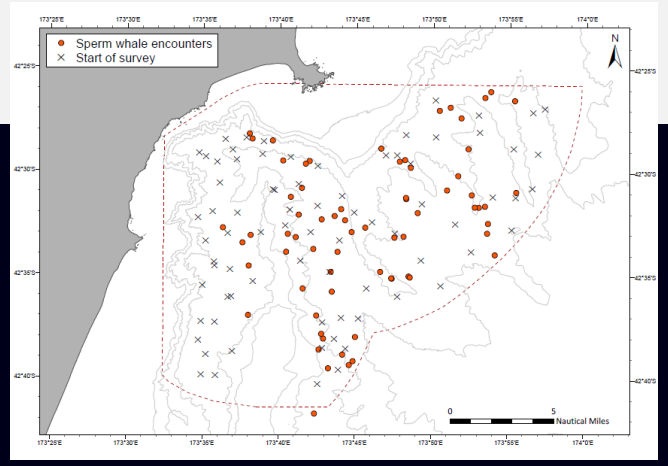
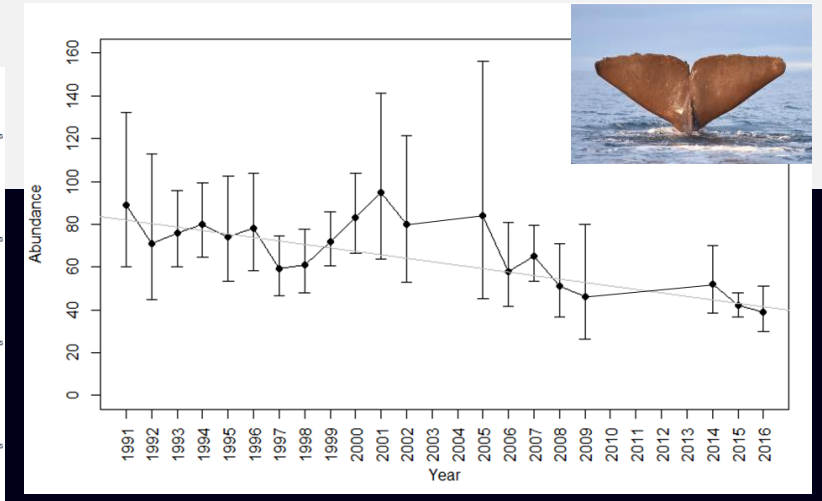


