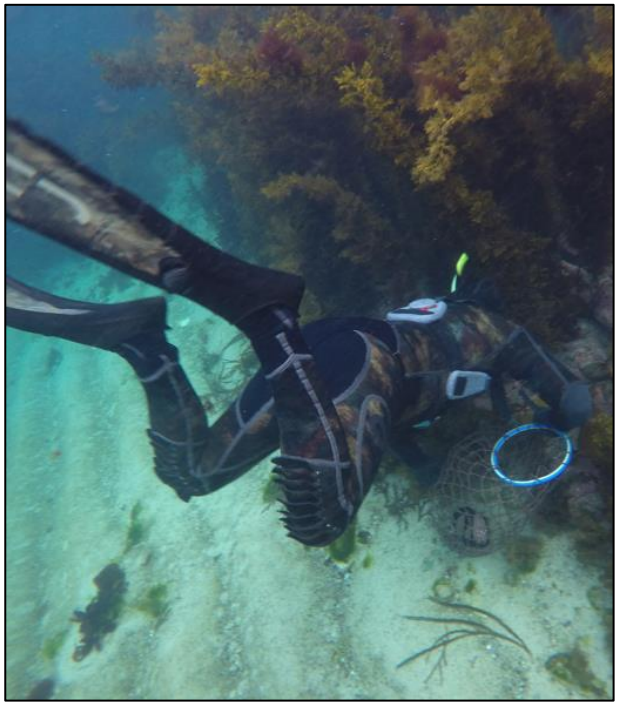
Enhancement of New Zealand's Commercial Abalone (Paua) Fishery


6th International Symposium on Stock Enhancement and Sea Ranching

Dr. Tom McCowan – Paua Industry Council Ltd., New Zealand

Outline

- New Zealand's abalone (paua) fishery
- Fisheries enhancement initiatives
  - Reseeding
- What have we learned? Where are we going?

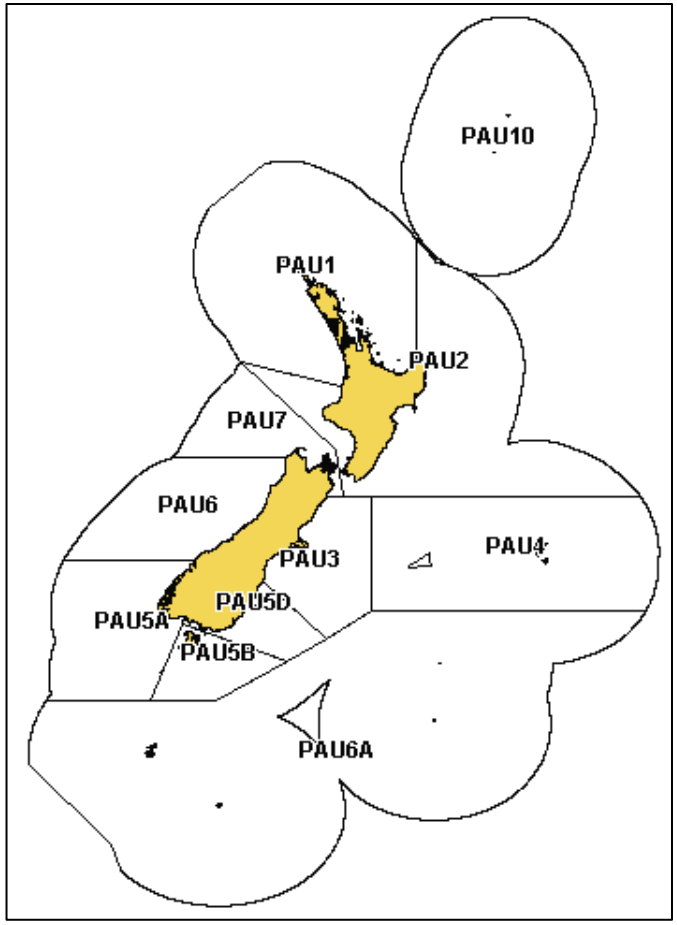

Canada
United States
Mexico
North Pacific Ocean
Japan
South Korea
Indonesia
Papua New Guinea
Australia
New Zealand
South Pacific Ocean
Venezuela
Colombia
Peru
Brazil
Bolivia
Chile
Argentina

