



Sustainable Seas

Ko ngā moana whakauka

National Science Challenge

Ecosystem Models

“end to end” models to assist in decision making

Atlantis model for Tasman and Golden Bays

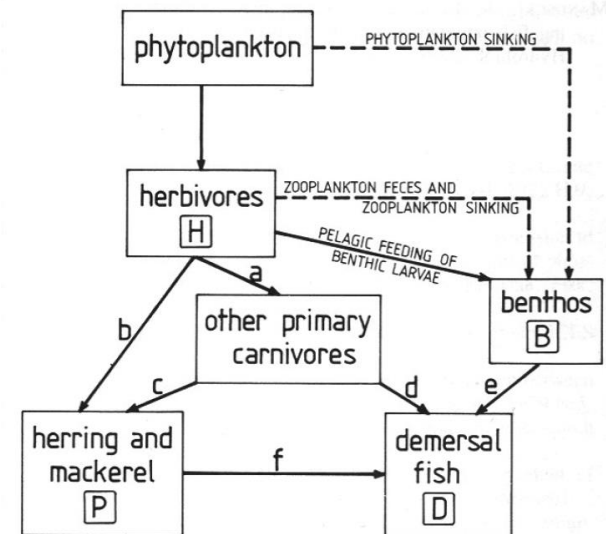
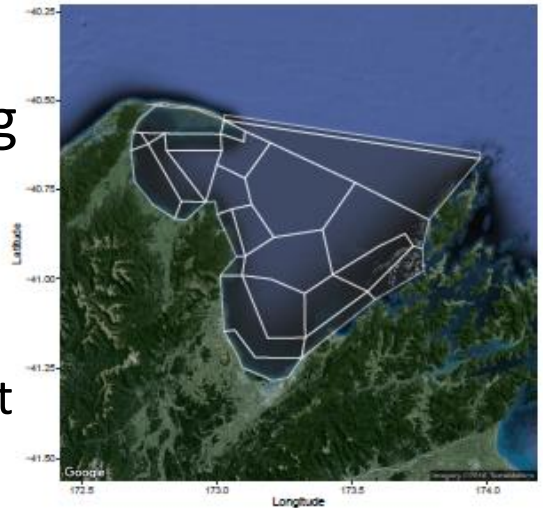
Develop model, apply to environmental and management scenarios

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

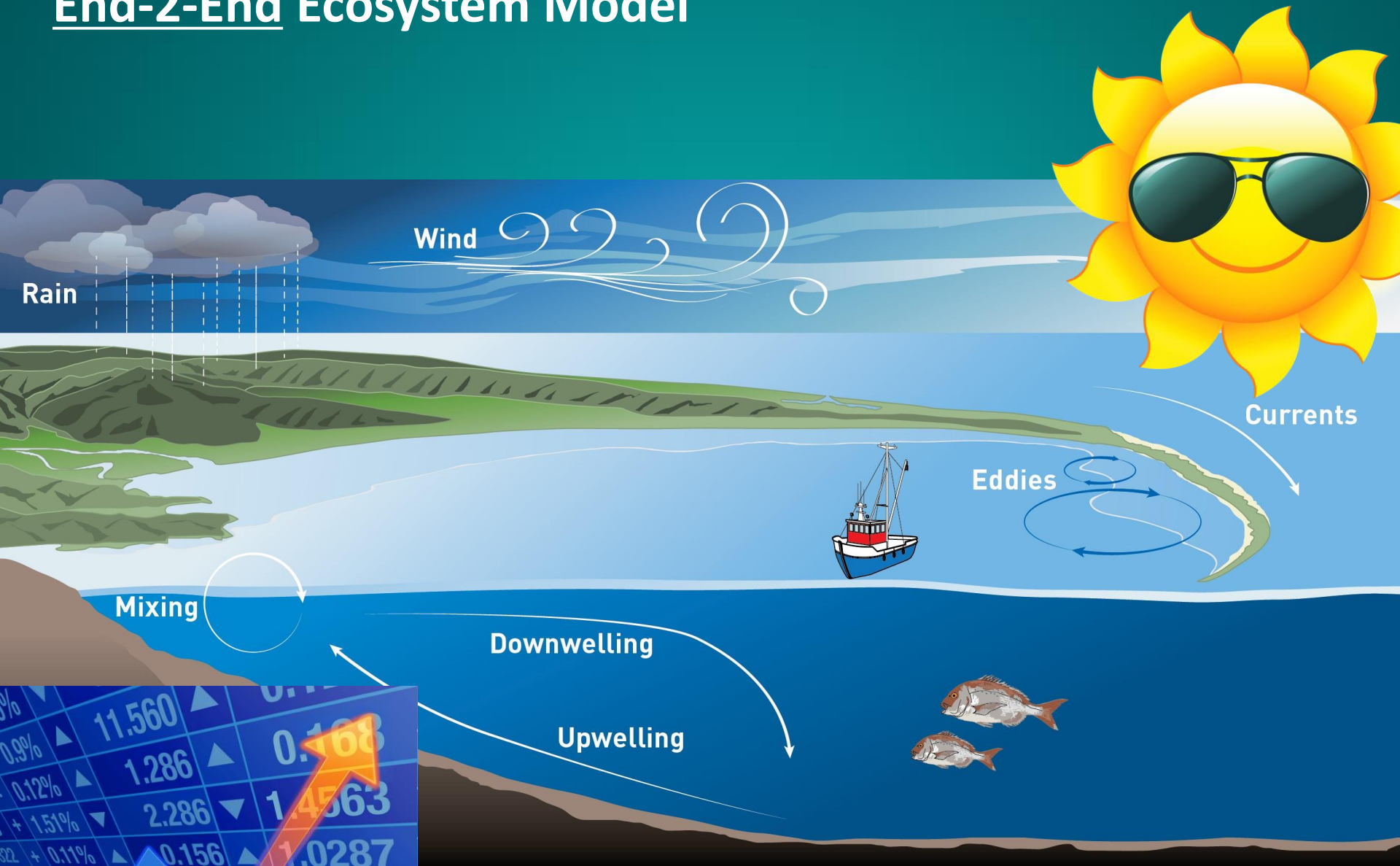


An underwater scene with a deep blue background. A large school of small fish is swimming in the upper half of the frame. In the lower-left foreground, a large, detailed fish with a prominent eye and a spiny dorsal fin is visible. The overall lighting is dim, creating a sense of depth and mystery.

