National Science Challenges

SUSTAINABLE SEAS

Ko ngā moana whakauka

Sustainable Seas

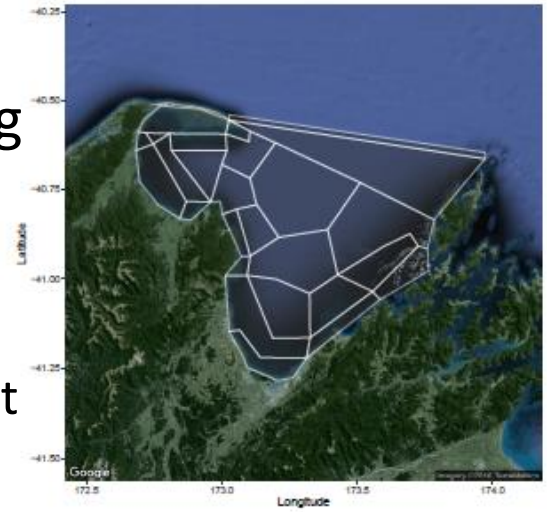
Ko ngā moana whakauka

National Science Challenge

CAWTHRON INSTITUTE · GNS SCIENCE TE PŪ AO · NIWA Taihoro Nukurangi · THE UNIVERSITY OF AUCKLAND NEW ZEALAND · UC UNIVERSITY OF CANTERBURY Te Whare Wānanga o Waitaha CHRISTCHURCH NEW ZEALAND · THE UNIVERSITY OF WAIKATO Te Whare Wānanga o Waikato · UNIVERSITY of OTAGO Te Whare Wānanga o Otāgo NEW ZEALAND · VICTORIA

Ecosystem Models

"end to end" models to assist in decision making



Atlantis model for Tasman and Golden Bays

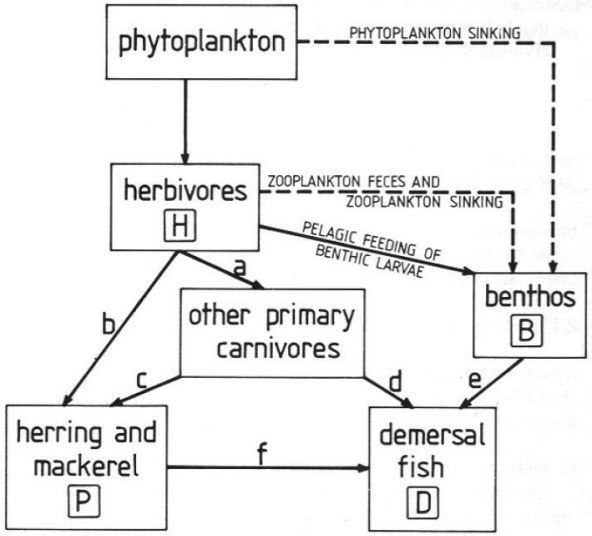
Develop model, apply to environmental and management scenarios

Alternative ecosystem models

Explore other sorts of models, and the implications of their assumptions

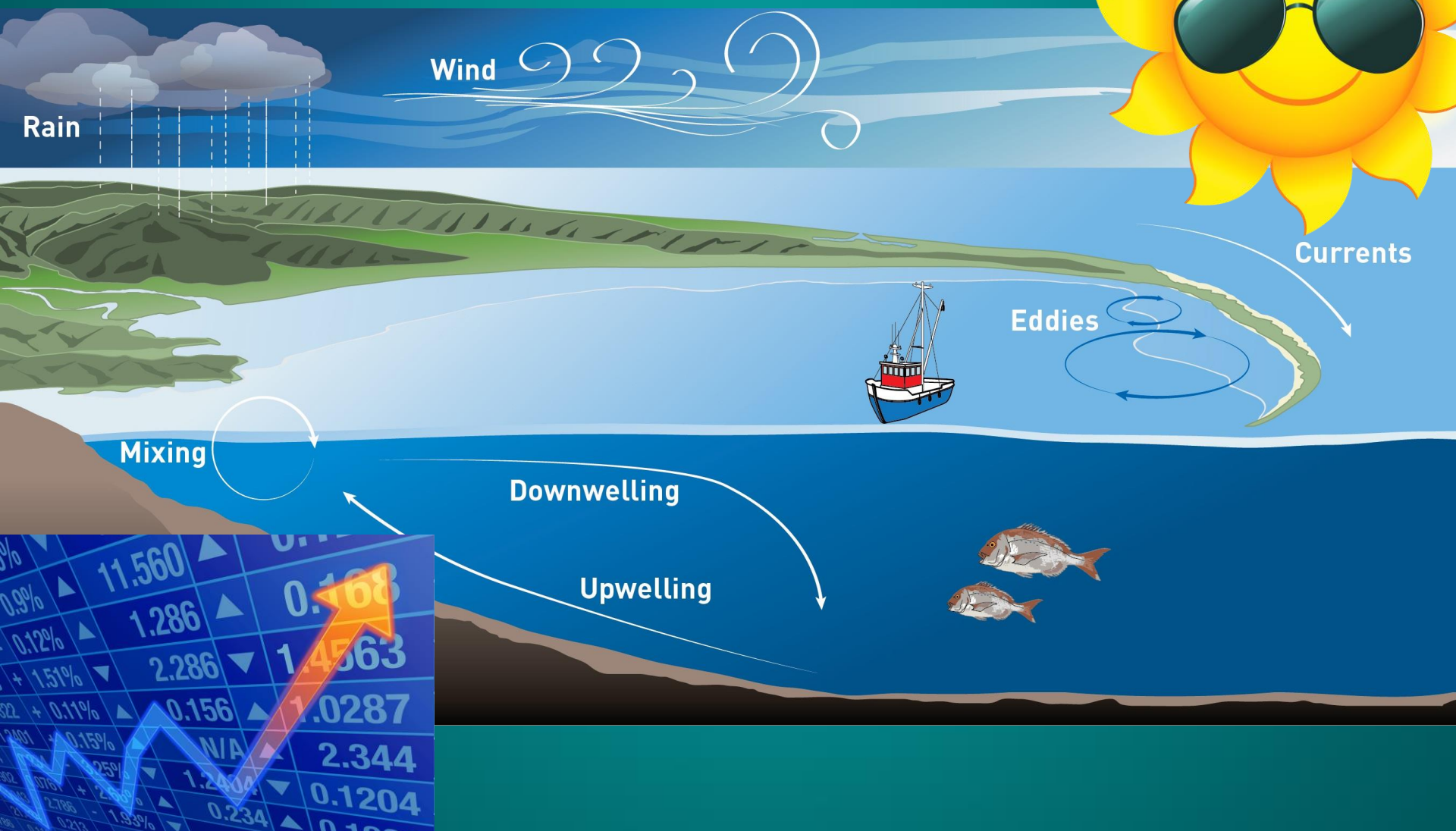
Model comparison approaches

Validate and compare approaches to determine most appropriate / useful for particular situations