New Zealand's abalone fishery

Blackfoot abalone (paua) – *Haliotis iris*

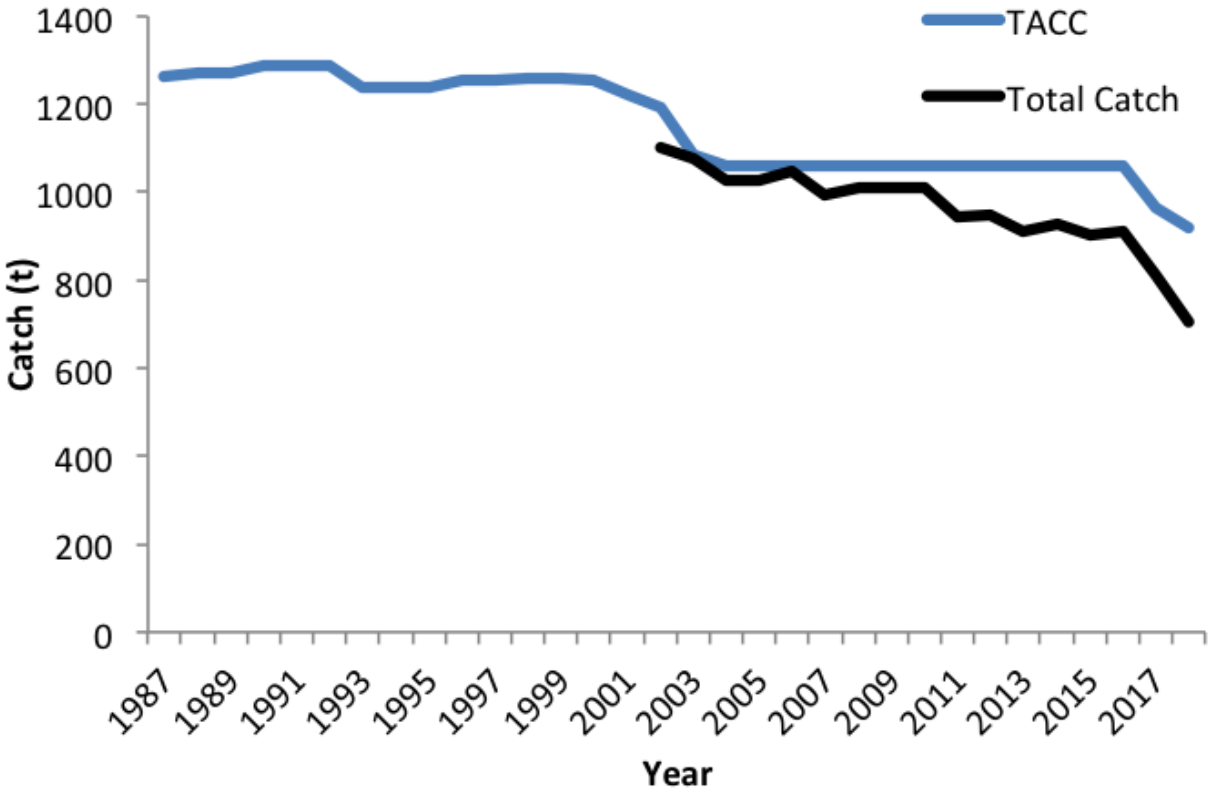
New Zealand's abalone fishery

- Current production: 705 t (TACC is 921 t)
- One of the last remaining wild abalone fisheries
- Quota Management System
  - Catch set over 7 regional management areas
  - Minimum legal size (125mm)
  - Free dive fishery



New Zealand's abalone fishery

Wild harvest



New Zealand's abalone fishery

Other Challenges:

- Increasing recreational effort
- Environmental stressors
  - Increasing SST
  - Ocean acidification
  - Sedimentation

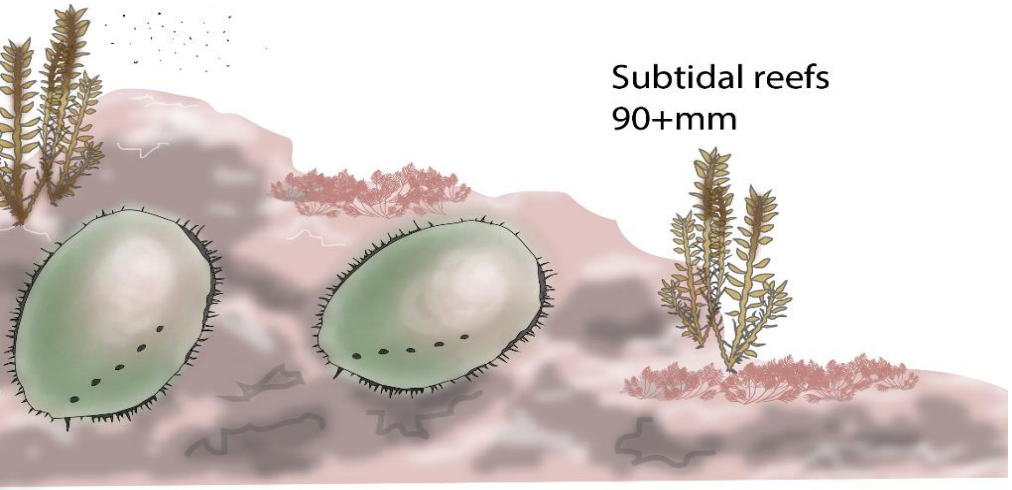
New Zealand's abalone fishery

Management

- Government (Fisheries New Zealand / MPI)
  - Catch limits and MLS
- The Paua Industry Council
  - Administrative, legal, policy and management support to quota owners
- PauaMACs
  - Regional management bodies

The paua life cycle

MARINE ECOLOGY RESEARCH GROUP
UNIVERSITY OF CANTERBURY, N.Z.



Paua Stock Enhancement (Reseeding)

- First declines in fisheries starting to be observed in in early 2000s
- Increasing interest in aquaculture and potential for enhancement
- Intuitive, simple, success in other species

Paua Reseeding

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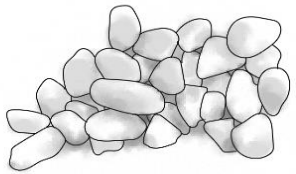
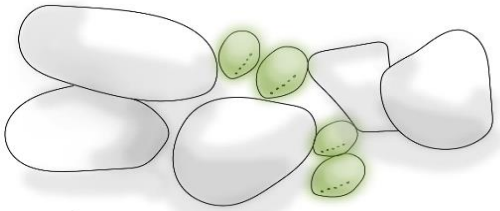
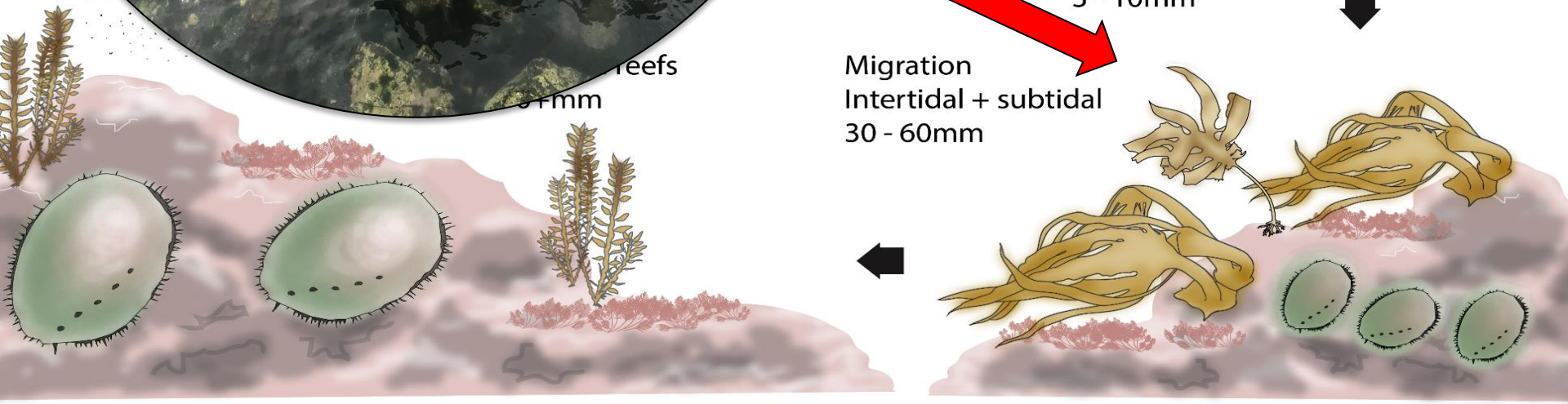