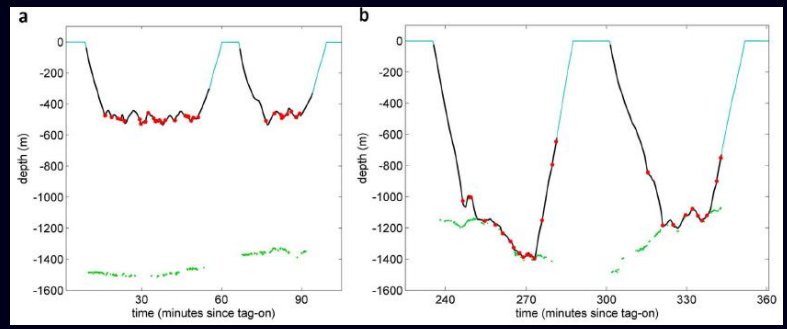
Image: NIWA

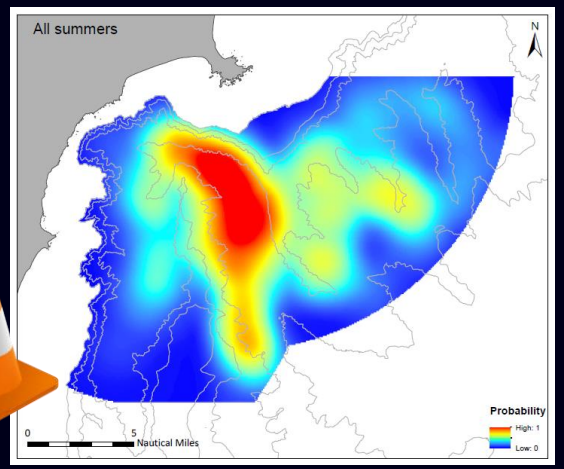
Sperm whale research

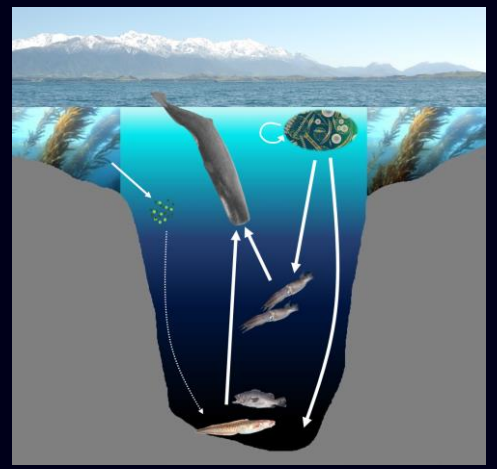
- Research since 1990
  - Abundance
  - Distribution
  - Behaviour
  - Effects of whale watching
  - Size estimation …
- Since 2014
  - Abundance
  - Habitat preferences
  - Food web
- November 2016 – Kaikōura Earthquake
  - Effect on sperm whales?









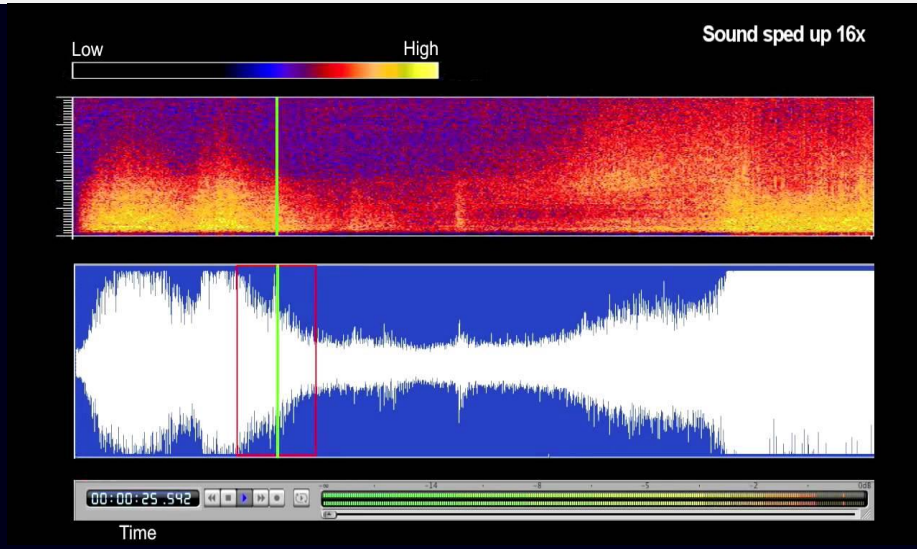


Potential effects of the earthquake on sperm whales

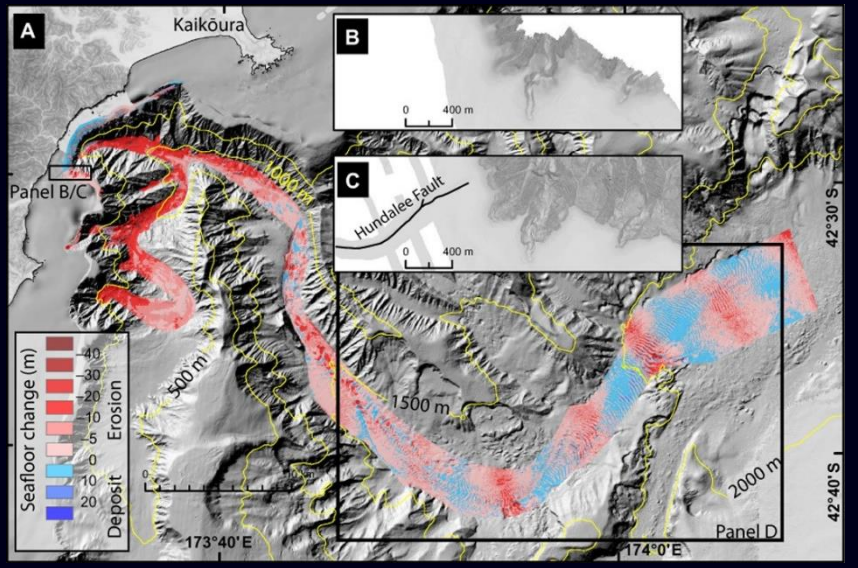
- Unknown effects of earthquakes on cetaceans

- Earthquake noise
  - Sperm whales very sensitive to noise
  - Potential masking
  - Displacement