ATLANTIS

Developing a model for future change

End-2-End Ecosystem Model



End-2-End Ecosystem Model

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



```

555 * Calculate
556 * mg N s-1.
557 * to get th
558 *
559 */
560 void Eat(MSE
561 int prey
562 int kij
563 int habi
564 long dou
565 long dou
566 int ncoh
567 int is_o
568 int zero
569 int catc
570 double d
571 double p
572 double t
573 long dou
574 long dou
575
576
577 // if ((bm-
578 // fpri
579 //
580 //
581 // )
582 /* Initi
583 living_p
584 living_p
585 plant_pr
586 labdet =
587 refdet =
588 graze_li
589
590 /* Get t
591 chrtstag
    
```

```

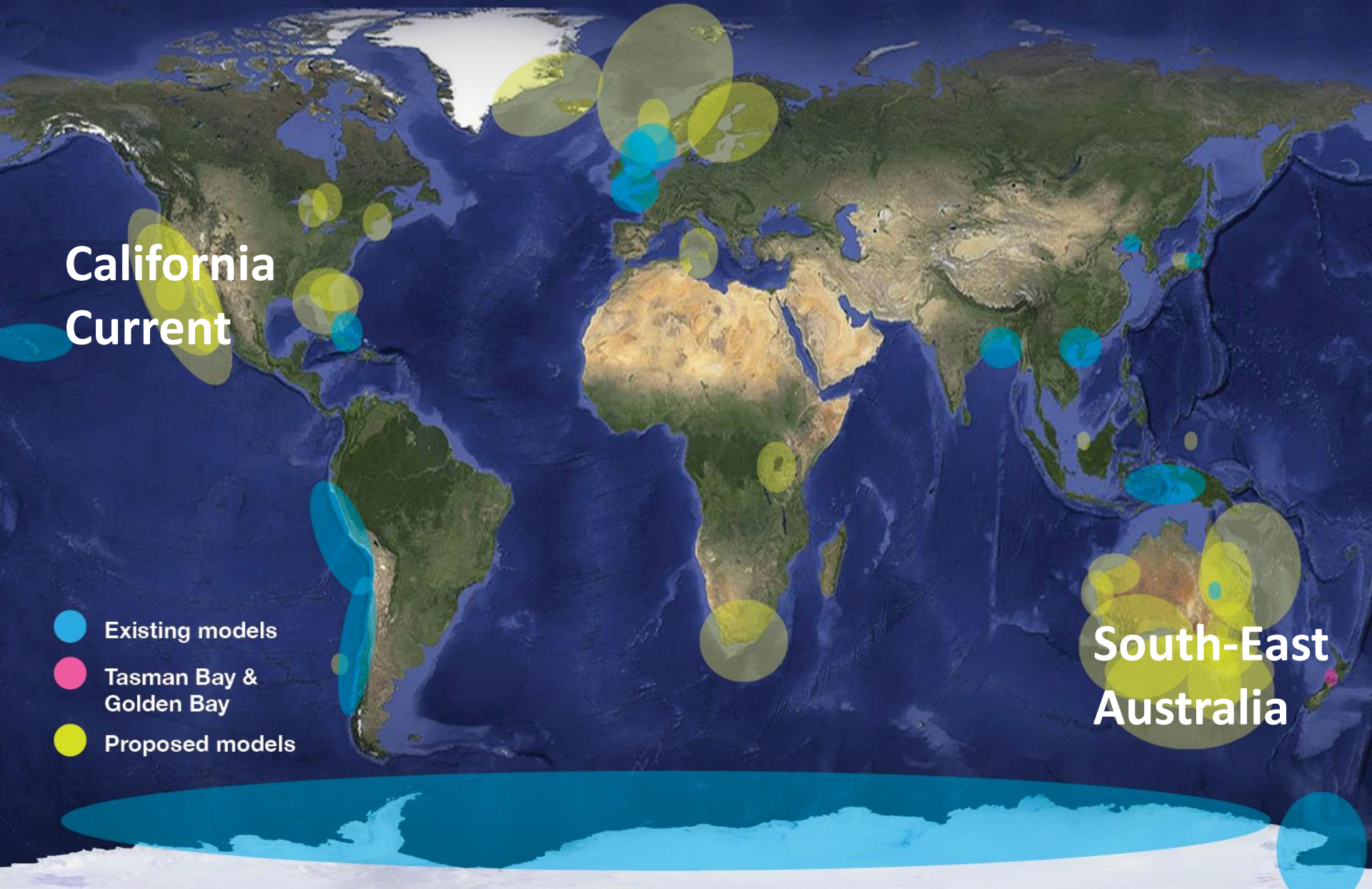
p, double mum_sp,
step1, plant_pre
eckstop)) {
sp = %.20e, mum_s
ohort, sp, C_sp,
    
```