ATLANTIS
Developing a model for future change

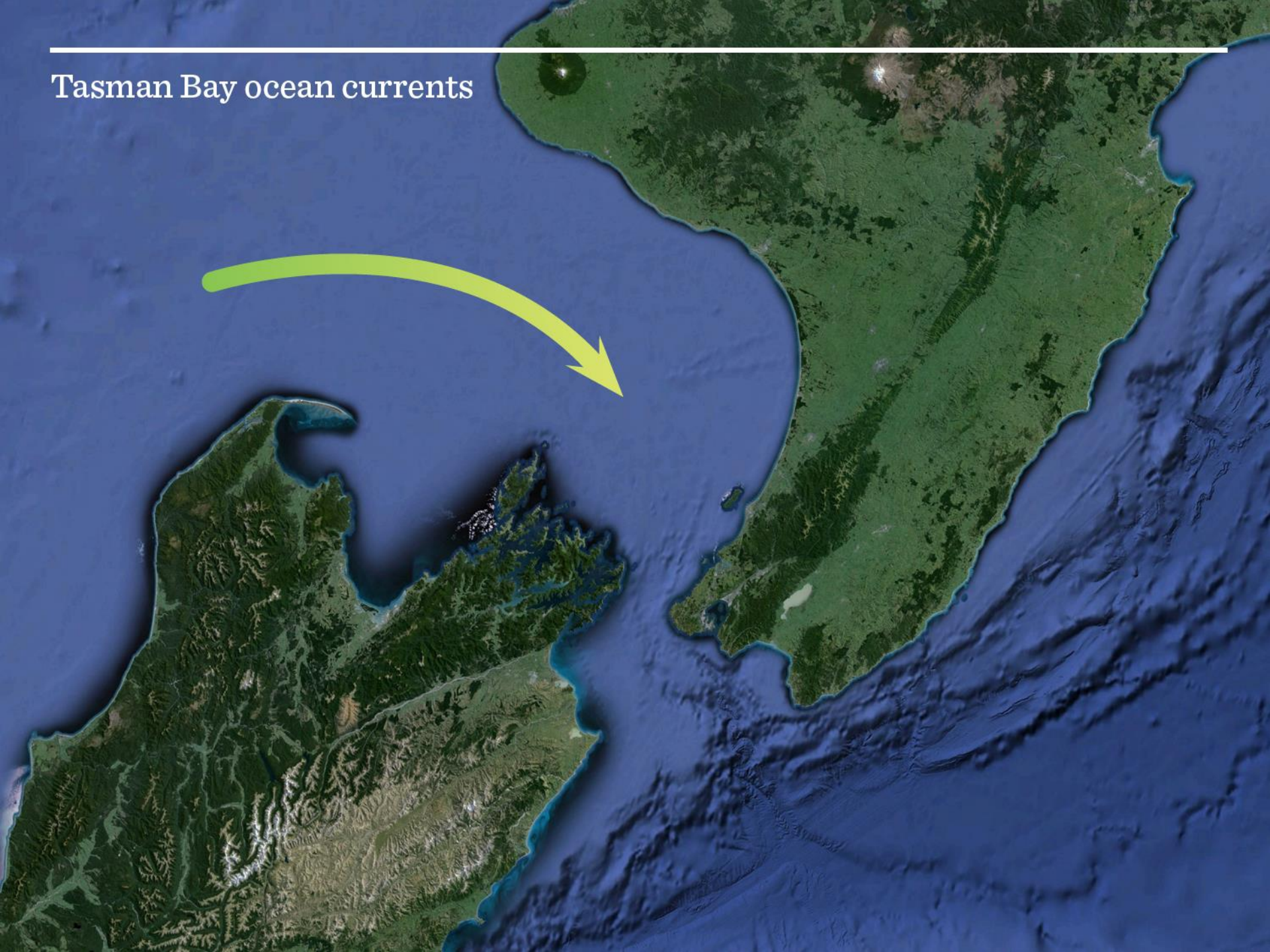
End-2-End Ecosystem Model

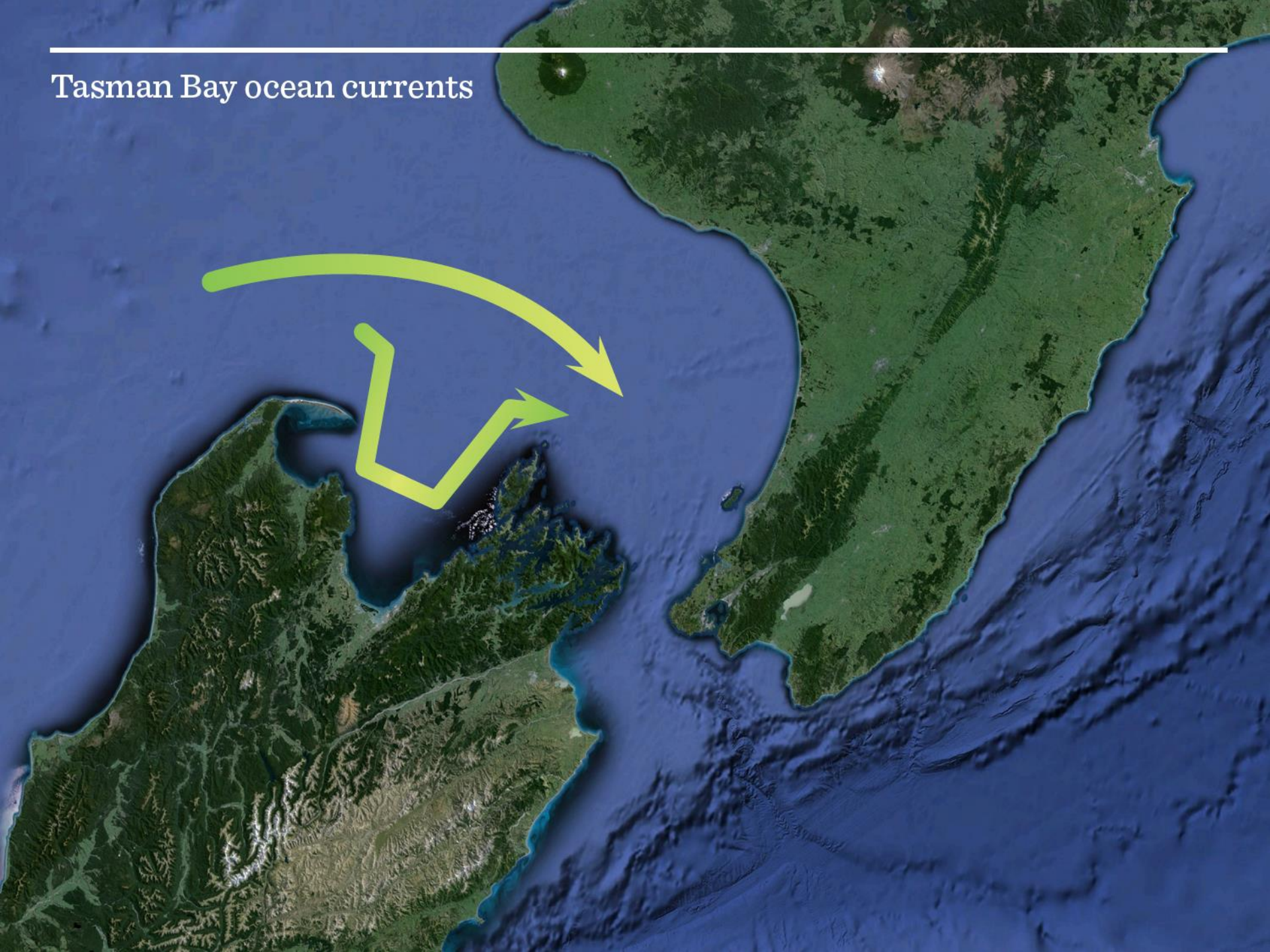


End-2-End Ecosystem Model

$$\frac{d(FX_{i,x})}{dt} = T_{IMM,FX_i} - T_{EM,FX_i} - M_{FX_i} - \sum_{j=predator} \left[P_{FX_j} - F_{FX_i}\right]$$