- Habitat changes
  - “Canyon-flushing”
  - Removal/smothering of seafloor fauna



Earthquake noise (Japan, 2008) © OSU, NOAA



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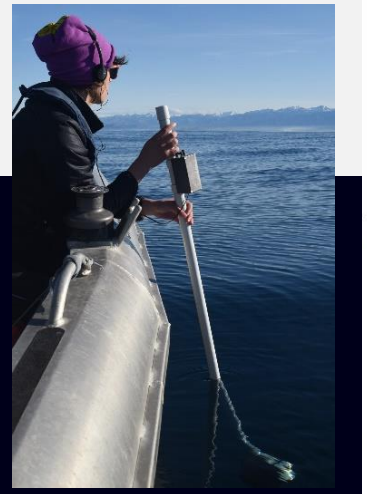
Potential effects on abundance, distribution, foraging behaviour, diet

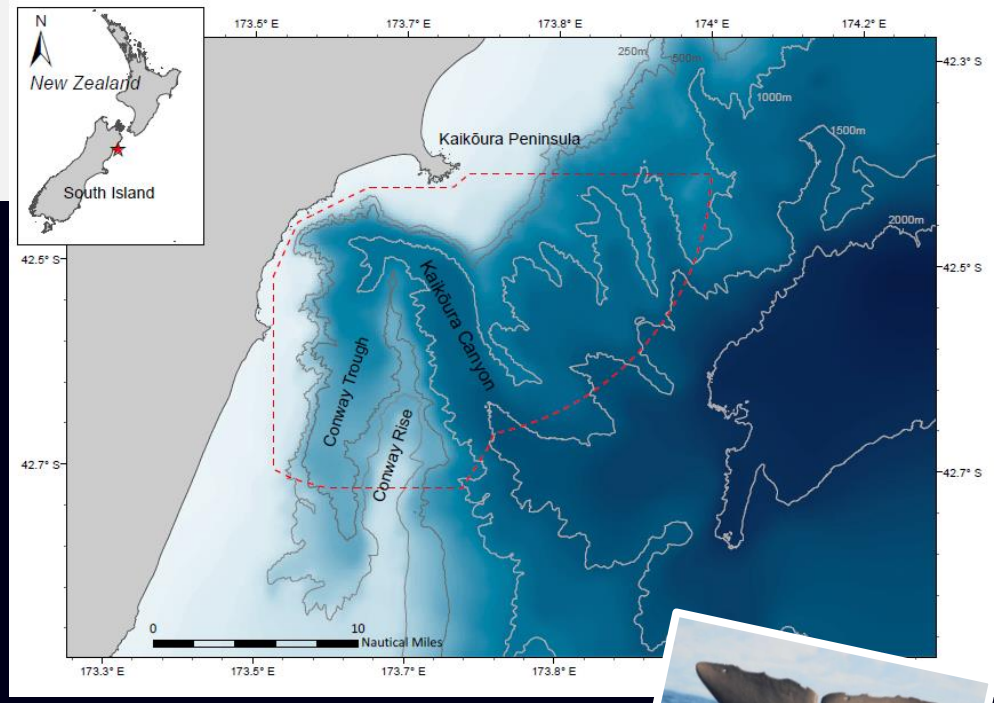
Research study

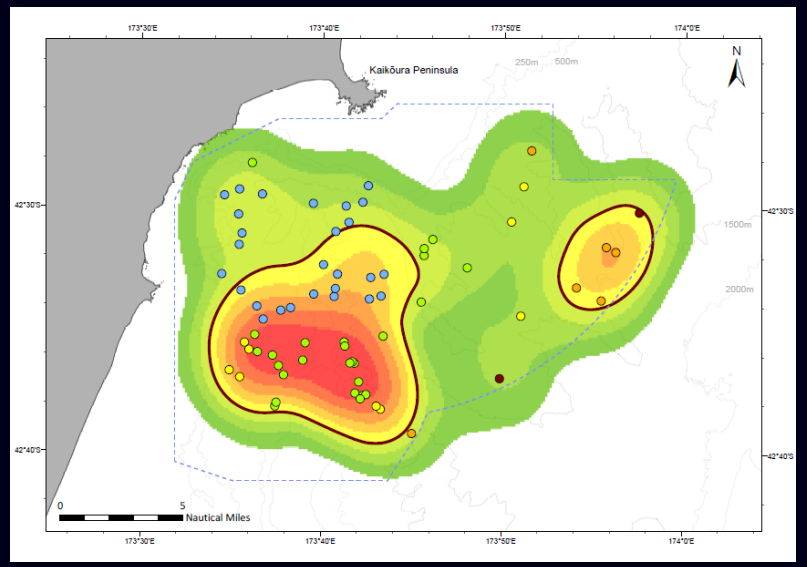
- Boat-based surveys

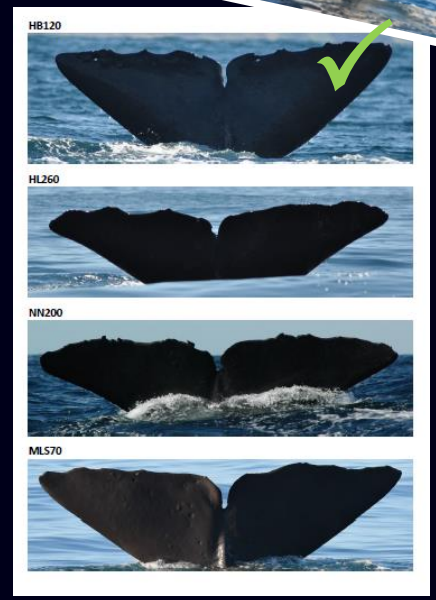