Atlantis around the world

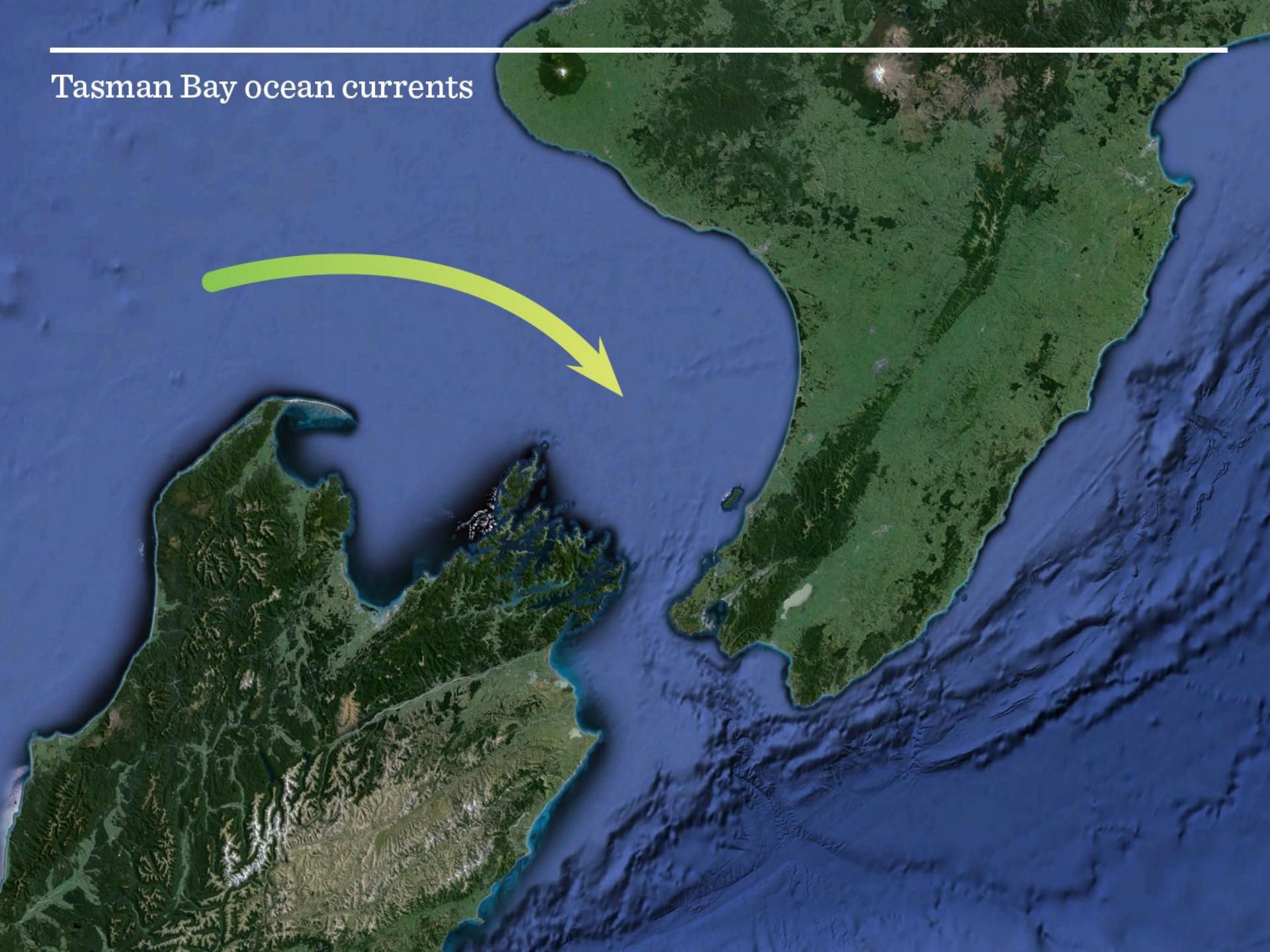
California
Current

- Existing models
- Tasman Bay & Golden Bay
- Proposed models

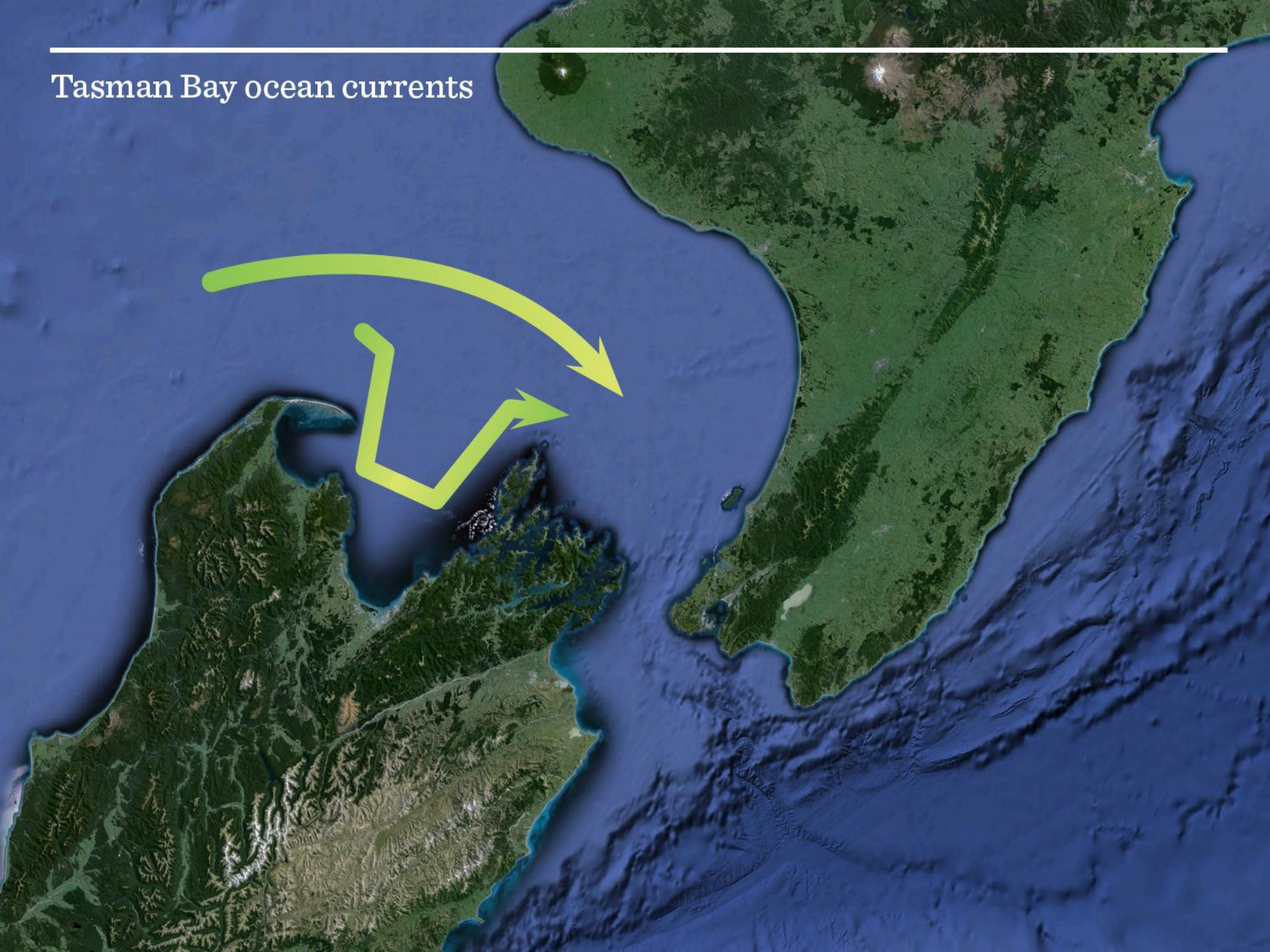
South-East
Australia



Tasman Bay ocean currents



Tasman Bay ocean currents



Tasman Bay characteristics

A shallow
water habitat



Tasman Bay characteristics

A shallow