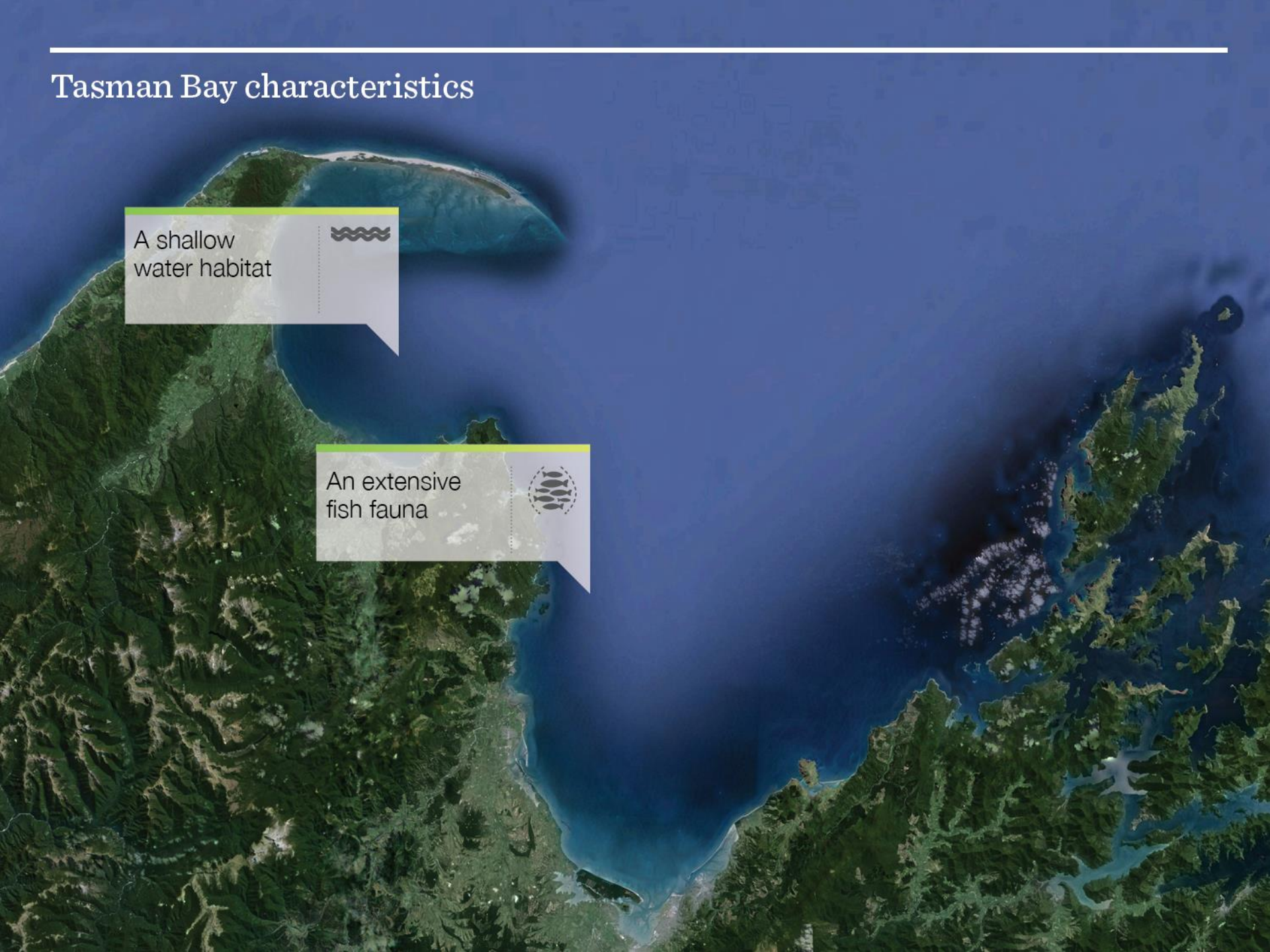
Atlantis around the world


Tasman Bay ocean currents

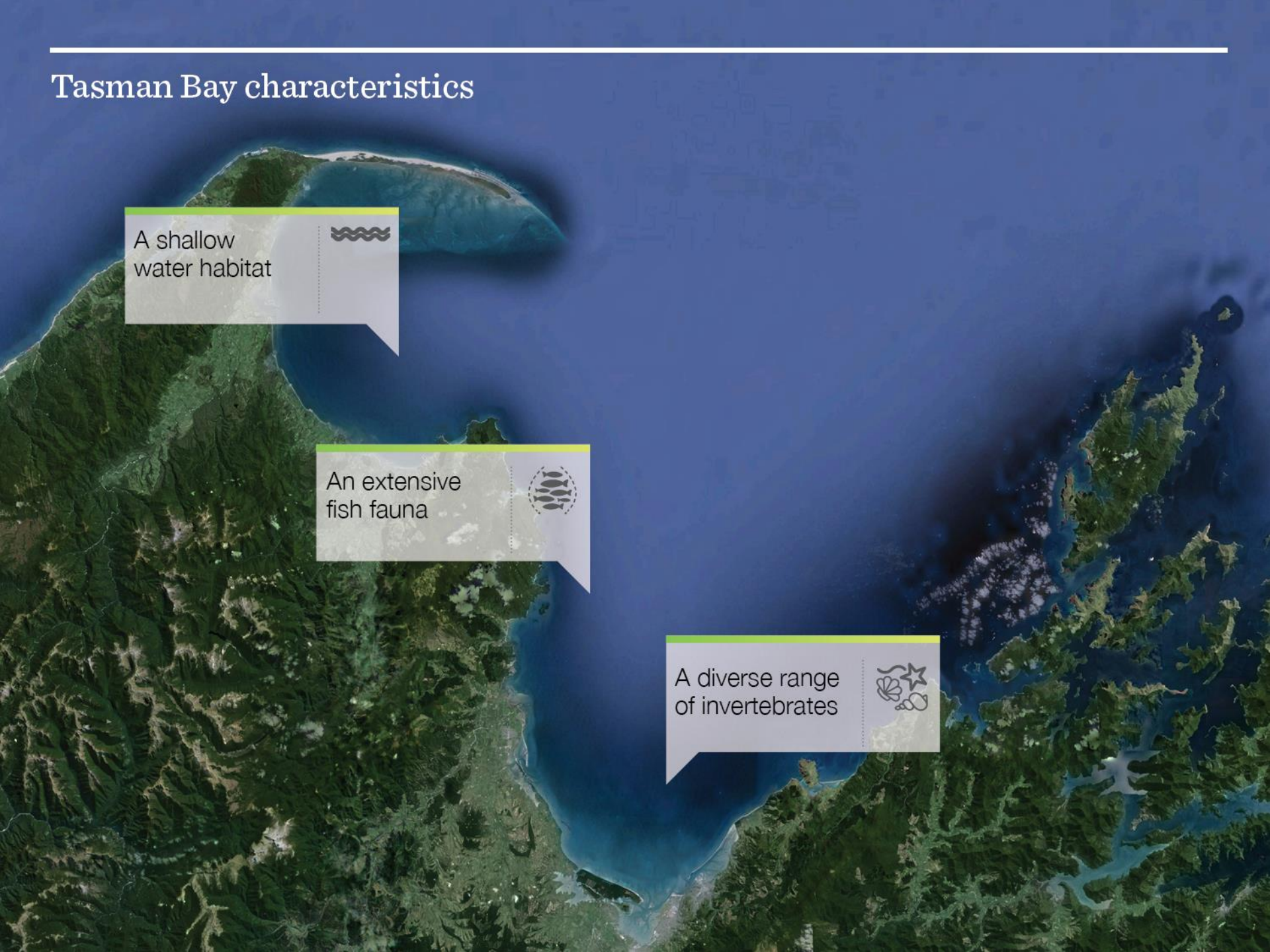

Tasman Bay ocean currents

Tasman Bay characteristics

Tasman Bay characteristics

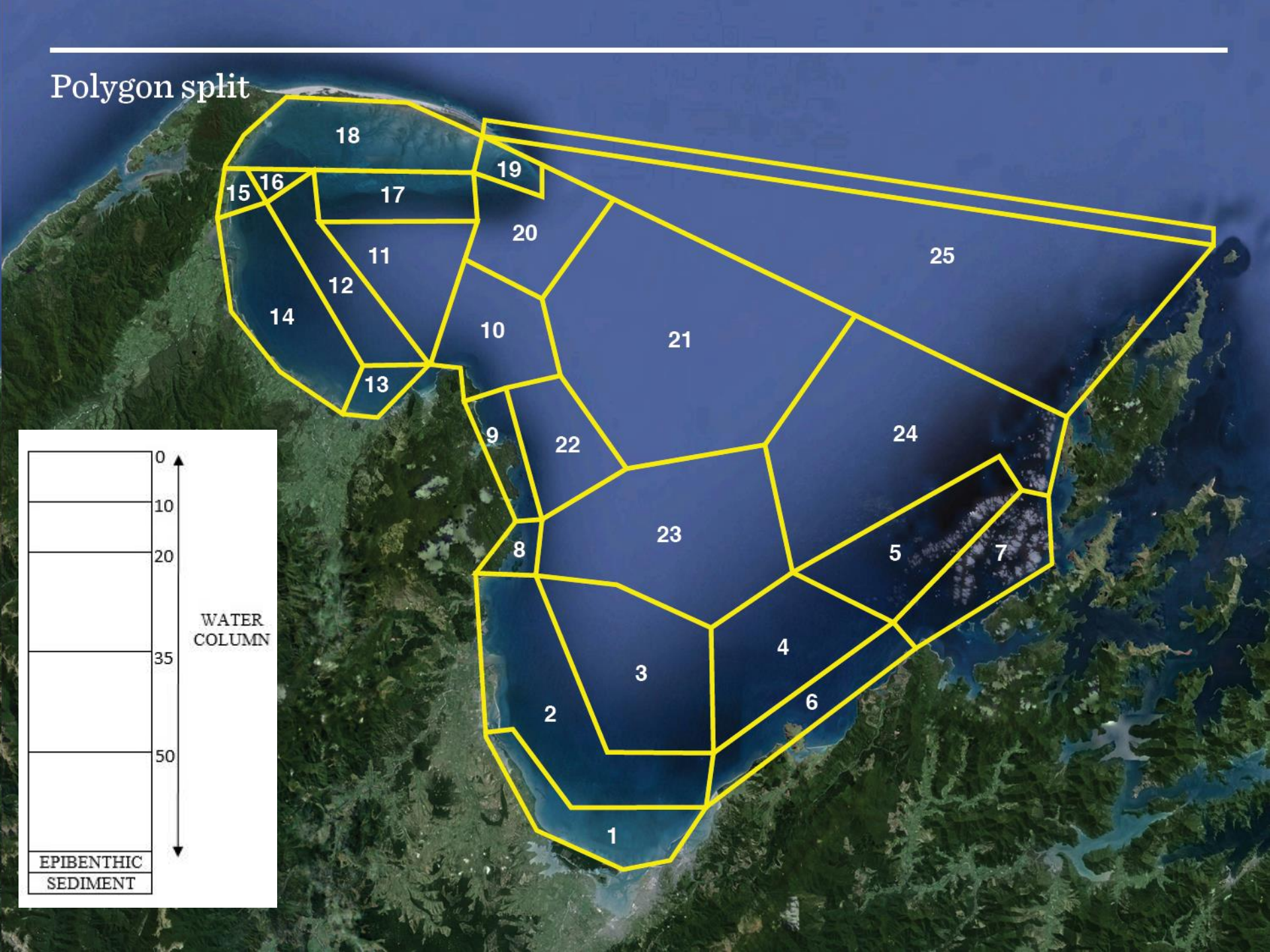


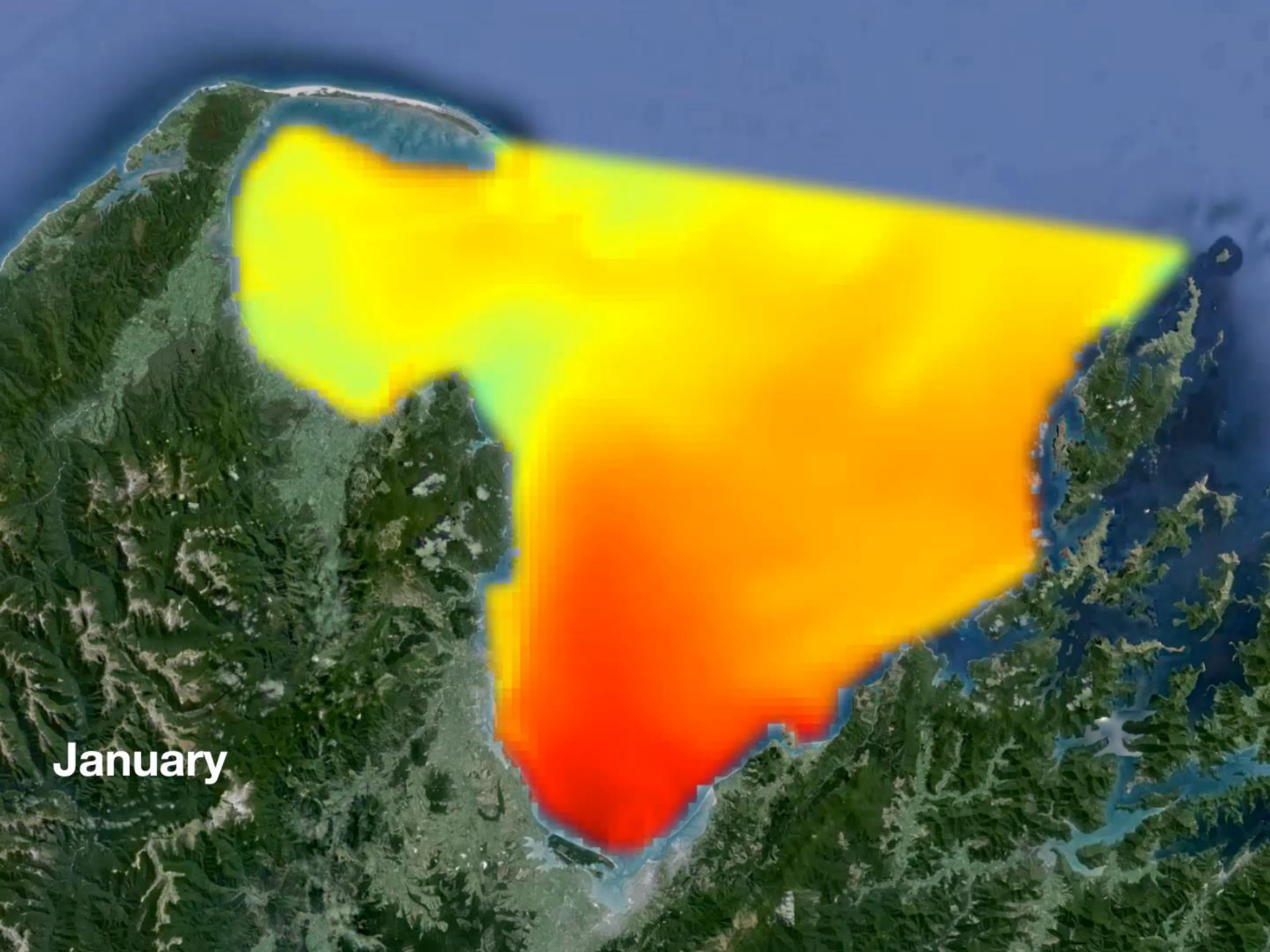