Cryptic
Intertidal/ subtidal
0.1 - 3mm



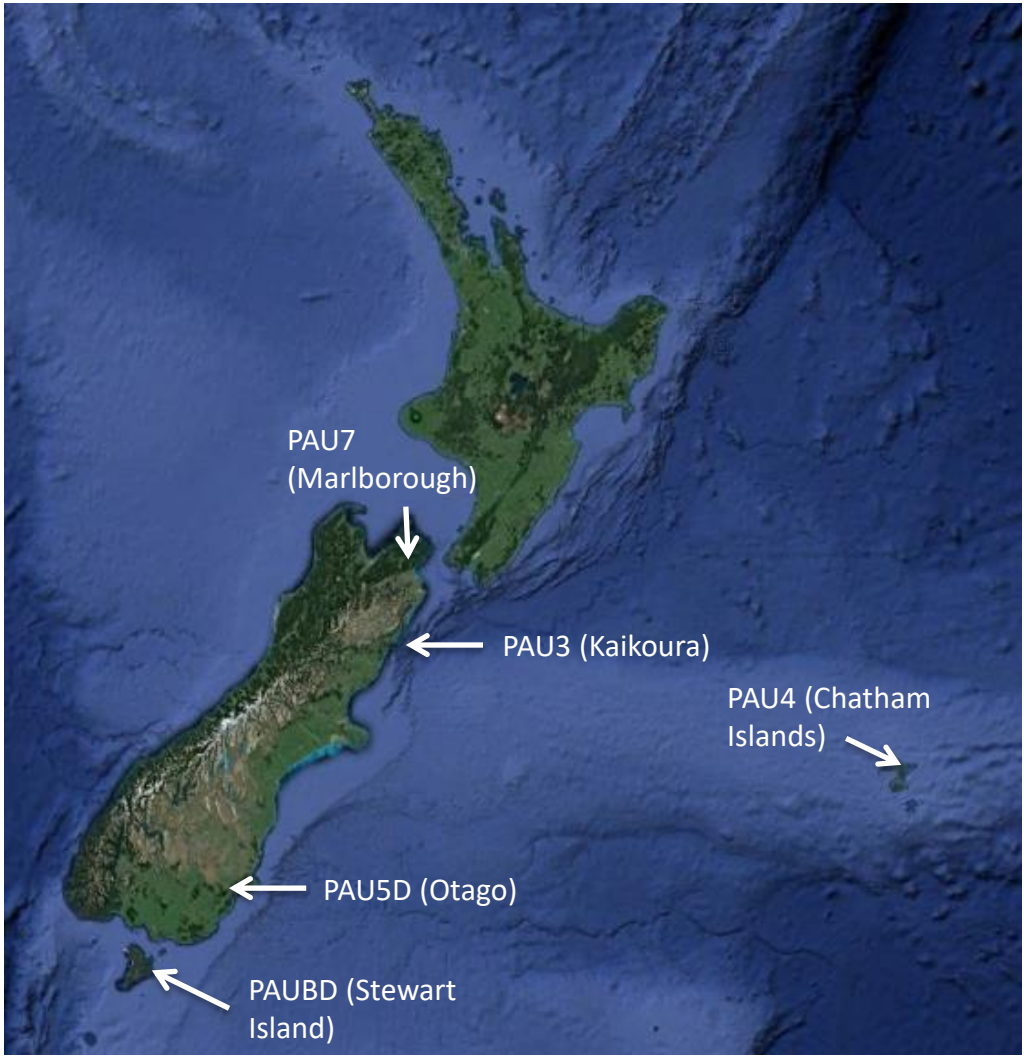
Emergent
Intertidal/ subtidal
3 - 10mm

Migration
Intertidal + subtidal
30 - 60mm



Paua Reseeding

- Scientific trials (since 1990s)
- Industry programs (early 2000s – present)

