



**NIWA**

Taihoru Nukurangi

Climate, Freshwater & Ocean Science

# Status of blue cod off Kaikōura

MPI project KAI2016-09

Mike Beentjes (NIWA)

27 June 2018  
(Memorial Hall, Kaikōura)

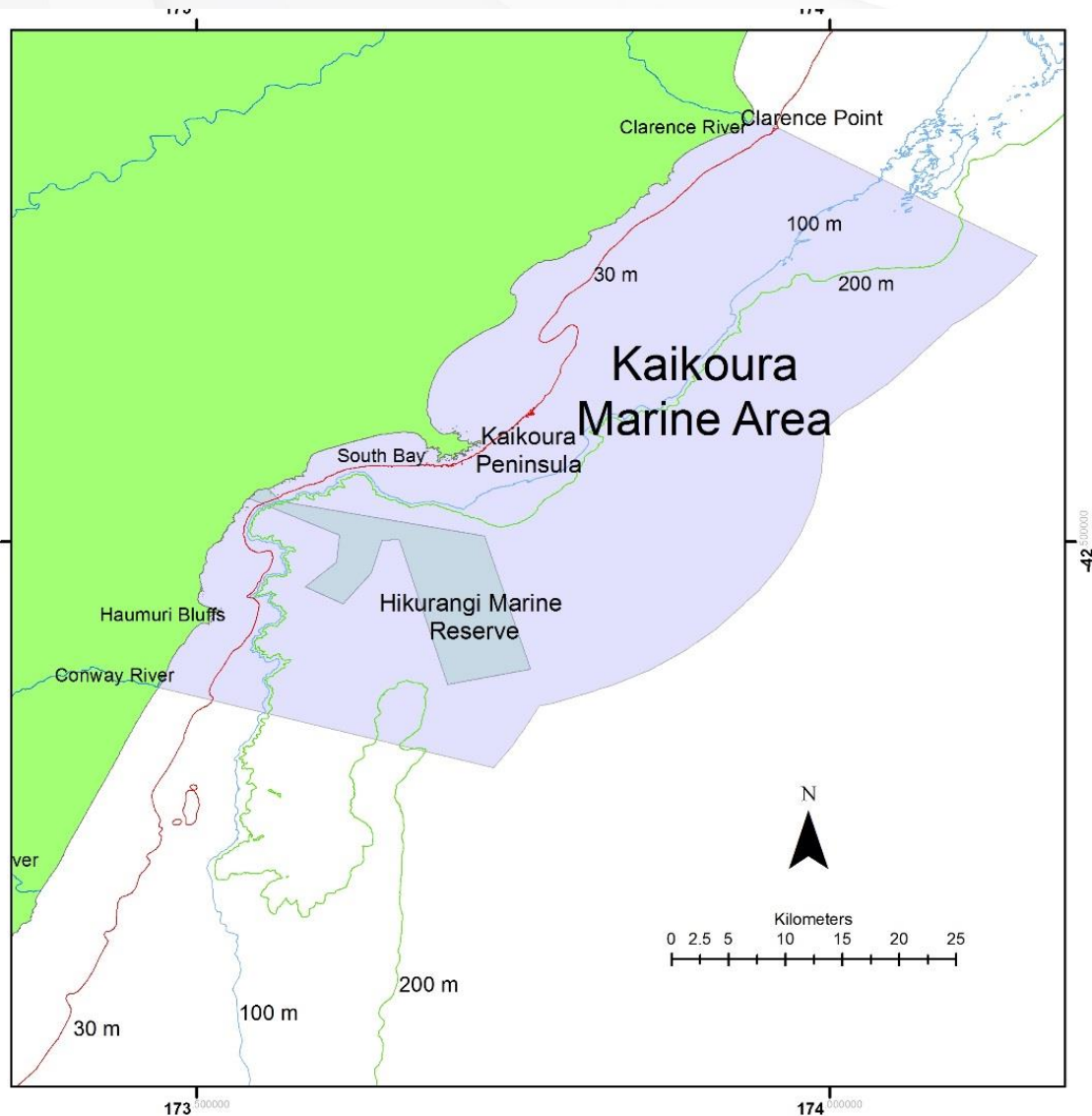
## **Overall Research Objective**

To conduct and analyse a blue cod potting survey along coastal Kaikōura.