Tasman Bay characteristics

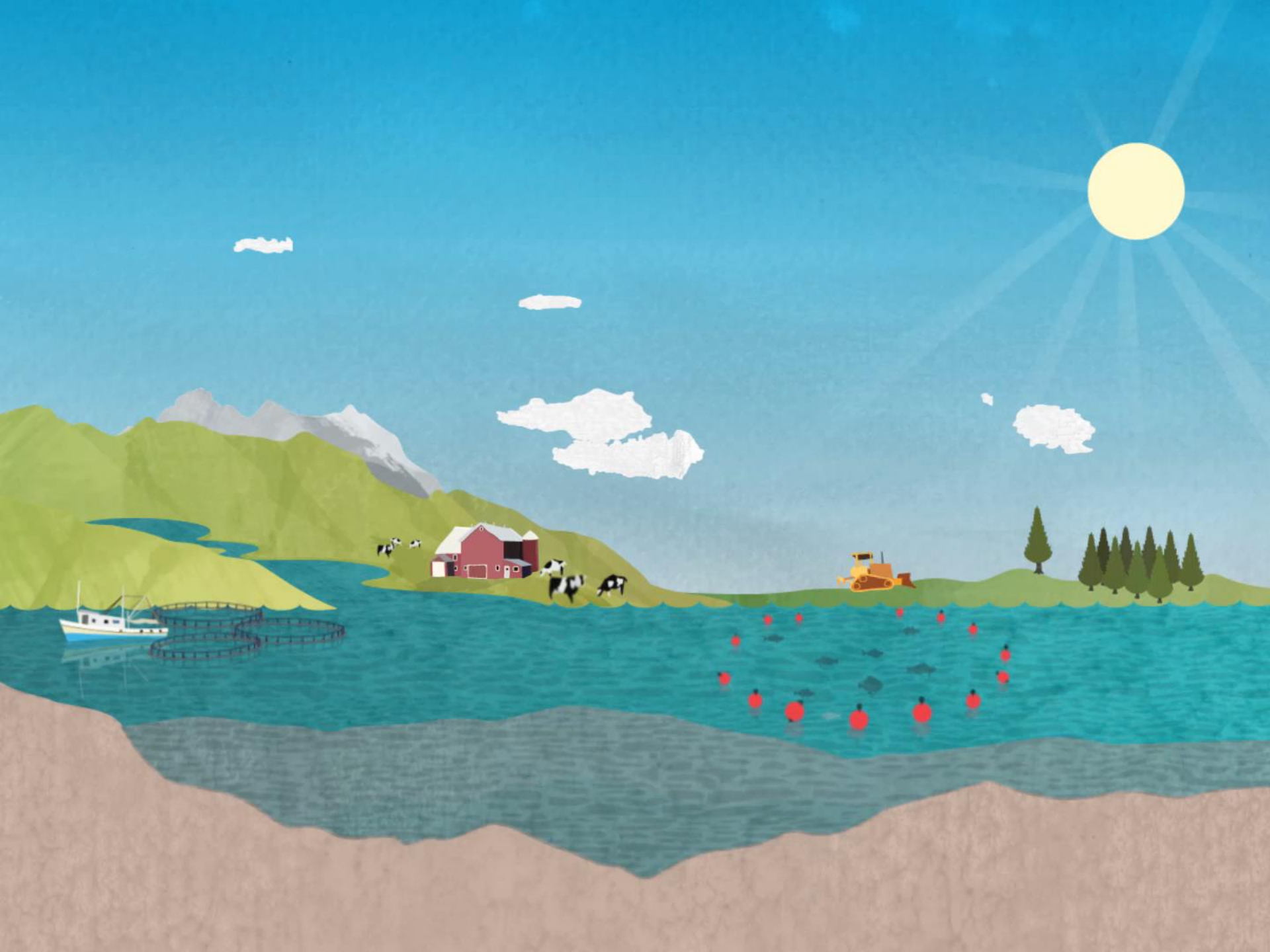


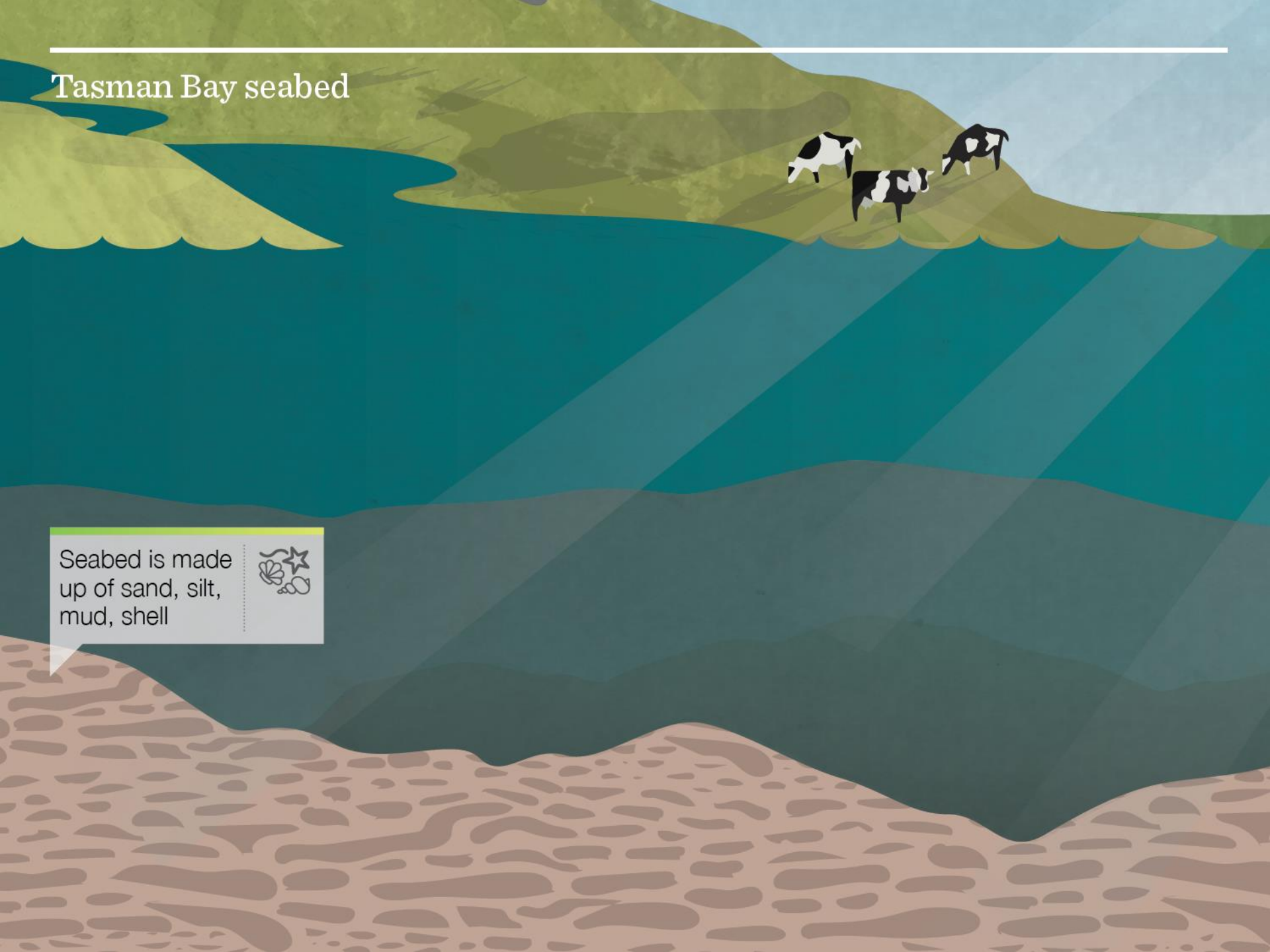
Tasman Bay characteristics

Polygon split



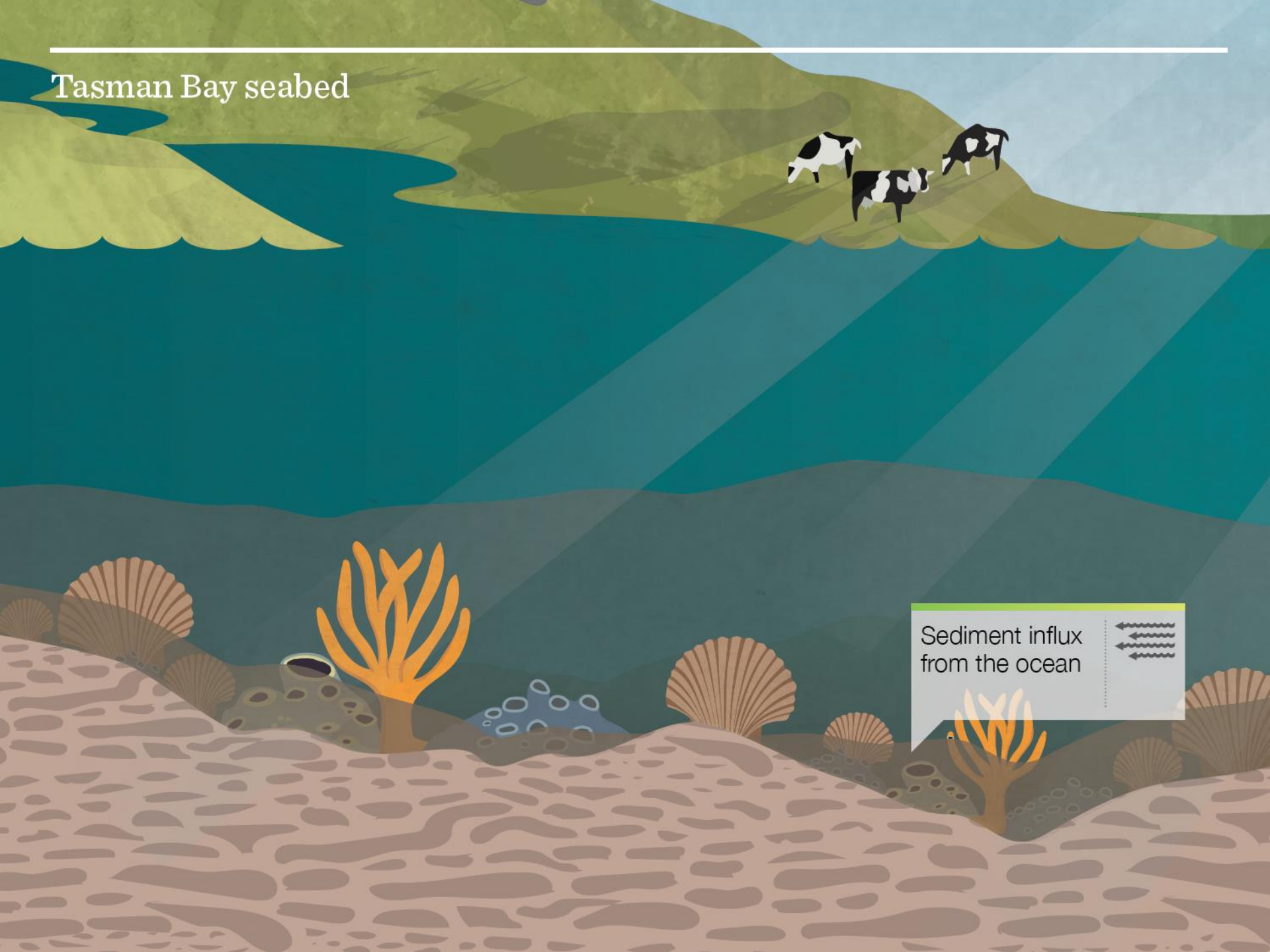

January

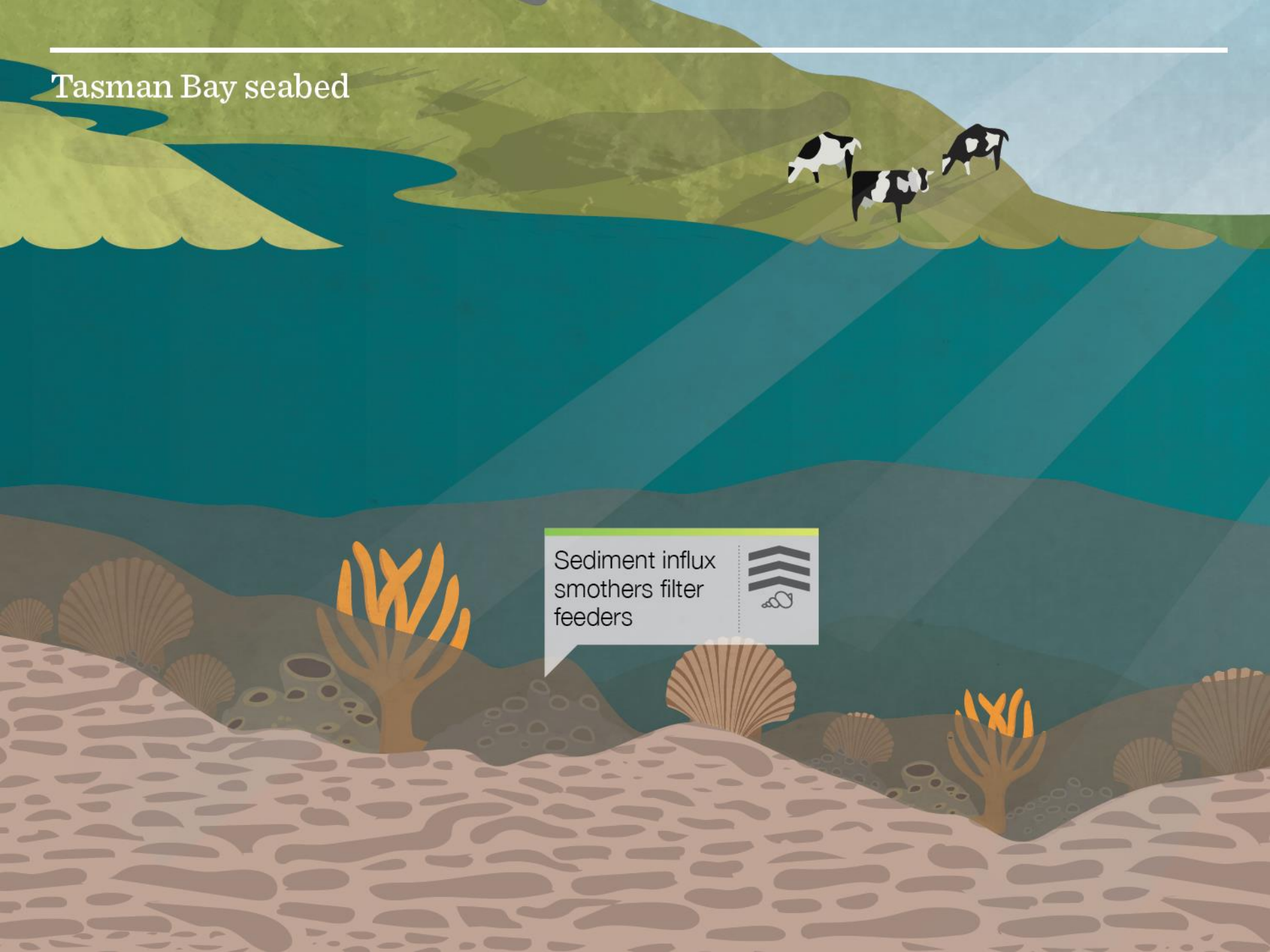