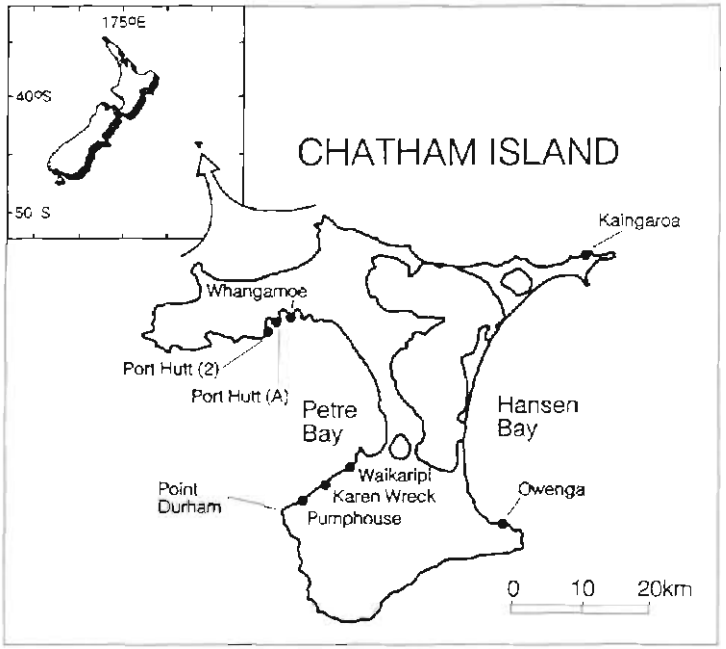


Paua Reseeding

Scientific trials

Scheil (1993) "Experimental evaluation of commercial-scale enhancement of abalone *Haliotis iris* populations in New Zealand"

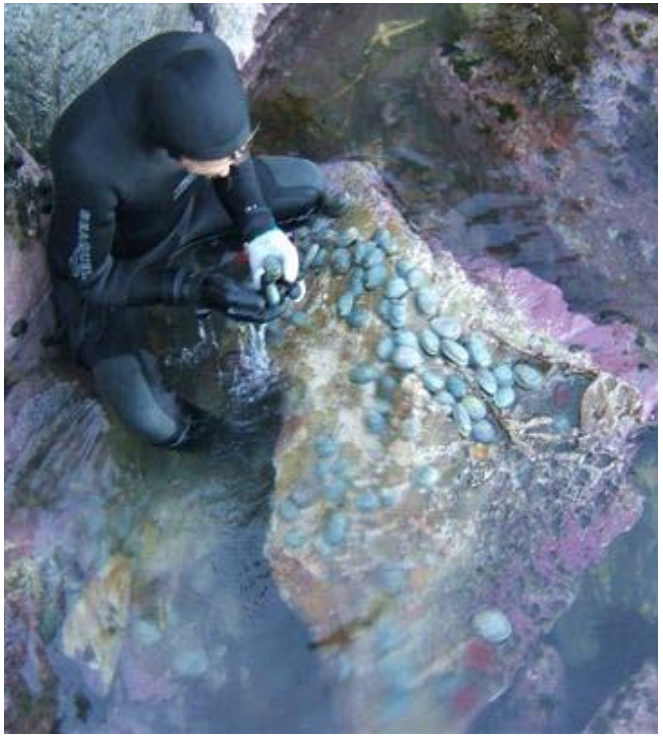
- 80,000 seed (3-30mm) over 8 sites
- High variability in mortality (27-98% annually)
- Mortality decreased with increased seed size
- Considered economically viable with careful site selection



Paua Reseeding

Scientific trials

Roberts et al (2007) "Viability of abalone (*Haliotis iris*) stock enhancement by release of hatchery-reared seed in Marlborough, New Zealand"