- Monitoring changes in <u>abundance</u>:
  - Photo-ID (1990 – 2017)
  - Population models

- Monitoring changes in <u>distribution:</u>
  - Whale locations (2014 – 2017)
  - Density maps of core areas



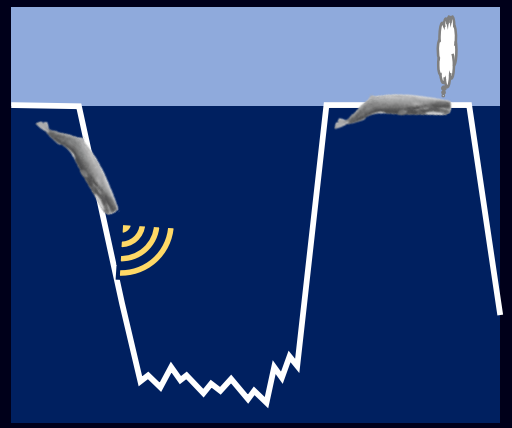


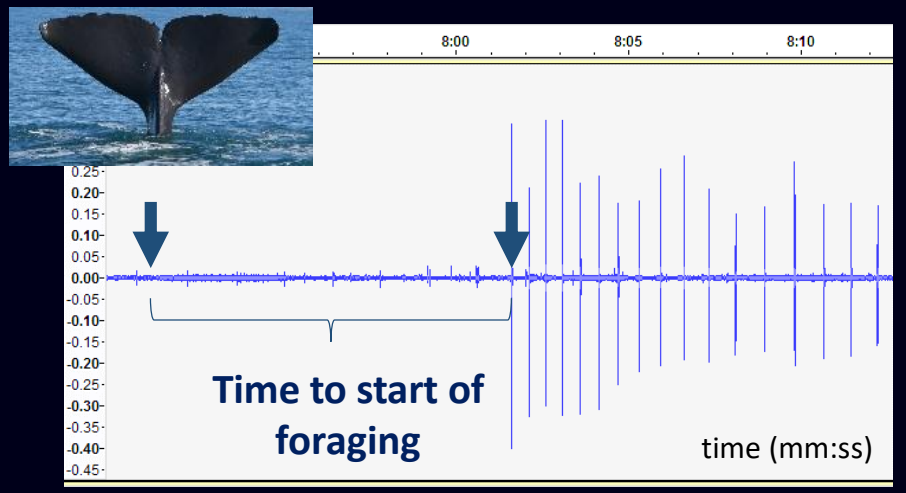




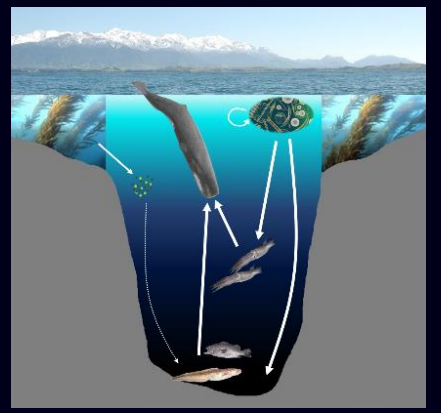
Research study

- Monitoring changes in <u>behaviour</u>:
  - Resting behaviour between dives
  - Foraging behaviour (acoustic recordings)