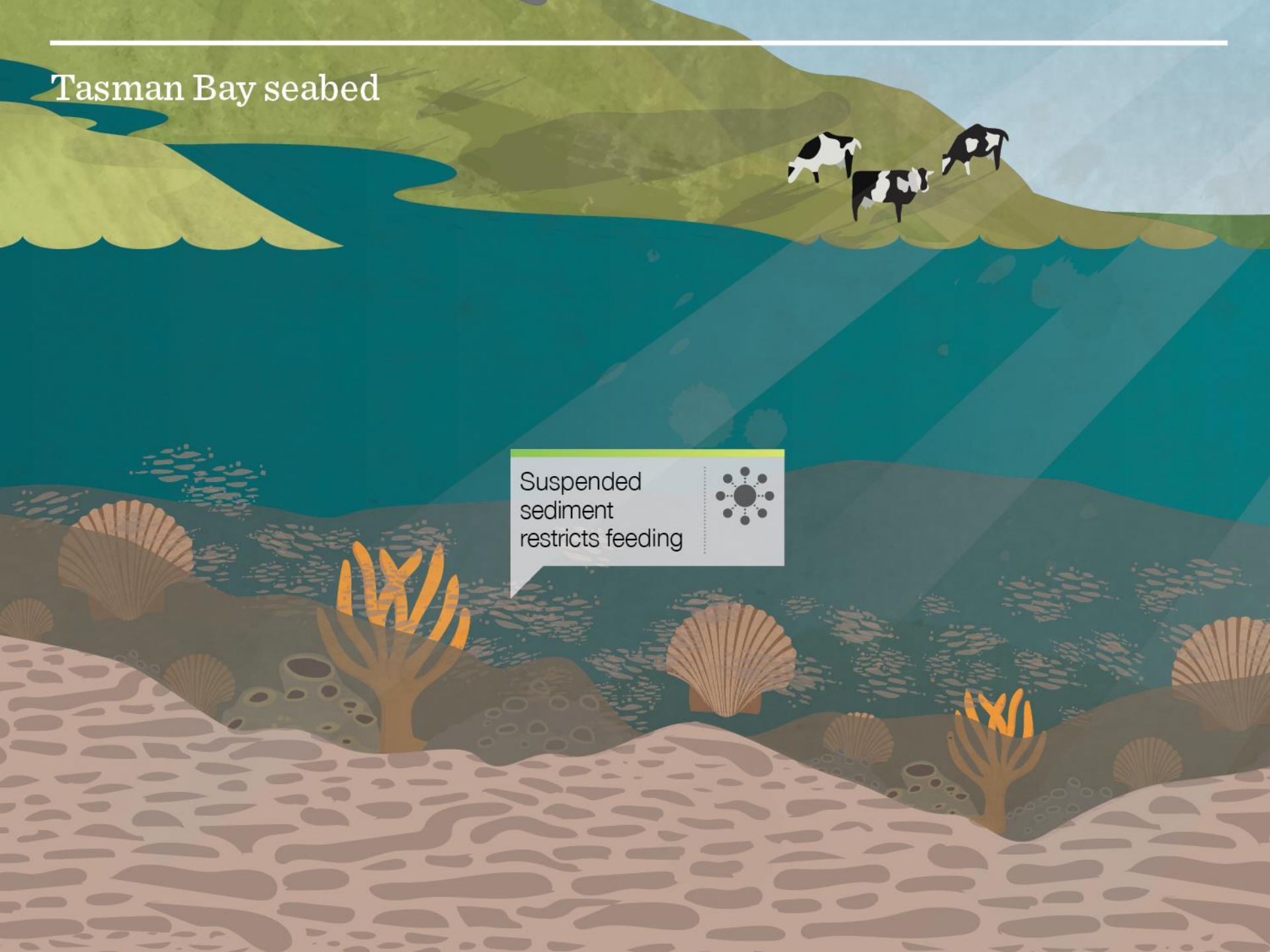

Tasman Bay seabed
Seabed is made up of sand, silt, mud, shell


Tasman Bay seabed
Filter feeders thrive on the seabed


Tasman Bay seabed
Sediment influx
from the river

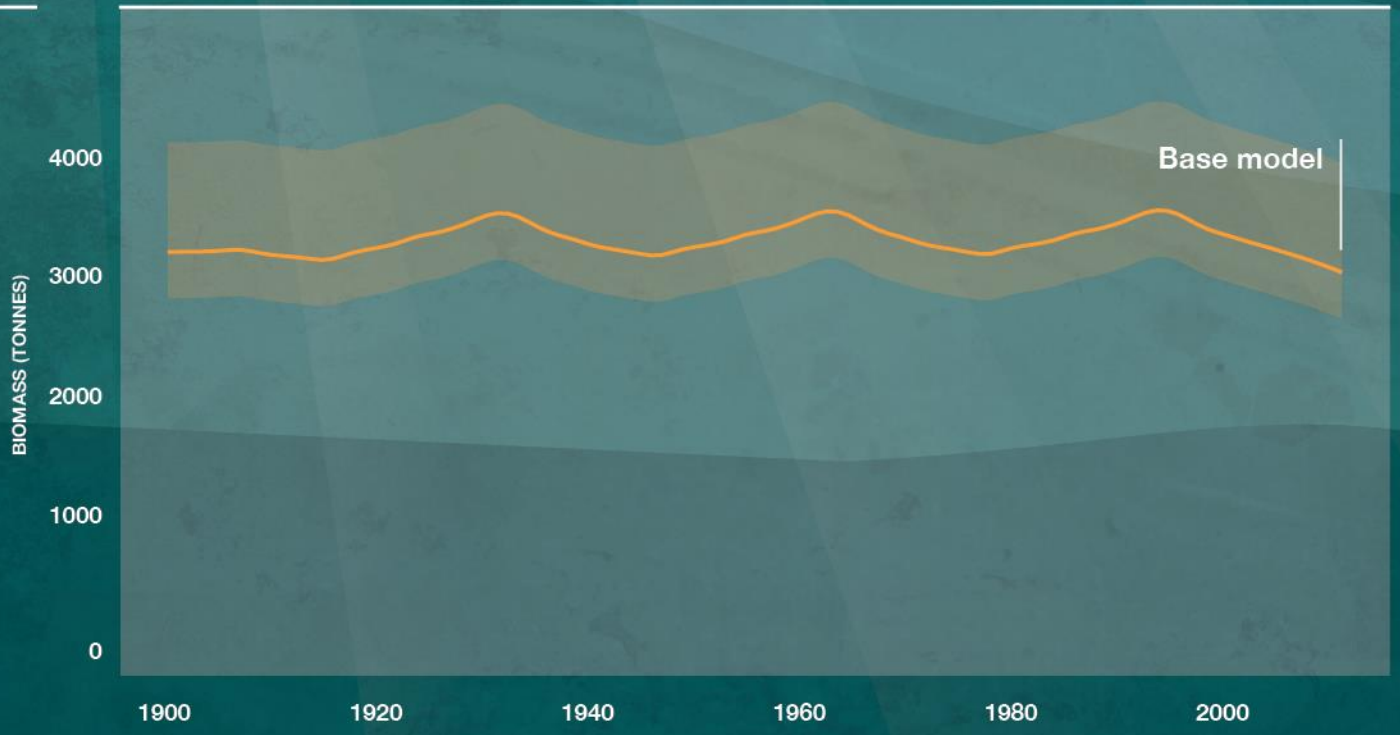

Tasman Bay seabed
Sediment influx
from the ocean