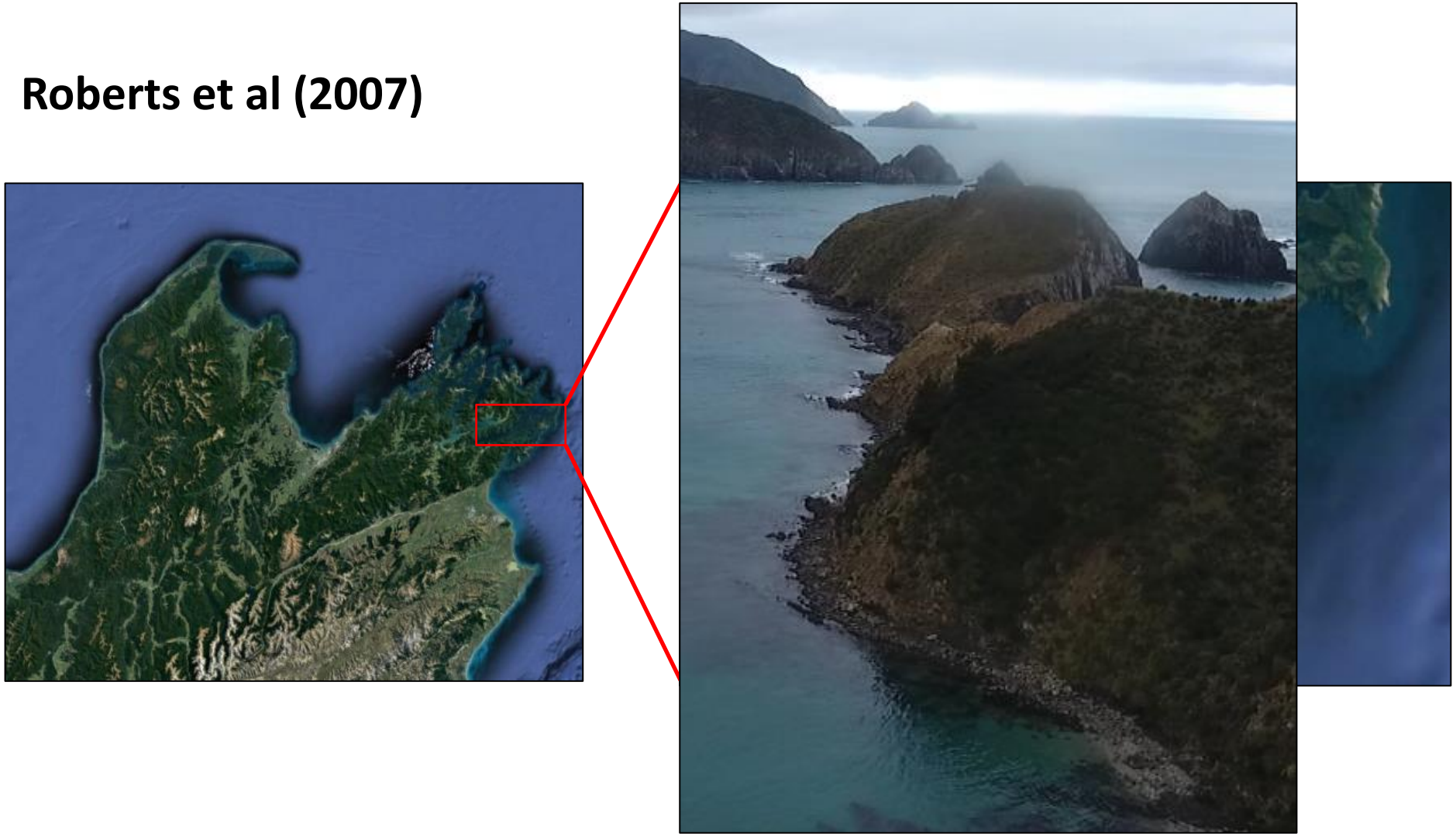


5 Year project investigating:

- Optimum seed size
- Optimum seeding density
- Survival to harvest (125mm)
- Growth through to harvest (125mm)
- Identify best seeding sites
- Economic viability of reseeding

Paua Reseeding

Roberts et al (2007)



Paua Reseeding

Roberts et al (2007)

- Natural and artificial release sites
- Adult shell for out-planting

Paua Reseeding

Roberts et al (2007)

- Measuring growth and survival

Paua Reseeding

Roberts et al (2007)

Findings:

- Observed ~13% survival after 2 years
- Modeled ~10.2% survival to harvest
- Optimum seed size of 10mm
- Densities of 50-300m^{-2} gave good survival and growth

Paua Reseeding

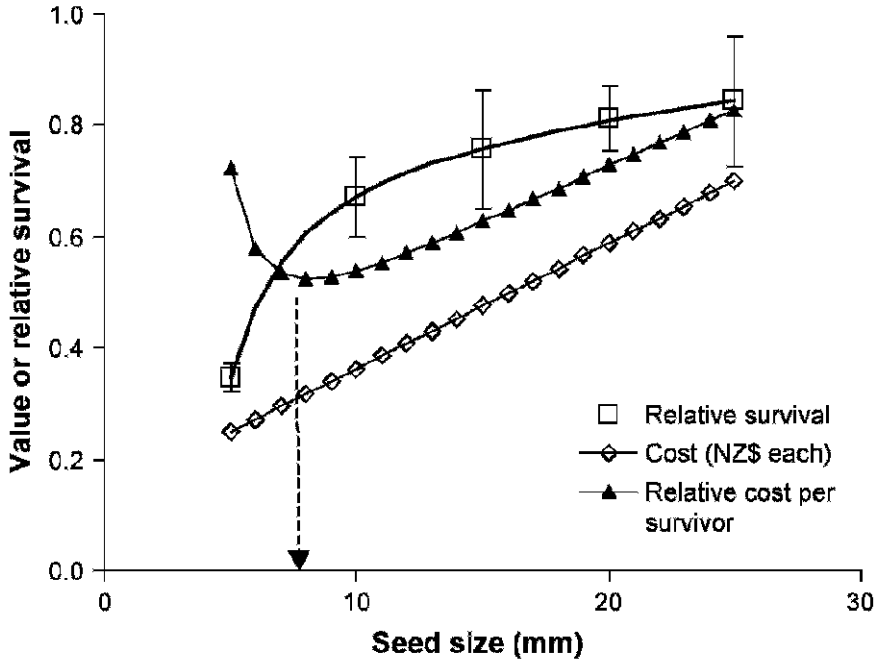
Roberts et al (2007)

Economic viability

- Modeled economic returns using:

[estimates of regulatory and admin costs, cost of seed, deployment, harvest, meat and shell price, survival, recovery, time to harvest, weight at harvest, mortality from survey to harvest]

- Modeled 20% return on investment with correct habitat selection for larger scale reseeding

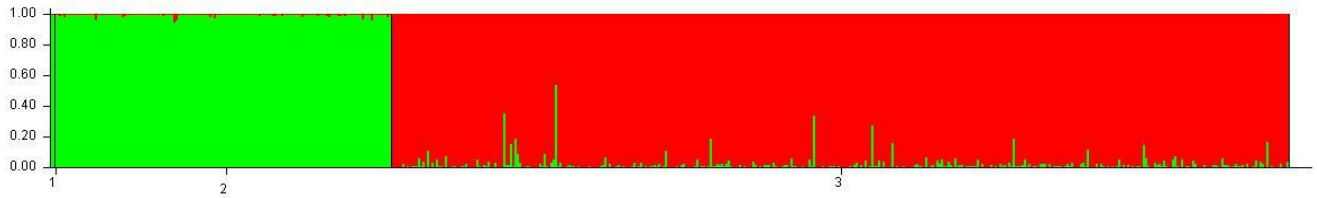


Paua Reseeding

Scientific trials

McCowan (2012) Using genetic markers to monitor survival rates of reseeding

- Microsatellite markers – genotyping of broodstock, reseed and mixed wild and reseed populations
- Parentage and population assignment
- Detect reseeds with high likelihood (>99%)



Paua Reseeding

Scientific trials

PauaMAC7 (2012-2017) Reseeding program and monitoring surveys

- Tory Channel – Reseeding events:
  - 2012 (99,100)
  - 2014 (60,000)