water habitat



An extensive
fish fauna



Tasman Bay characteristics

A shallow
water habitat



An extensive
fish fauna



A diverse range
of invertebrates



Tasman Bay characteristics

A shallow water habitat



An extensive fish fauna



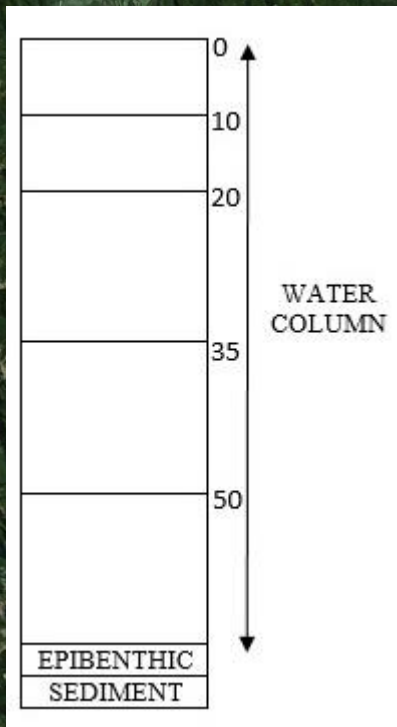
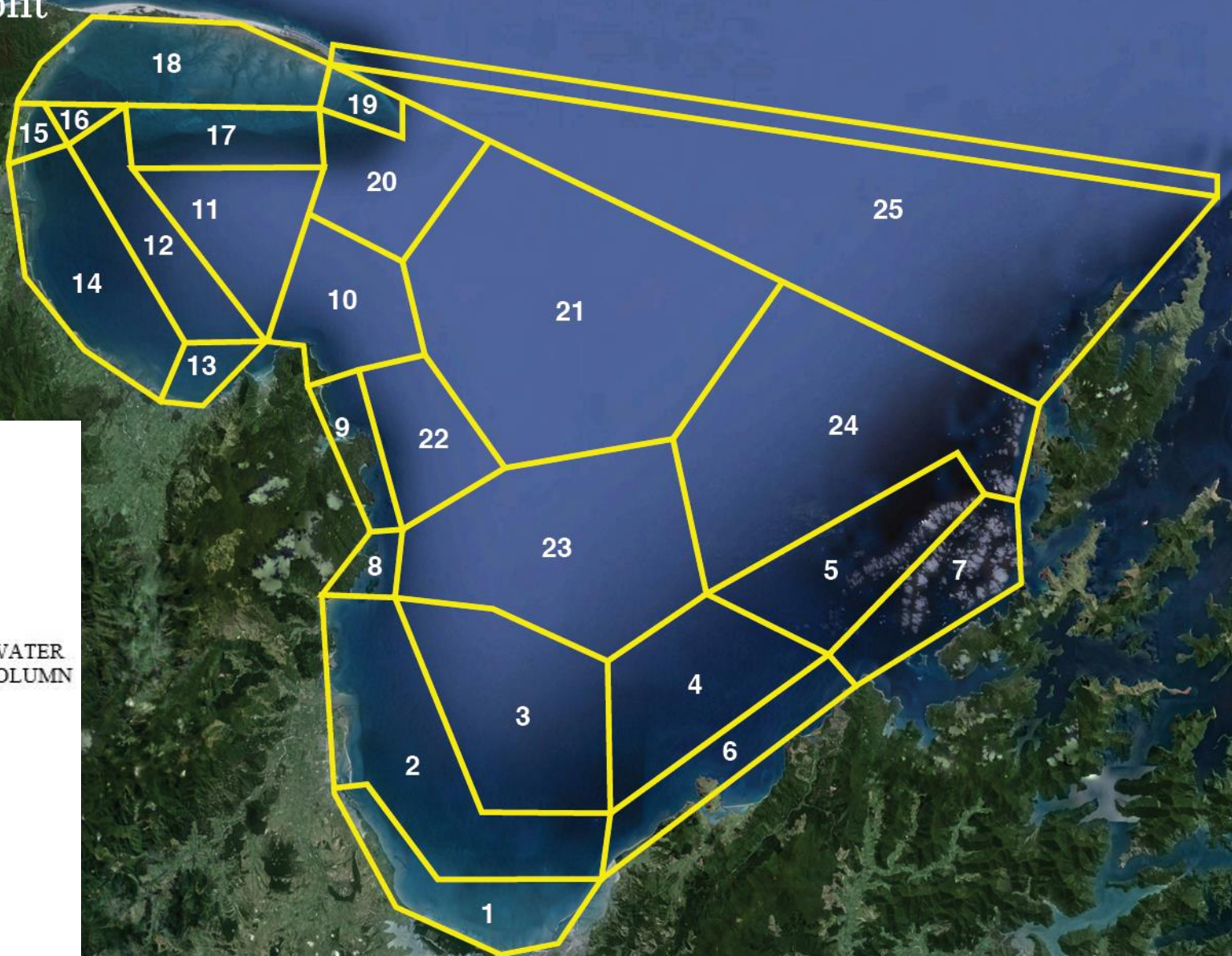
A large range of birds and mammals