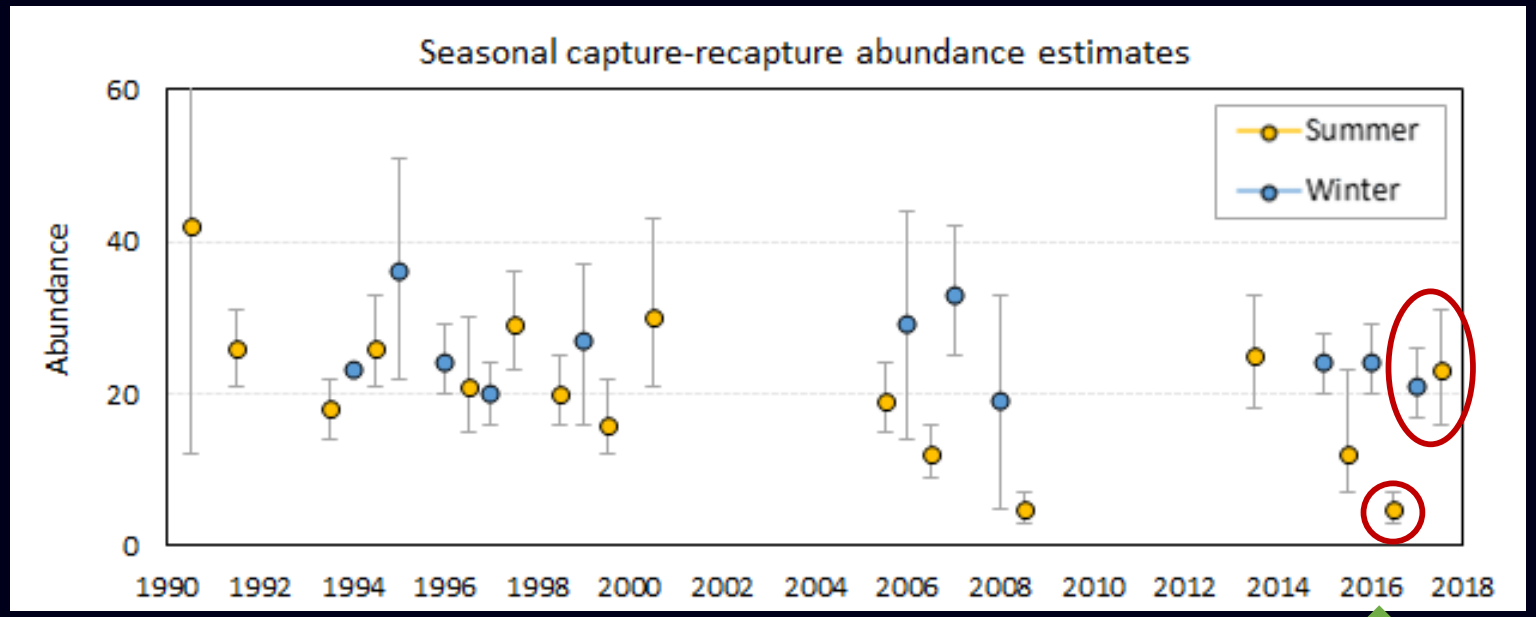


- Monitoring changes in the whales' <u>food web</u>:
  - Analysis of sperm whale skin
  - Stable isotope analysis: "you are what you eat"



Results – sperm whale abundance

- Summer 2016/17
  - Presence confirmed 6 days after the earthquake (WWK)
  - Dec/Jan – very low abundance
- Winter 2017 & Summer 2017/18
  - Similar abundance to pre-earthquake years