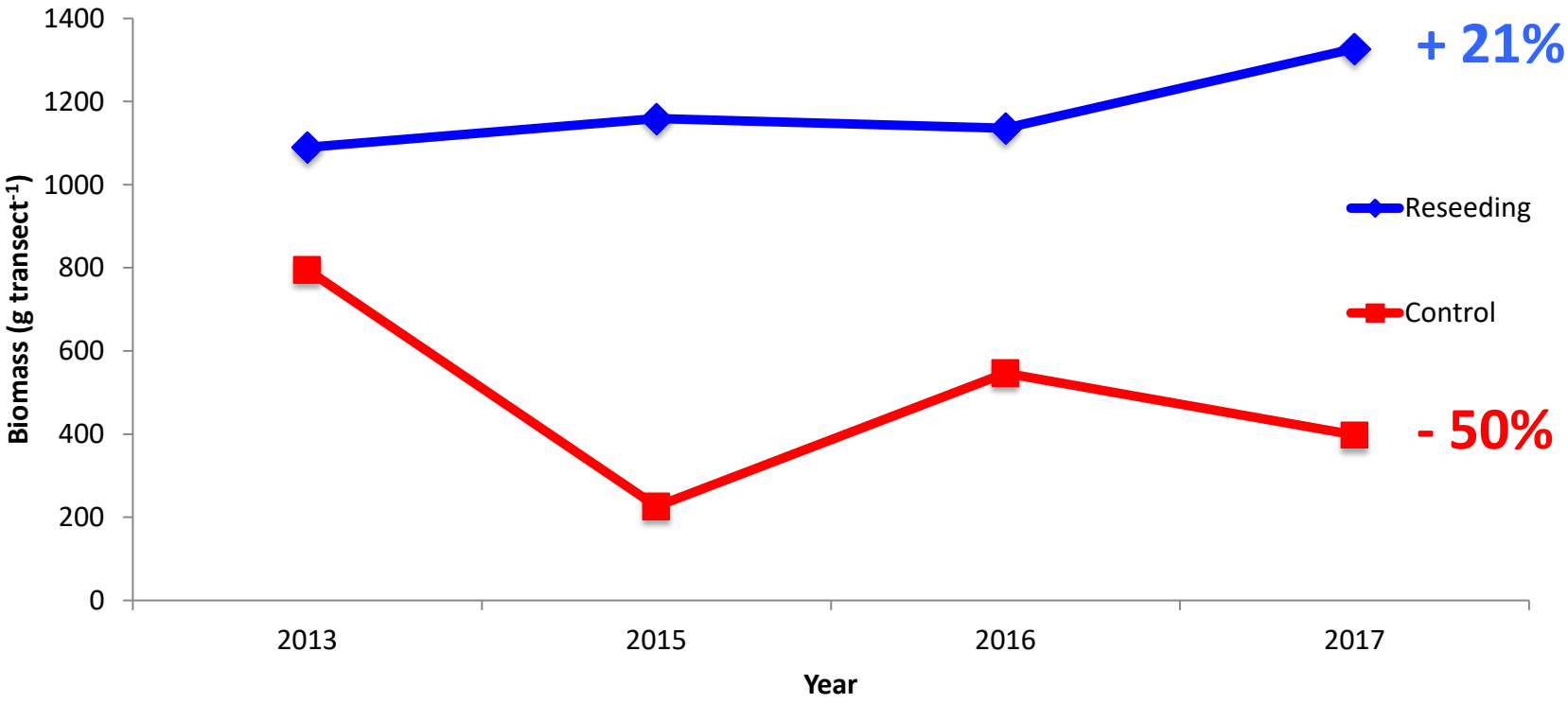
- Monitoring – reseed and control sites
  - Comprehensive transect surveys (2013, 2015, 2016 and 2017)
  - Genetic sampling (2016)


Control
Reseeding
Control


bluebridge.co.nz

Paua Reseeding

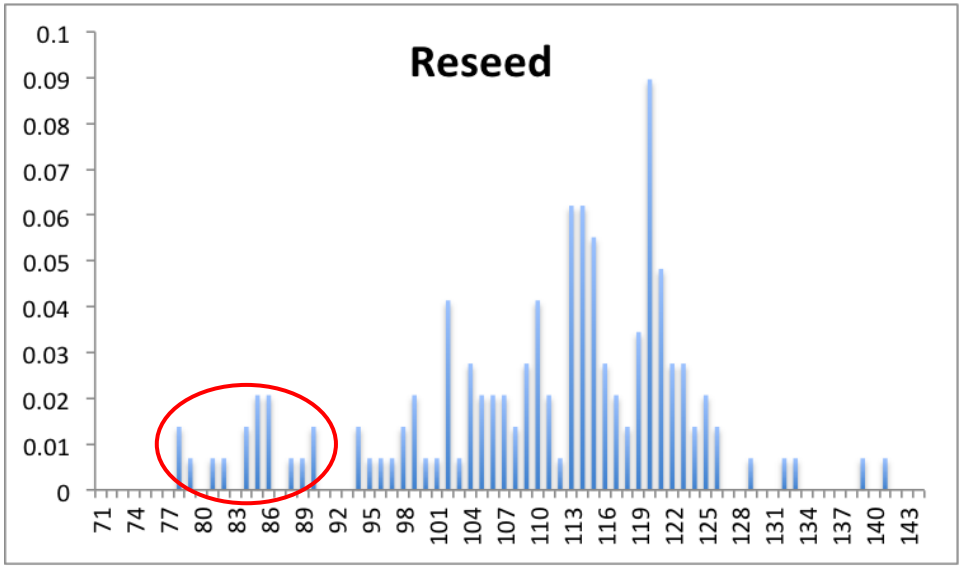
PauaMAC7 (2012-2017) Transect surveys – biomass