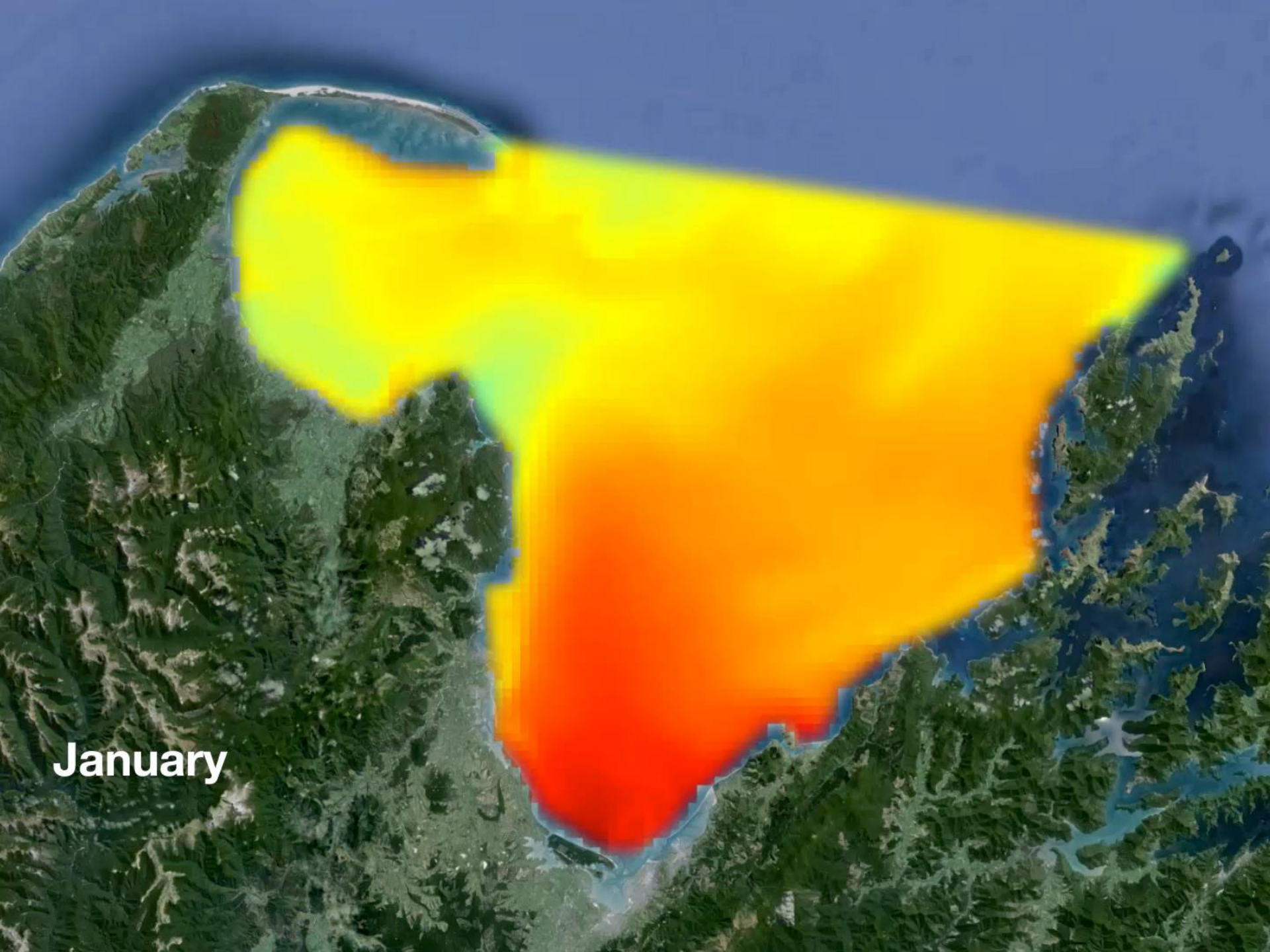


A diverse range of invertebrates

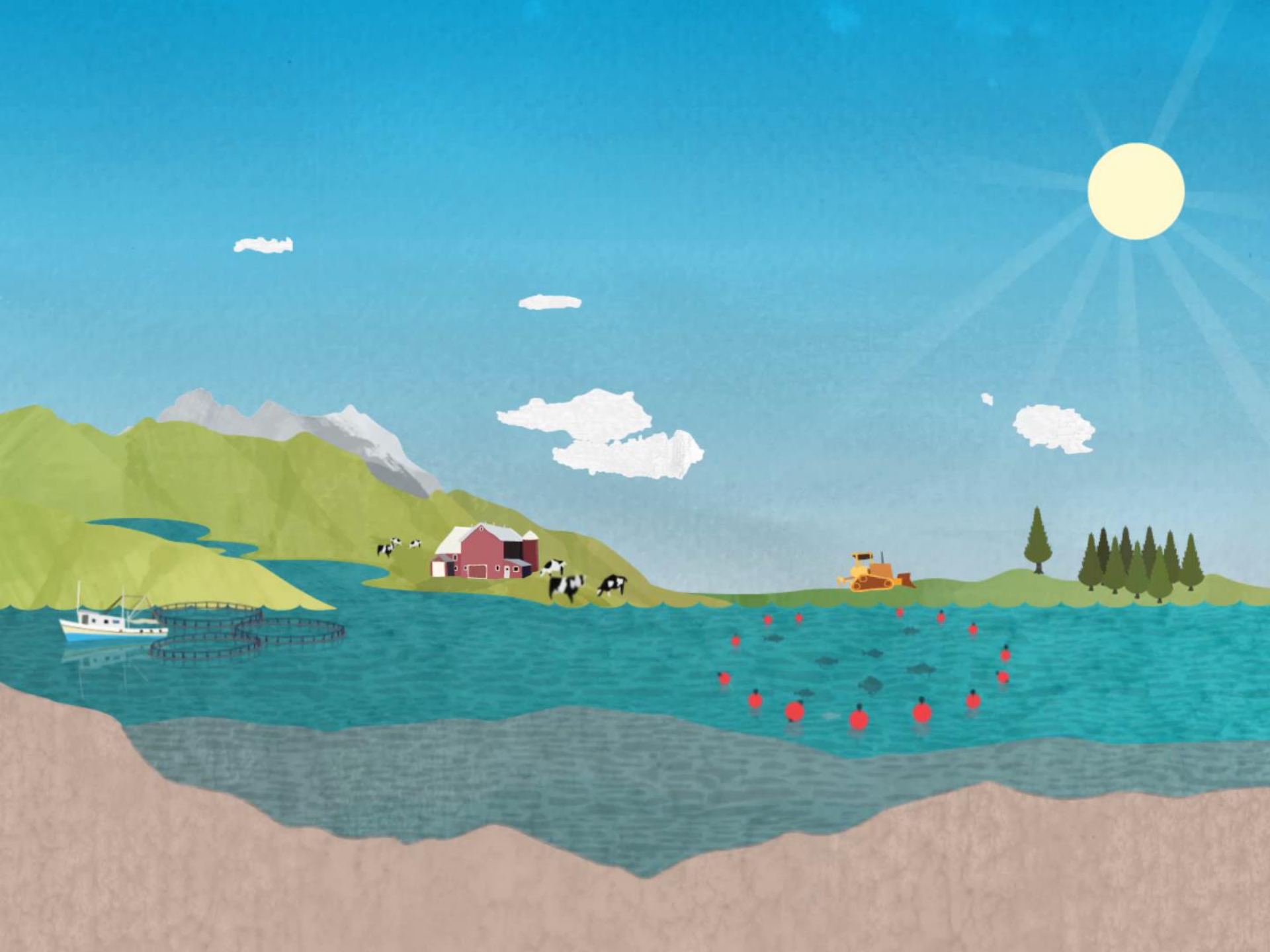


Polygon split





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



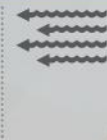
Sediment influx
from the river



Tasman Bay seabed



Sediment influx