Low abundance after earthquake, but only temporarily

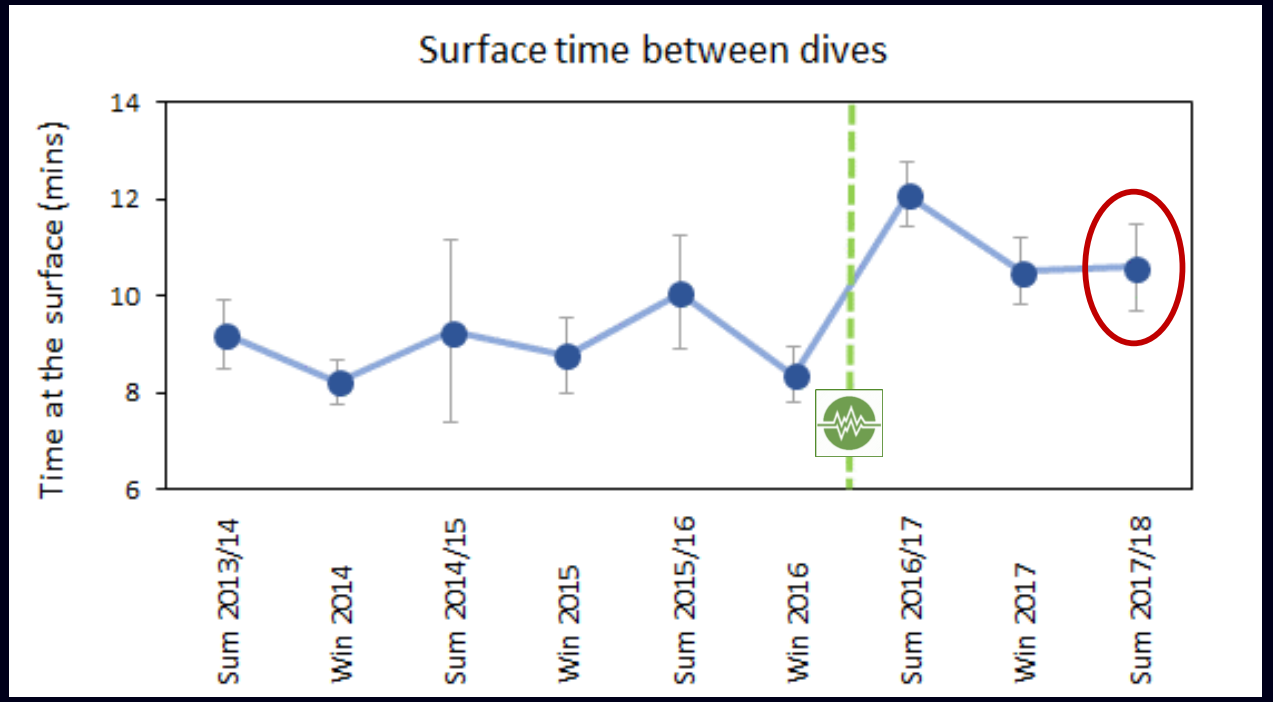
Results – sperm whale behaviour

- Summer 2016/17 and winter 2017
  - Long surface intervals (↑ 25%)

Increased search effort required to locate food resources?

- Summer 2017/18
  - Behaviour similar to pre-earthquake

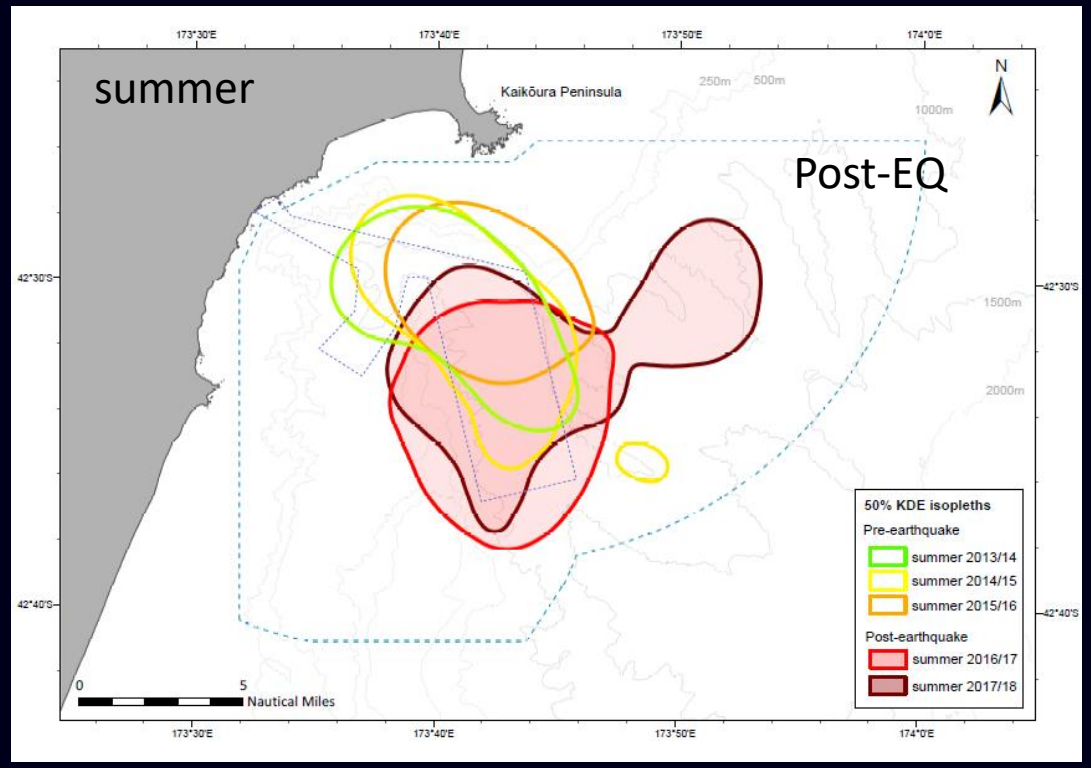
Recovery of foraging efficiency after one year