Tasman Bay seabed
Sediment influx smothers filter feeders


Tasman Bay seabed
Suspended sediment restricts feeding

What Atlantis has shown us

Filter Feeders



What Atlantis has shown us

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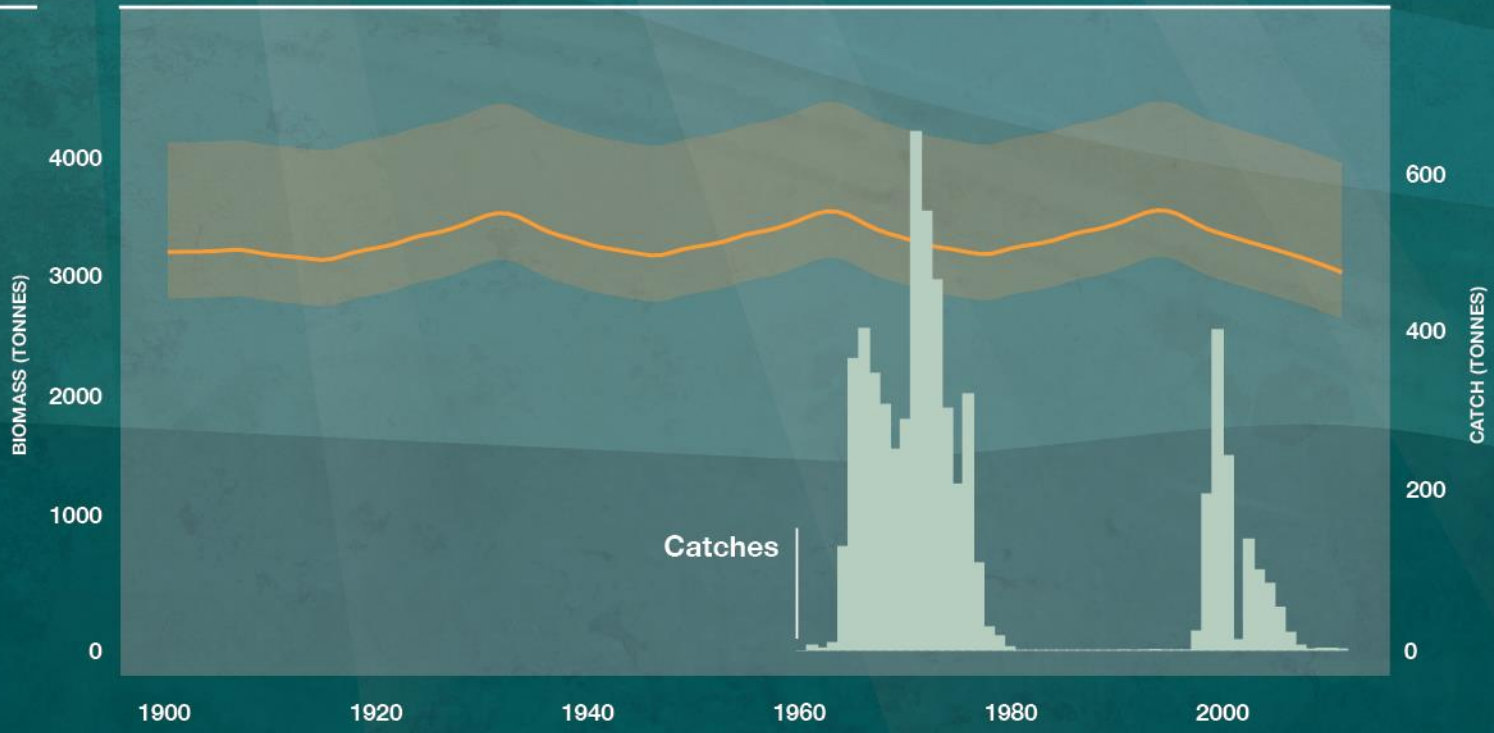