from the ocean



Tasman Bay seabed



Sediment influx
smothers filter
feeders



Tasman Bay seabed

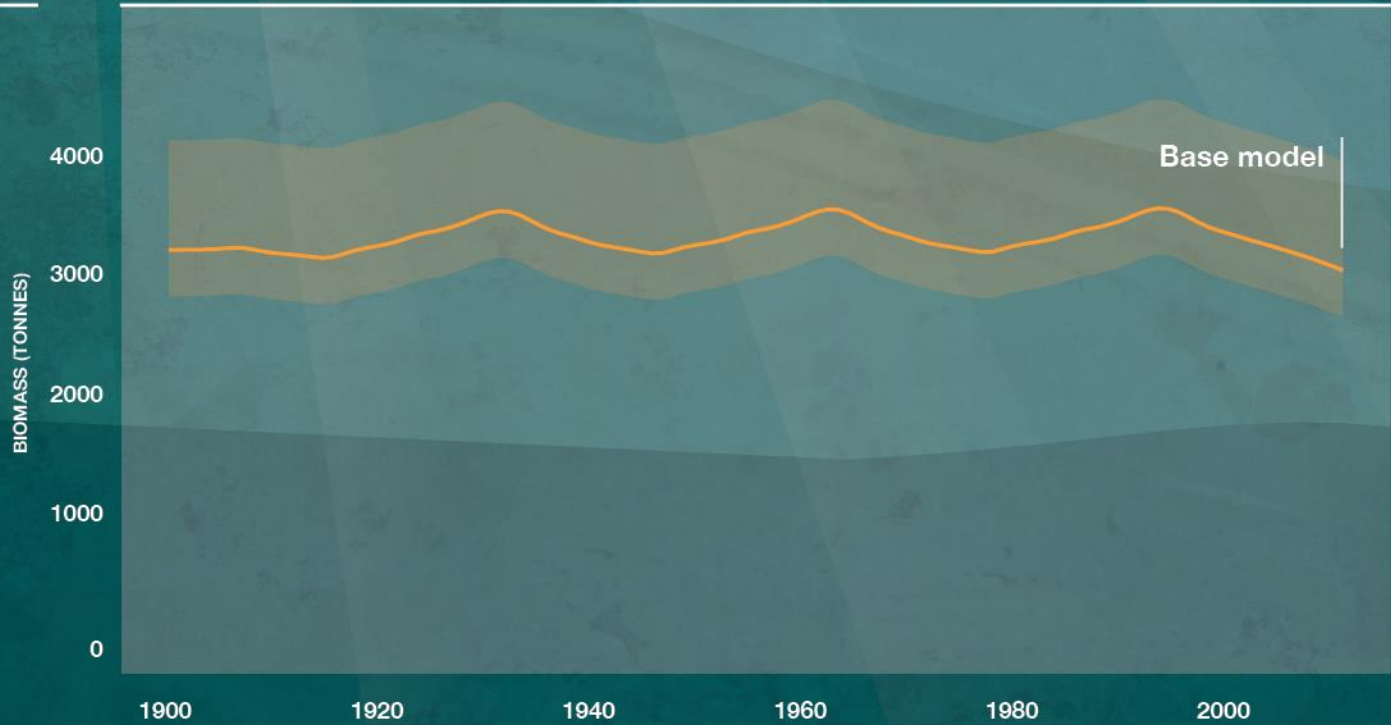


Suspended sediment restricts feeding



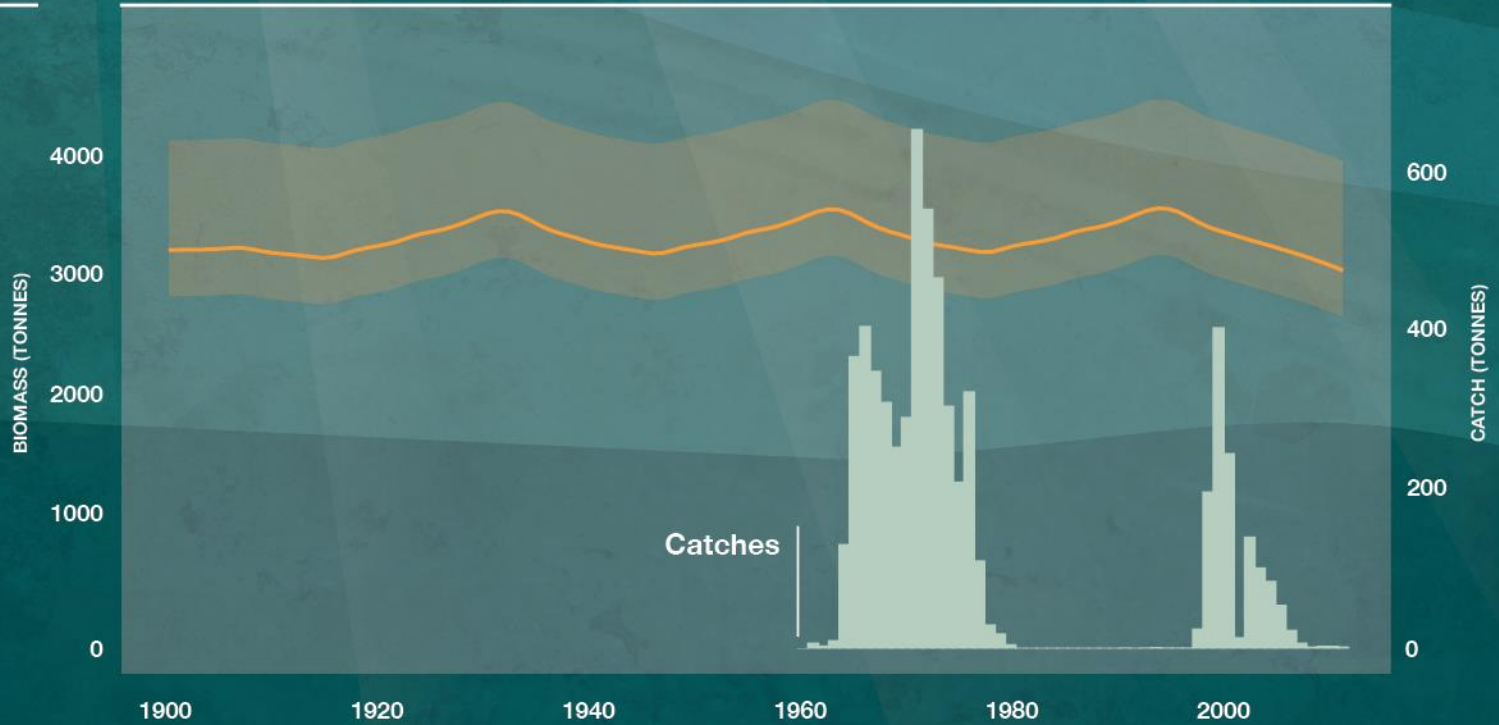
What Atlantis has shown us

Filter Feeders



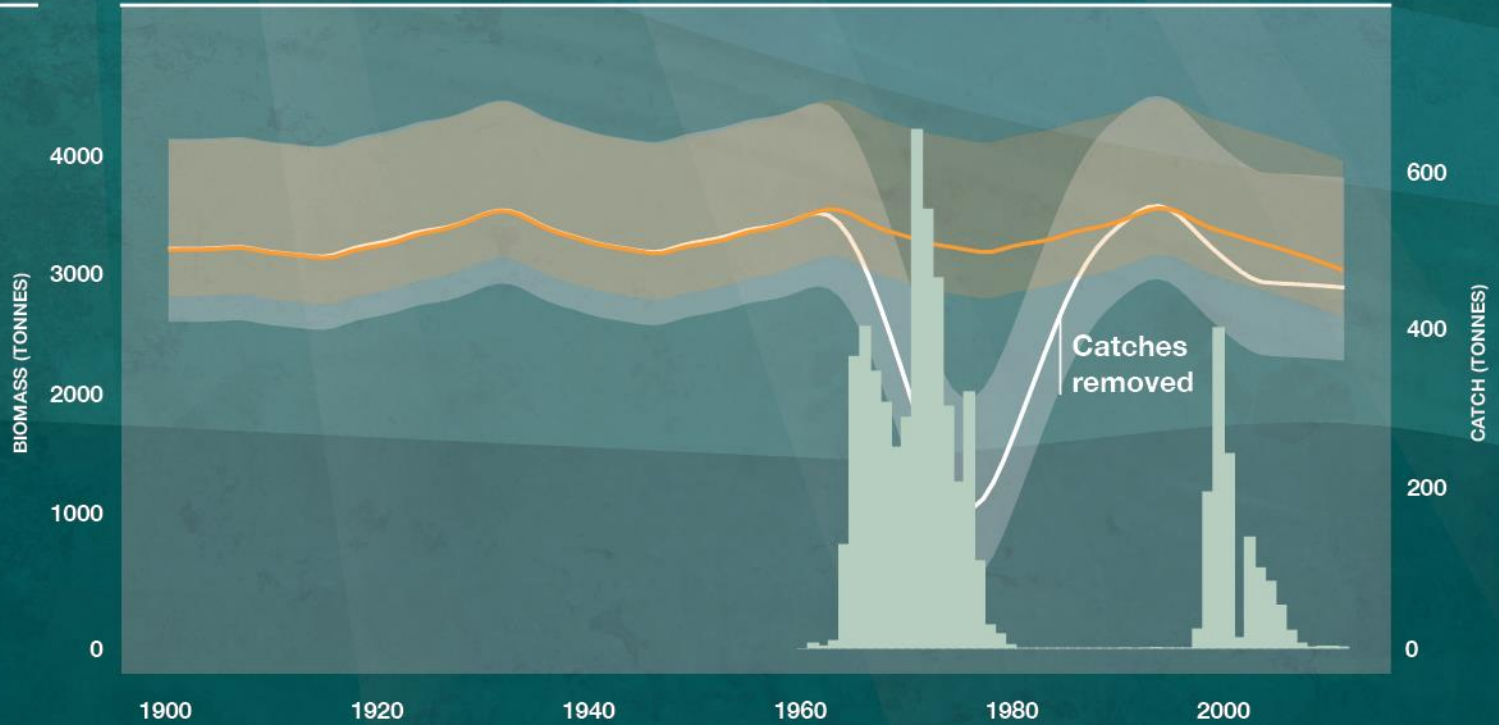