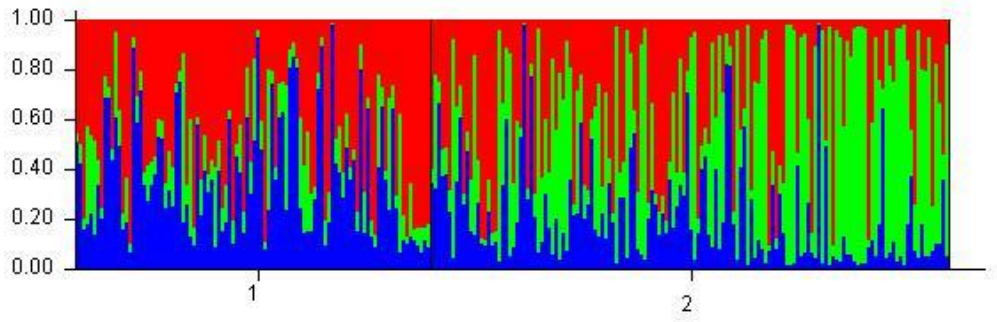


Paua Reseeding

PauaMAC7 (2012-2017) Genetic Sampling

- Estimated 30% of newly recruited biomass from reseeding





Paua Reseeding

PauaMAC7 (2012-2017)

Findings:

- Detectable increase in biomass in reseeded sites – 21%
- Estimated 30% attributable to reseeding
- No increase in catches (decrease)
- Survival rates? Viability?

Paua Reseeding

Industry trials

- Reseeding – 20 separate events across regions, between 100 to 60,000 seed released since 2002
- Larval seeding – 16 million larvae released 2001

- Limited surveys/quantification of success

- Anecdotal observations suggest increase in abundance

Paua Reseeding

Current programs

Post-Kaikoura Earthquake – education program

14 November 2016
7.8 Mw

Raised seabed off Kaikoura coast baffles marine experts

JACK FLETCHER
Last updated 14:33, November 16 2016

Trevor Burkhart

Co-seismic movement, the seismic release of energy along a fault, is behind the lifted seabed.

Coastal uplift up to 5m

High paua mortality

Massive loss of habitat


FISHERY CLOSED
Coromandel
Coordinates
For further information please phone MPI info line 0800 00 83 83

Paua Reseeding

Current programs

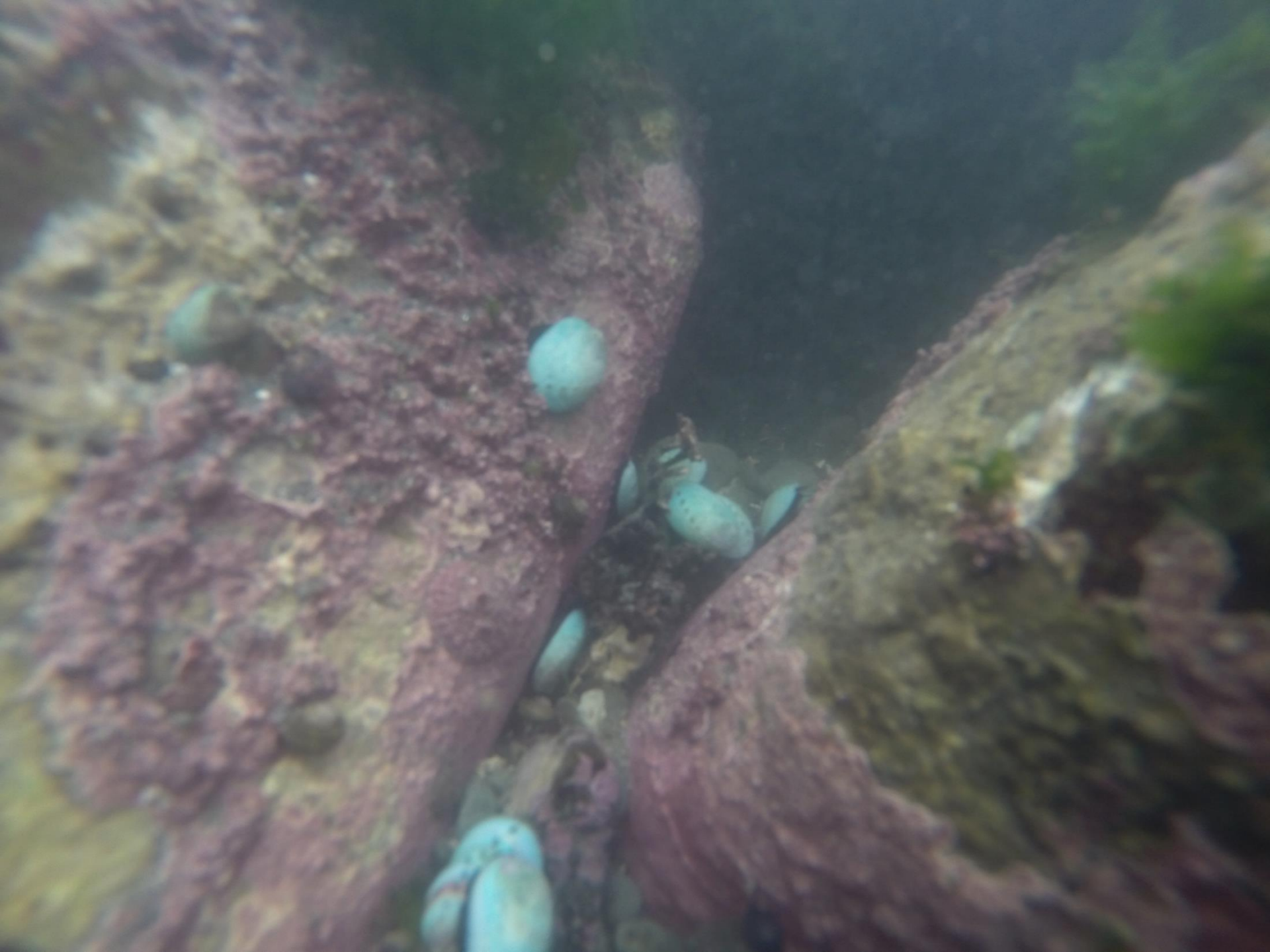
Post-Kaikoura Earthquake – education program

- Government support
- Integration into High School teaching program
- Establishment of local hatchery
- Reseeding into severely depleted areas

Reseeding
May 2018
167,000 juveniles
5 locations
(10-20mm)

Baseline abundance surveys

DNA references



Paua Reseeding

Where are we at?