What Atlantis has shown us

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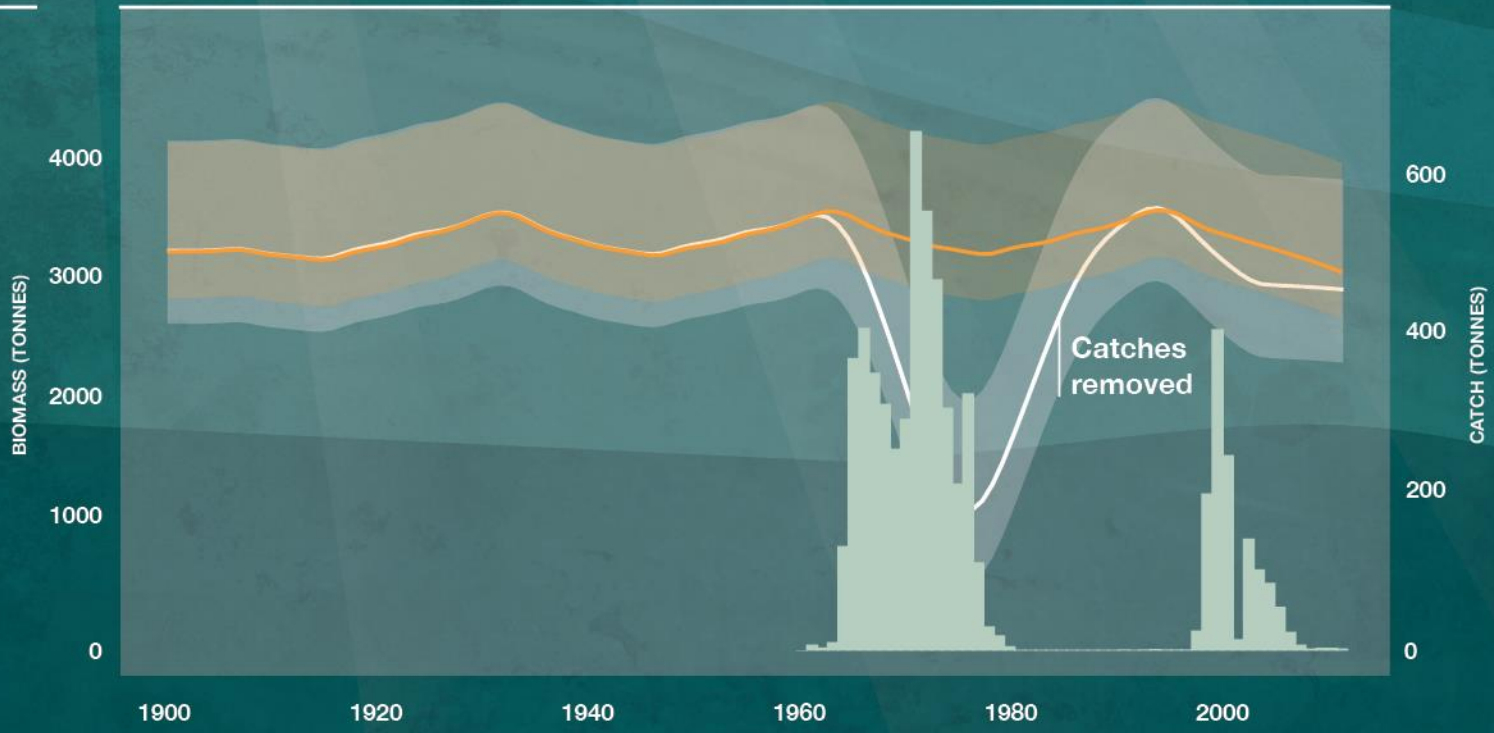
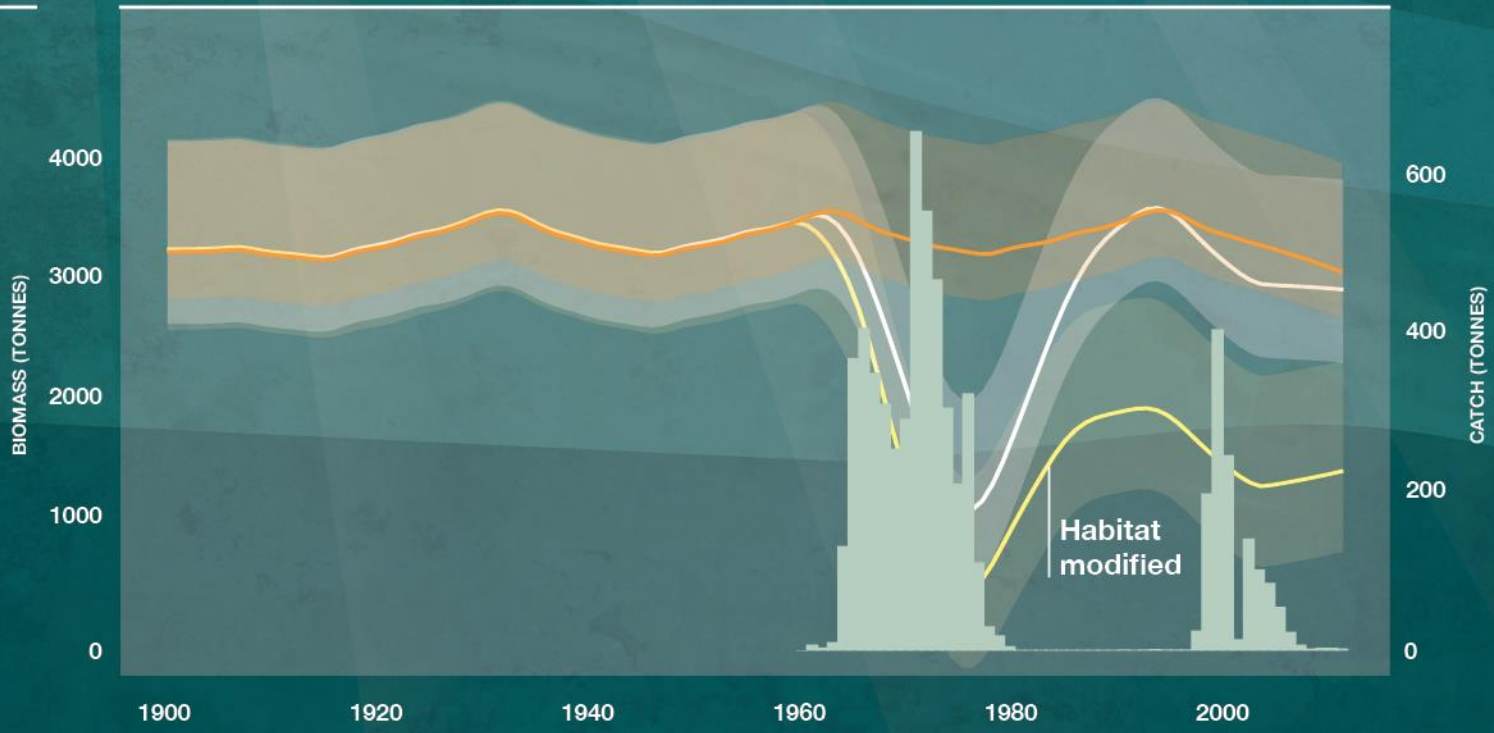


What Atlantis has shown us

Filter Feeders



4 areas of model development

1. Structure
2. Data
3. Dynamics
4. Uncertainty

STRUCTURE

- Spatial
- Temporal
- Species groups

DATA

- Initial conditions
- Parameter values
- Calibration (hind casting)
- Testing (forecasting)

DYNAMICS

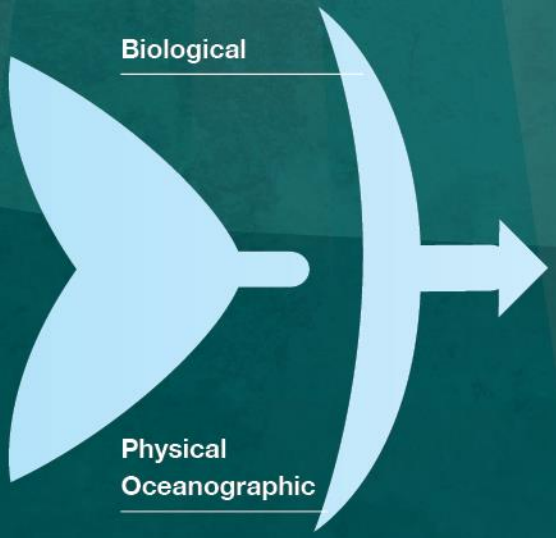
- Functional forms
  - nutrient cycles
  - feeding and growth
  - spawning