What Atlantis has shown us

Filter Feeders



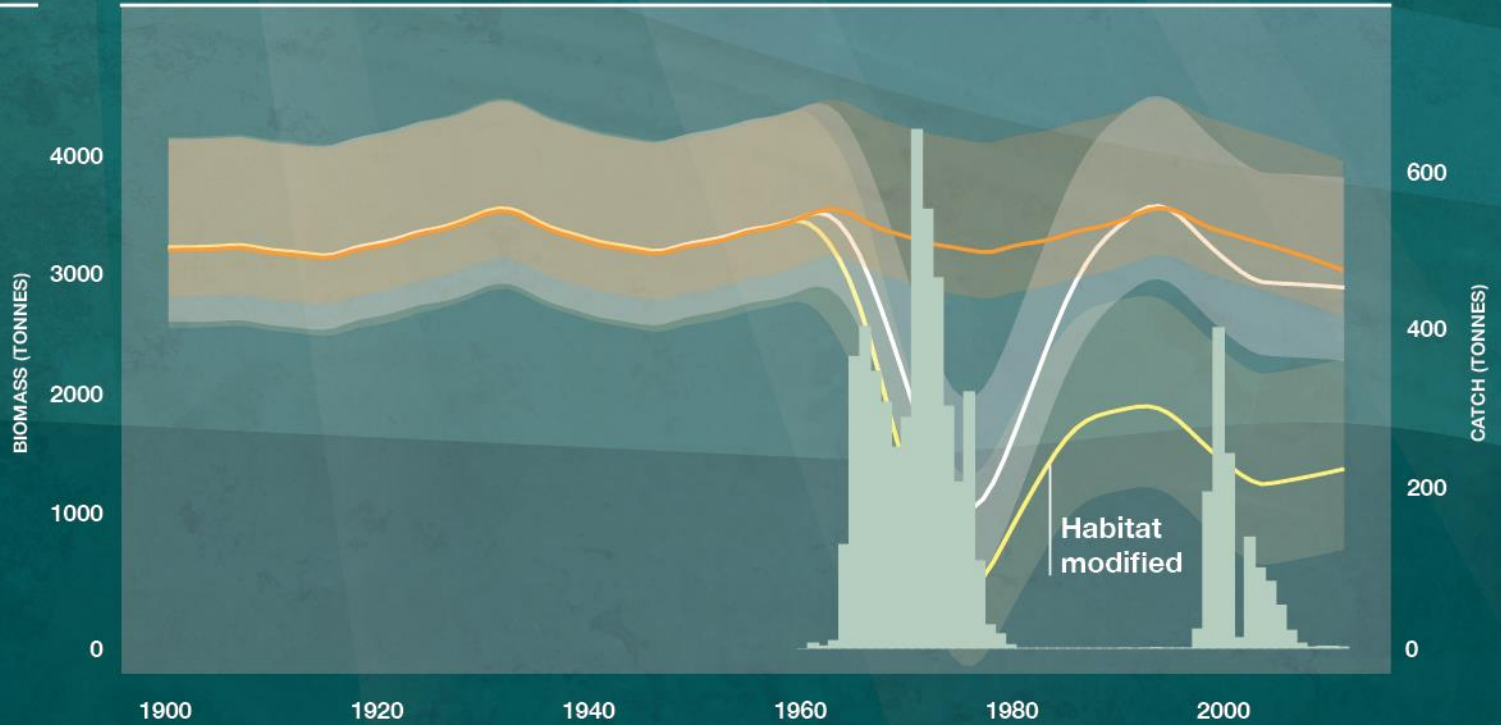
What Atlantis has shown us

Filter Feeders



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

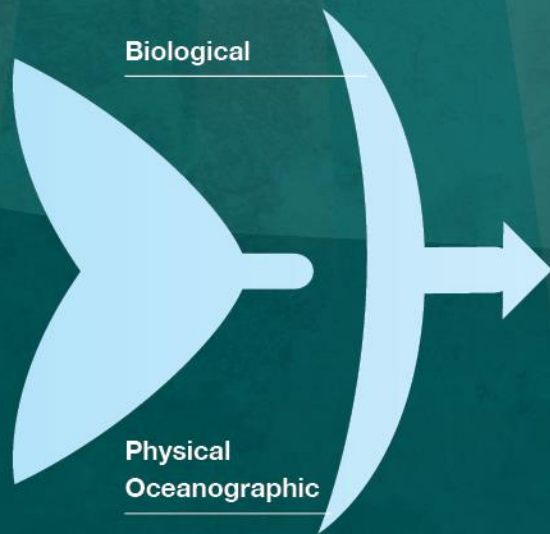
- **Functional forms**
 - **nutrient cycles**
 - **feeding and growth**
 - **spawning**