- Currently limited interest in commercial scale reseeding
- Isolated programs where extra funding has been available
- Targeting only areas of severely depleted biomass
- Beneficial as ‘PR’

Paua Reseeding

What have we learned?

Out-planting methods

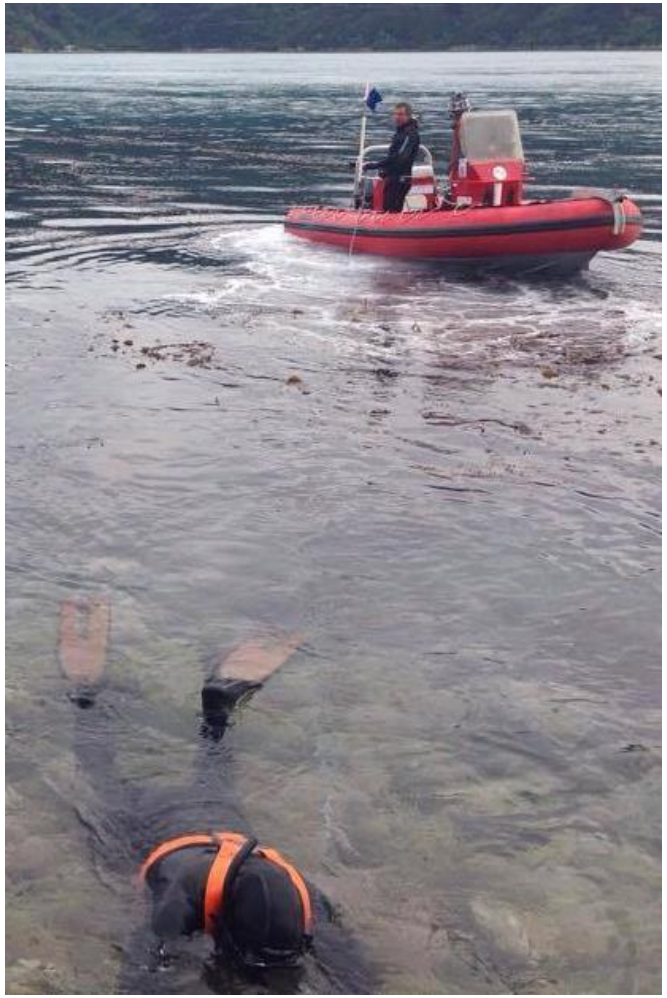
- Optimum seed size (10mm)
- Optimum density (~50 m^{-2})
- Deployment techniques
- Best habitats

Monitoring

- Artificial reefs vs. natural habitats
- Measured increase in emergent abundance
- Ability to distinguish between wild and reseeds

Viability

- Observed ~13% survival after 2 years
- Modeled ~10.2% survival to harvest
- 'Return on investment' 20% yr^{-1} at 10% survival to harvest

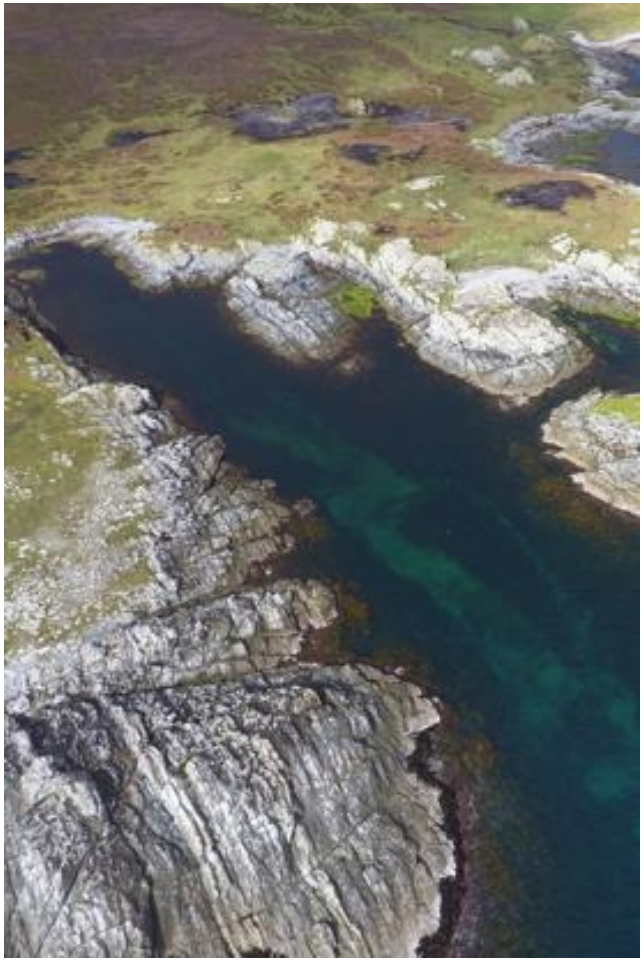


Paua Reseeding

What's holding us back?

Industry buy-in and funding

- All industry funded
- Lack of confidence and unity
- Ownership of enhanced stocks?
  - Commercial
  - Recreational
  - Customary (sub-MLS)
- Currently in a climate of ongoing catch reductions
- Money better spent on other initiatives?



Paua Reseeding

What's holding us back?

Seed production

- Cost - interest in larval reseeding to overcome this
- Reliable supply
- Disease testing can be prohibitive

Defining goals

- Increasing biomass ✓
- Economic viability ✓
  - Return on investment ✗
  - …or catch increase?

Paua Reseeding

The way forward?

External funding

- Sharing the costs (and benefits) across all sectors will increase buy-in

Seed supply

- Increase scale of production to increase reliability and reduce costs
- Larger seed?

Future role of enhancement

- For locally depleted areas
- Overcoming environmental challenges


Thank you