UNCERTAINTY

- System
  - bottom up
  - top down
- Model
  - parameters, functions, structure
- Scenario implementation

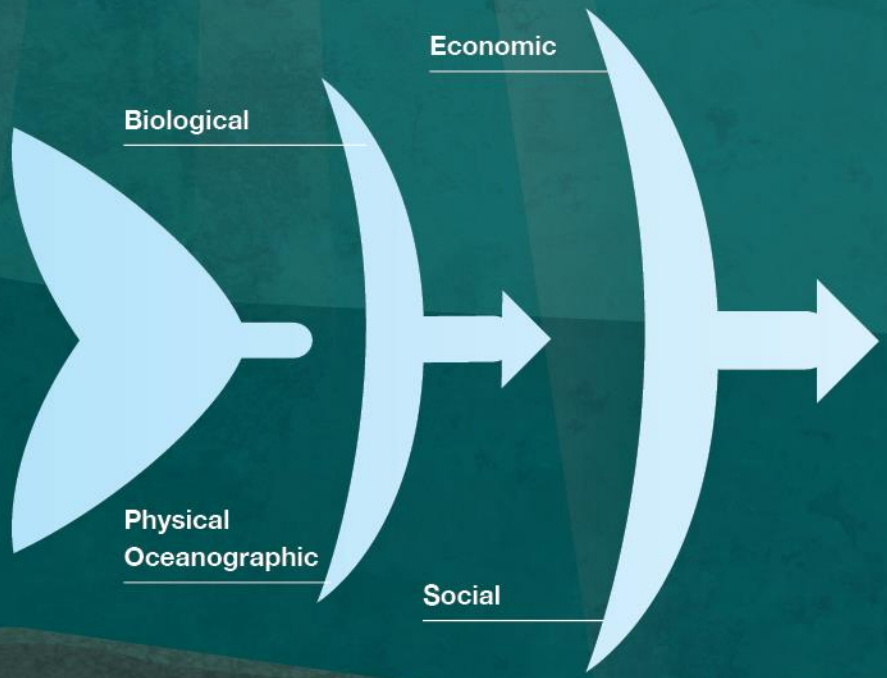
Understanding cause and effect

Cause



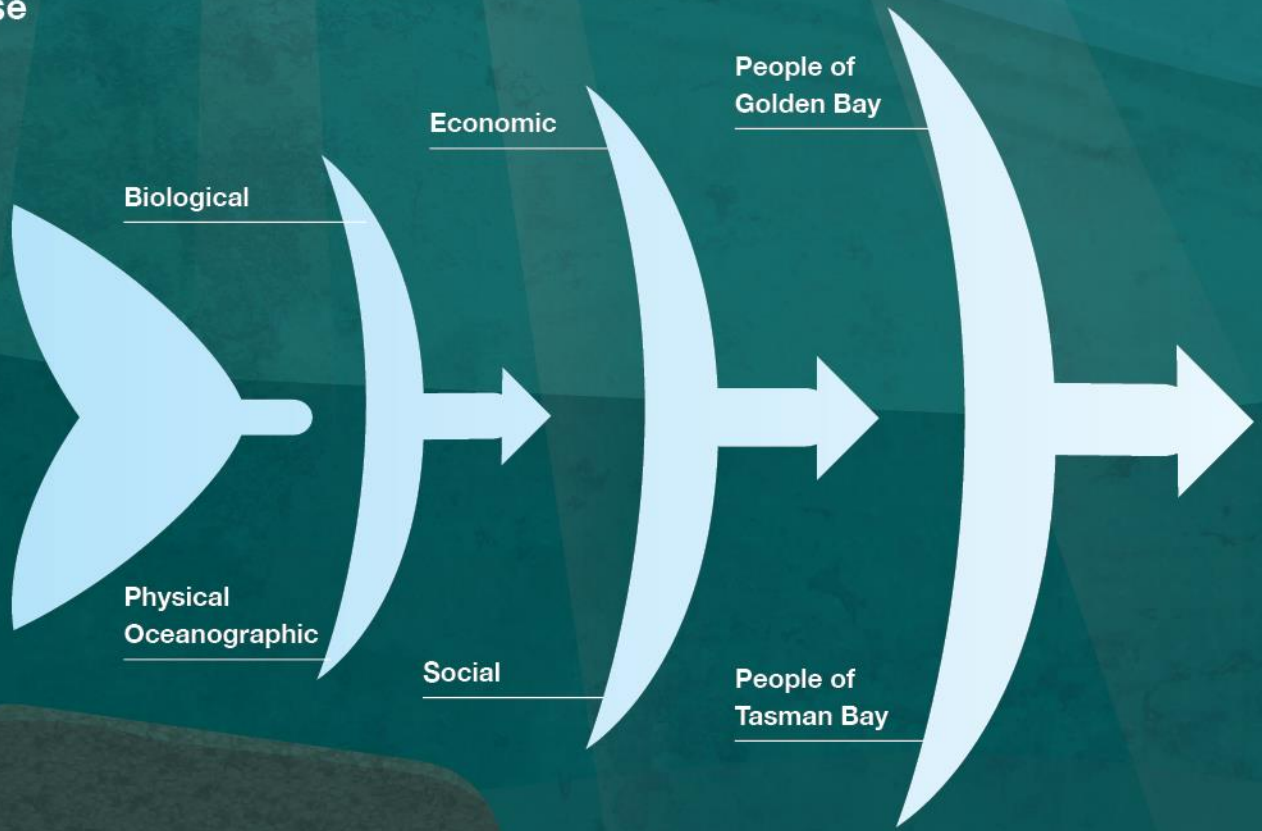
Understanding cause and effect

Cause

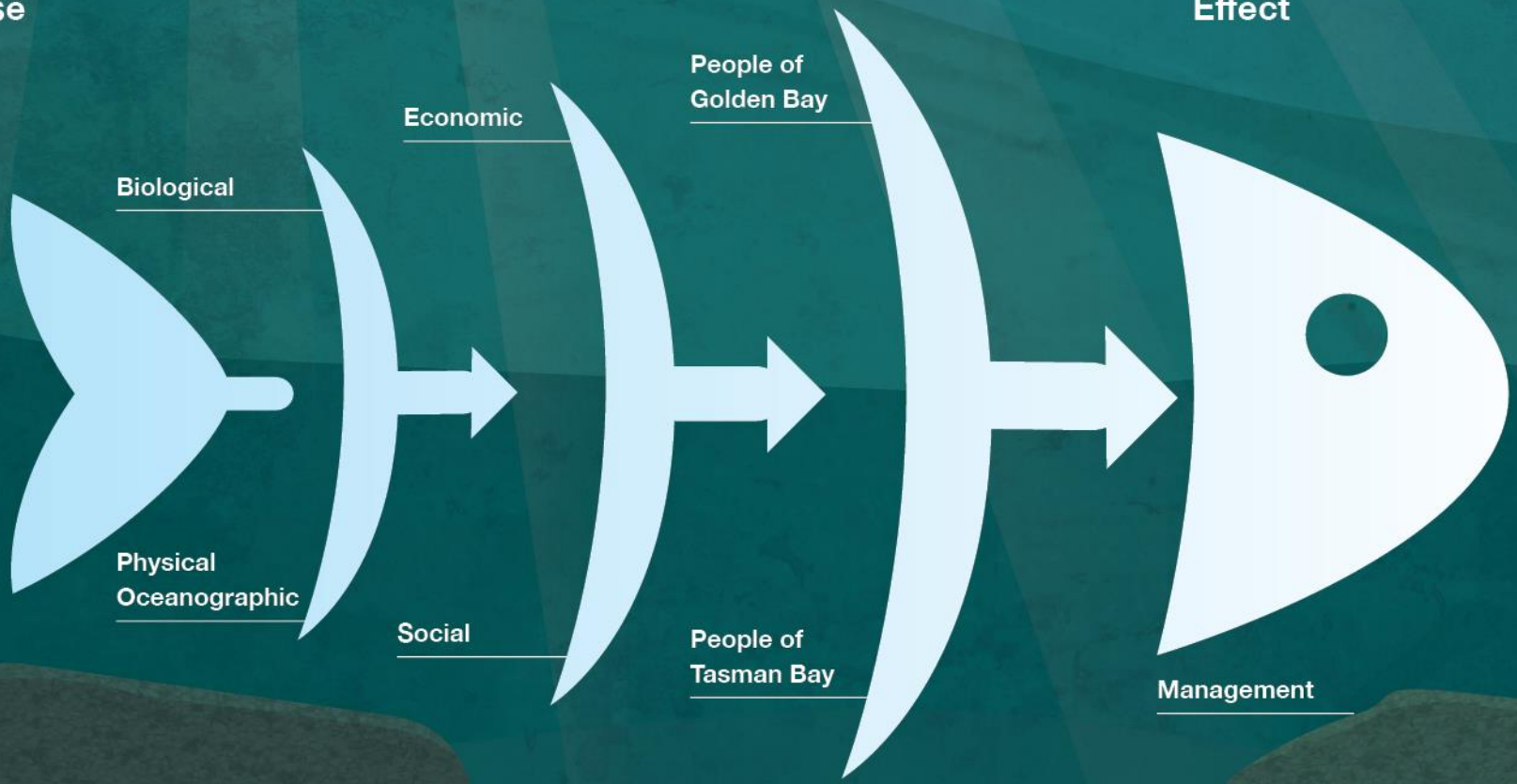


Understanding cause and effect

Cause



Understanding cause and effect



THANK YOU

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