UNCERTAINTY

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

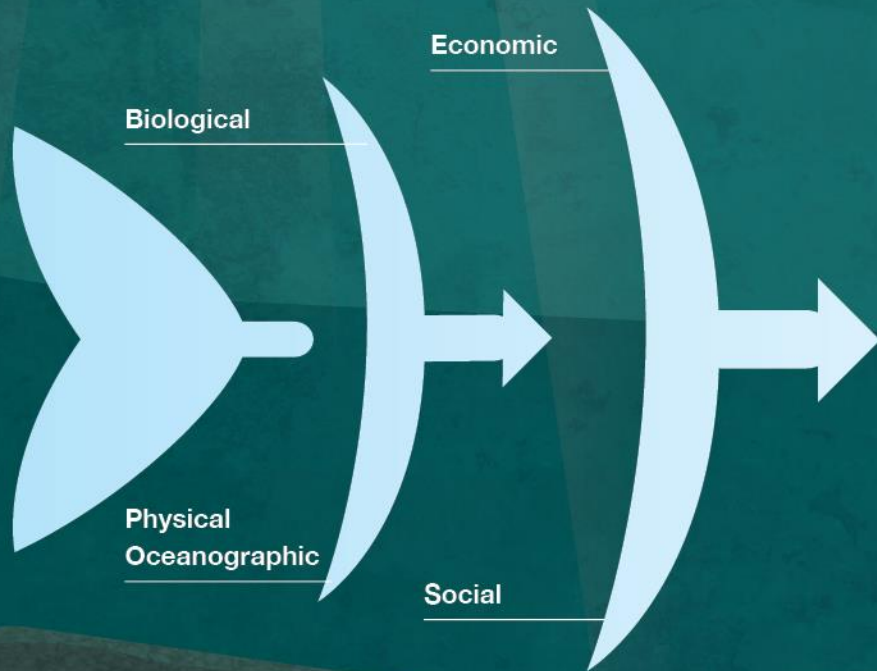
Understanding cause and effect

Cause



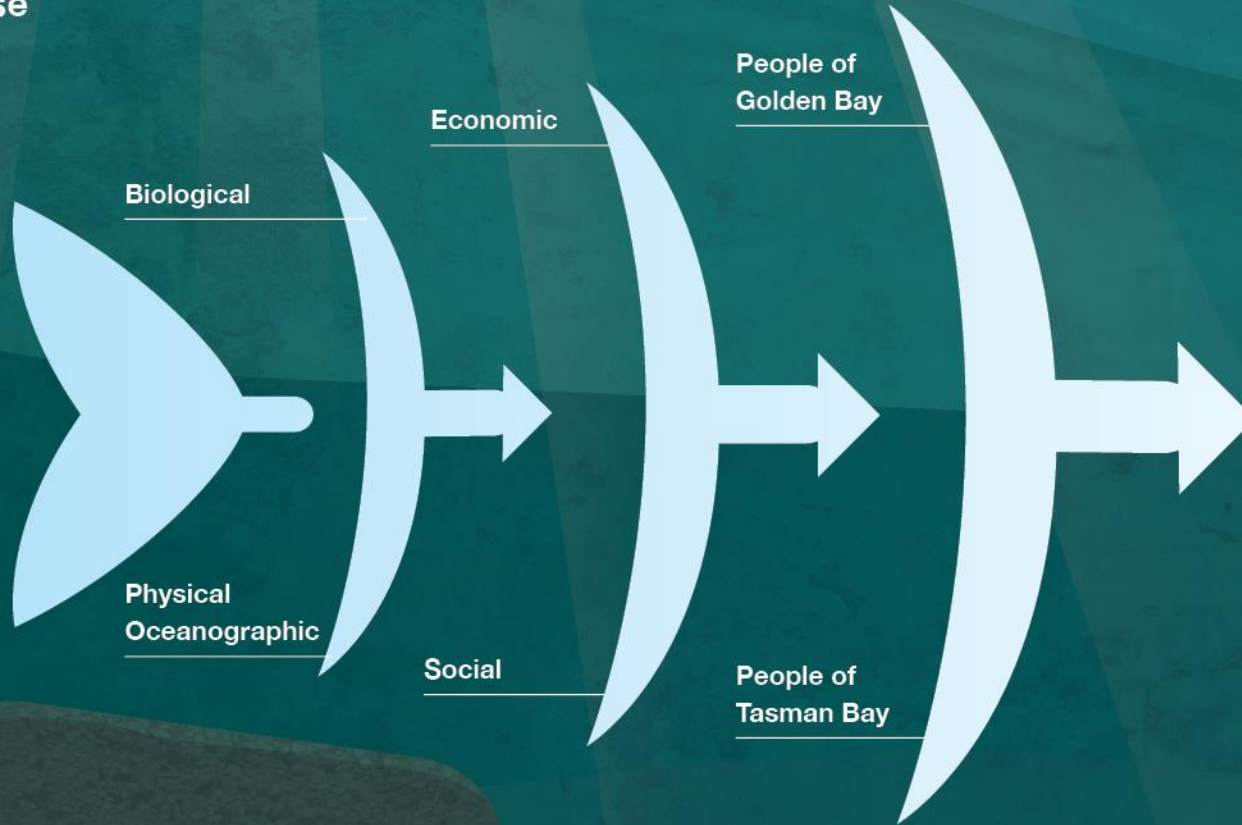
Understanding cause and effect

Cause



Understanding cause and effect

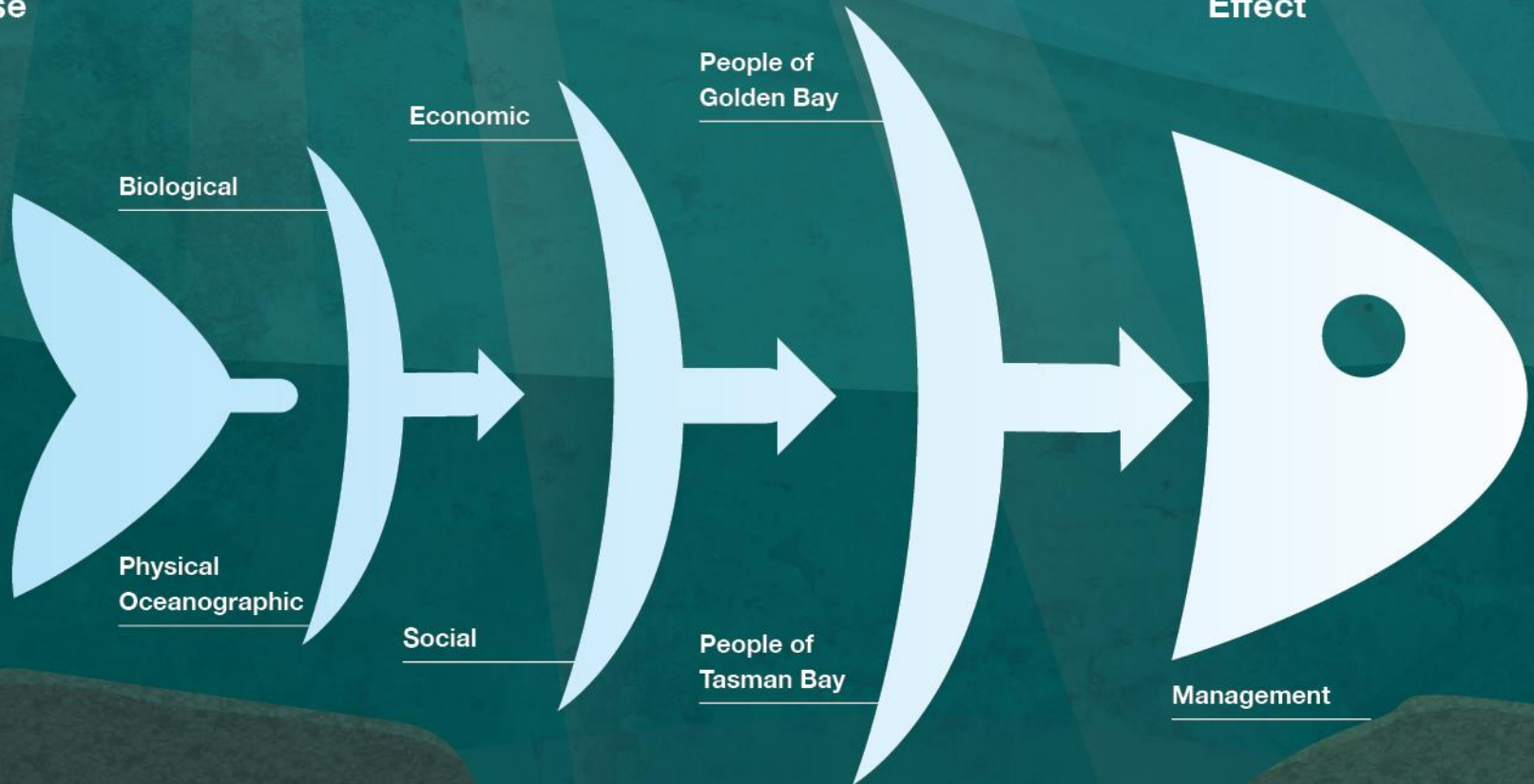
Cause



Understanding cause and effect

Cause

Effect



THANK YOU

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