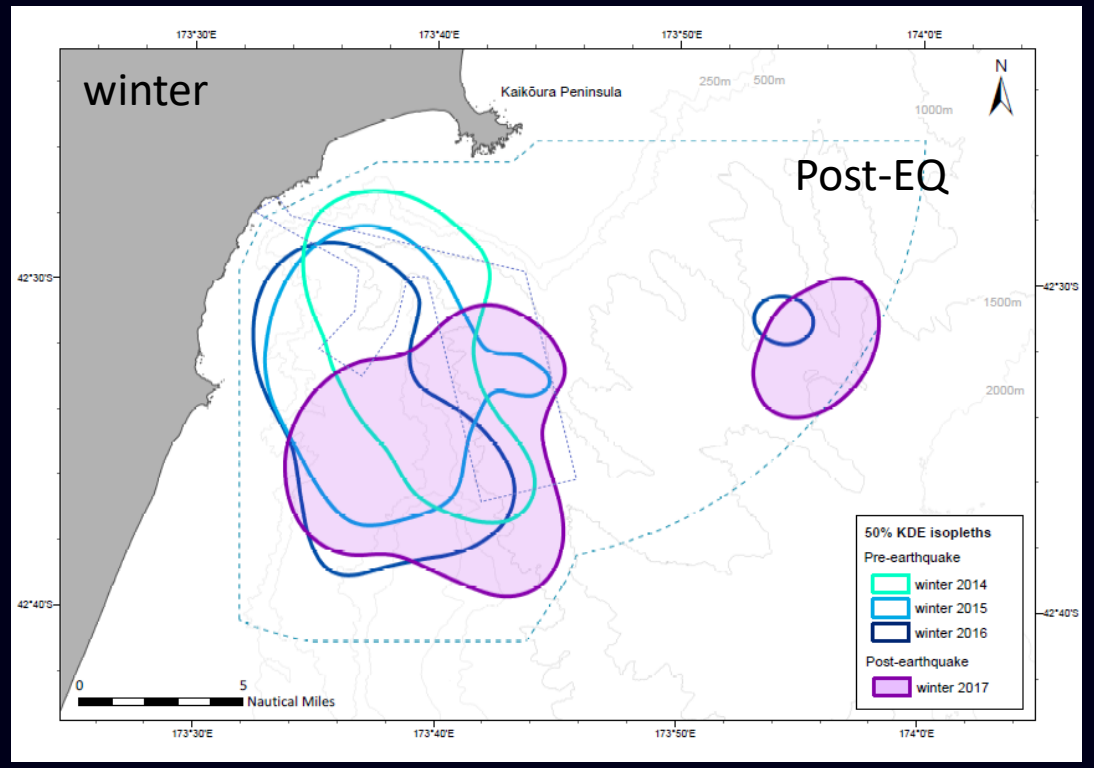


Results – sperm whale distribution

- Changes after the earthquake:

Changes in habitat use after the earthquake, likely related to canyon-flushing





Results – sperm whale food web

- No significant changes in any stable isotope biomarkers

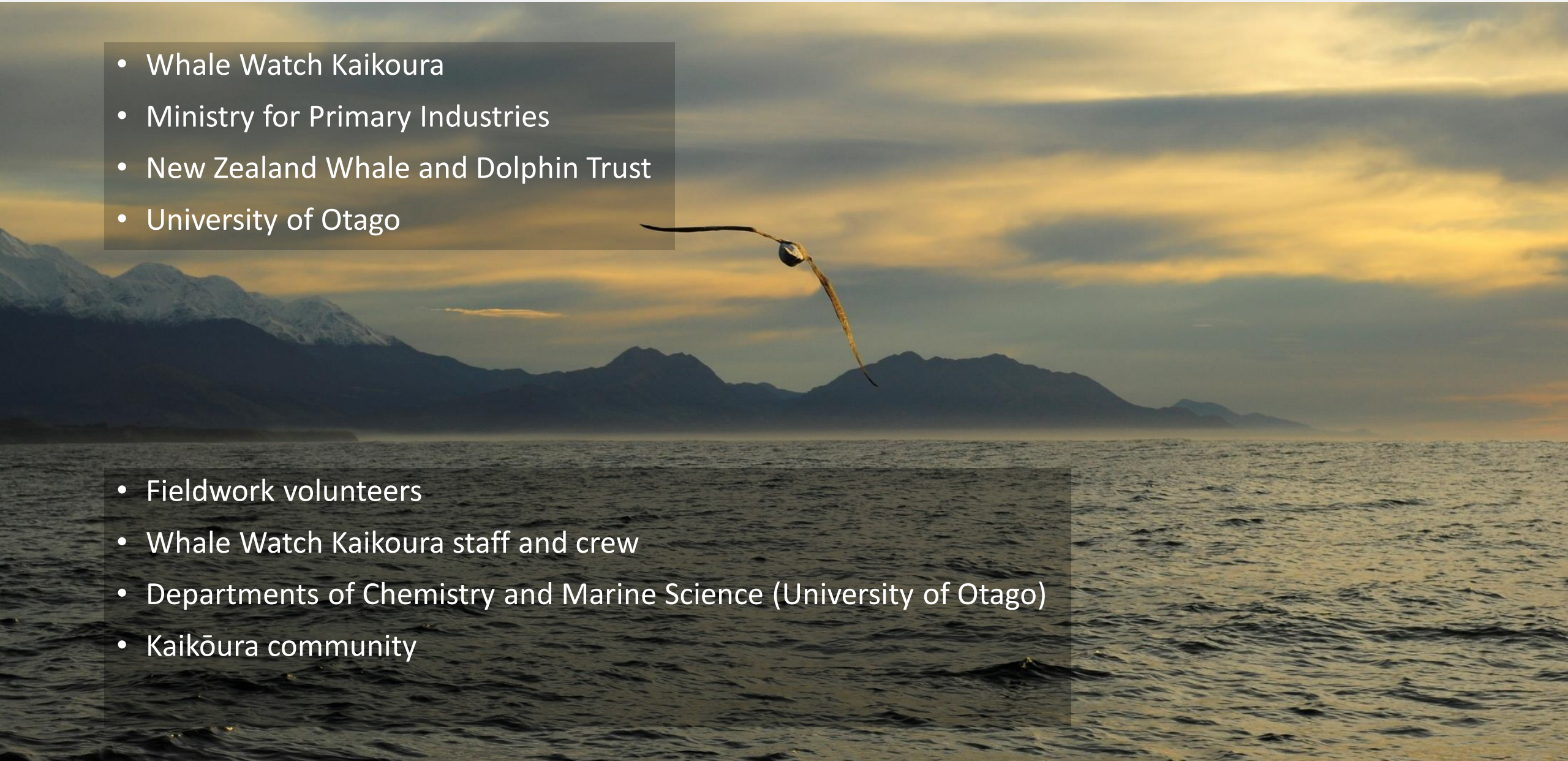
No evidence for a change in diet after the earthquake

Conclusions – effect of the earthquake on sperm whales

- No displacement of population away from Kaikōura
- Some changes in behaviour and spatial distribution: shifts in habitat use
- Influence of canyon-flushing event on habitat and distribution of food resources

- Capacity for adaptation vs vulnerability to impacts
- Precautionary management of anthropogenic activities
- Further research necessary to assess longer-term impacts

Acknowledgements



- Whale Watch Kaikoura
- Ministry for Primary Industries
- New Zealand Whale and Dolphin Trust
- University of Otago

- Fieldwork volunteers
- Whale Watch Kaikoura staff and crew
- Departments of Chemistry and Marine Science (University of Otago)
- Kaikōura community