## **Specific Research Objectives**

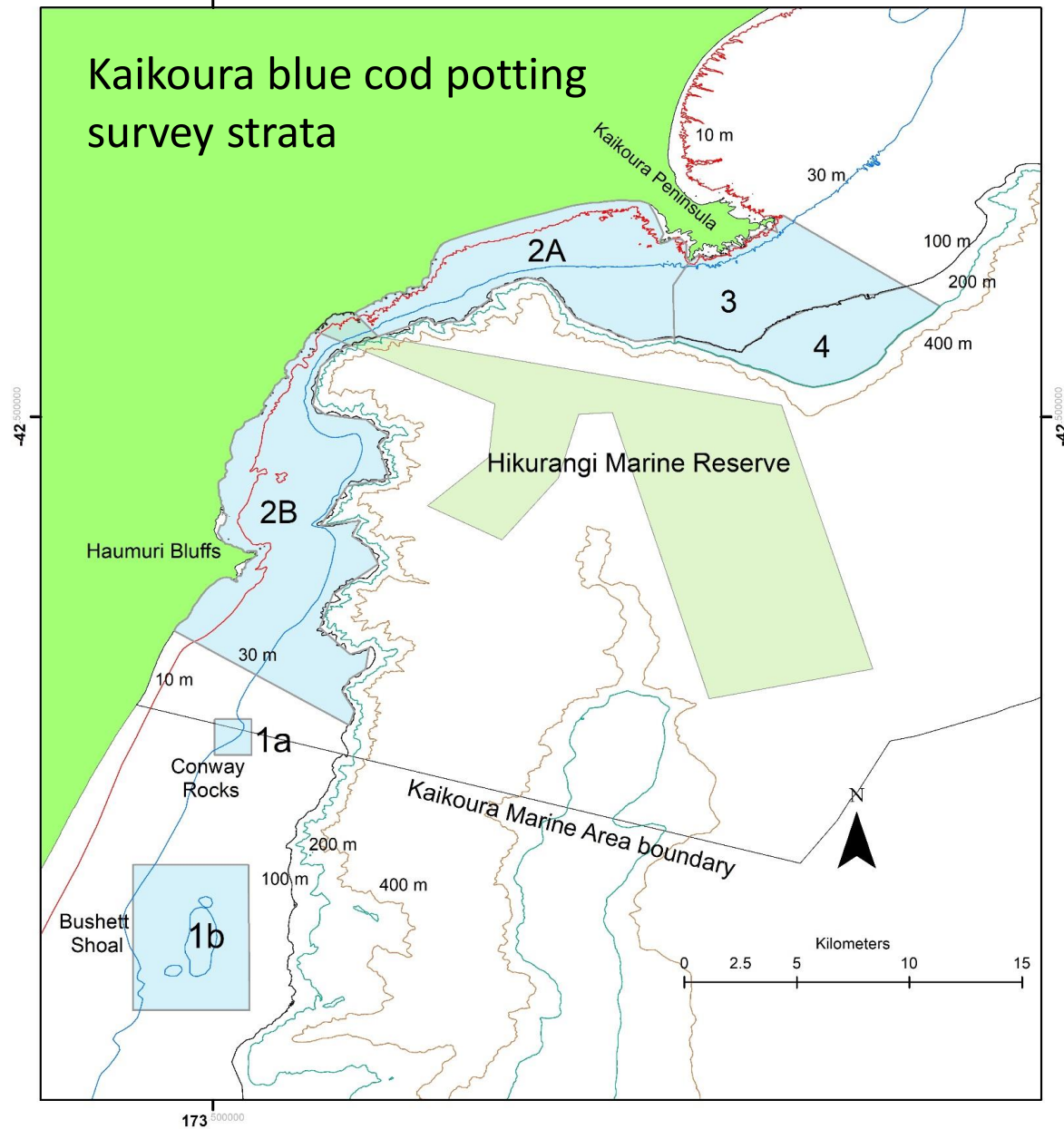
- Estimate abundance of blue cod
- Estimate the size composition of blue cod
- Estimate the age composition of blue cod
- Estimate the sex ratio of blue cod

Use the results of the survey to assess the ecological impact of the November 2016 earthquake on the Kaikōura blue cod population



- Established in 2014, along with the Hikurangi Marine Reserve
- Inside Kaikōura Marine Area  
MLS = 33 cm  
daily bag limit = 6 blue cod
- Outside Kaikōura Marine Area  
MLS = 30 cm  
daily bag limit = 10 blue cod

# Kaikoura blue cod potting survey strata





## **Blue cod pots:**

Deploy six blue cod pots at each site baited with paua viscera in snifter pottles.



NIWA inshore research vessel *Ikatere*.  
Aluminum alloy catamaran  
13.9 m length



Setting a pot from *Ikatere*



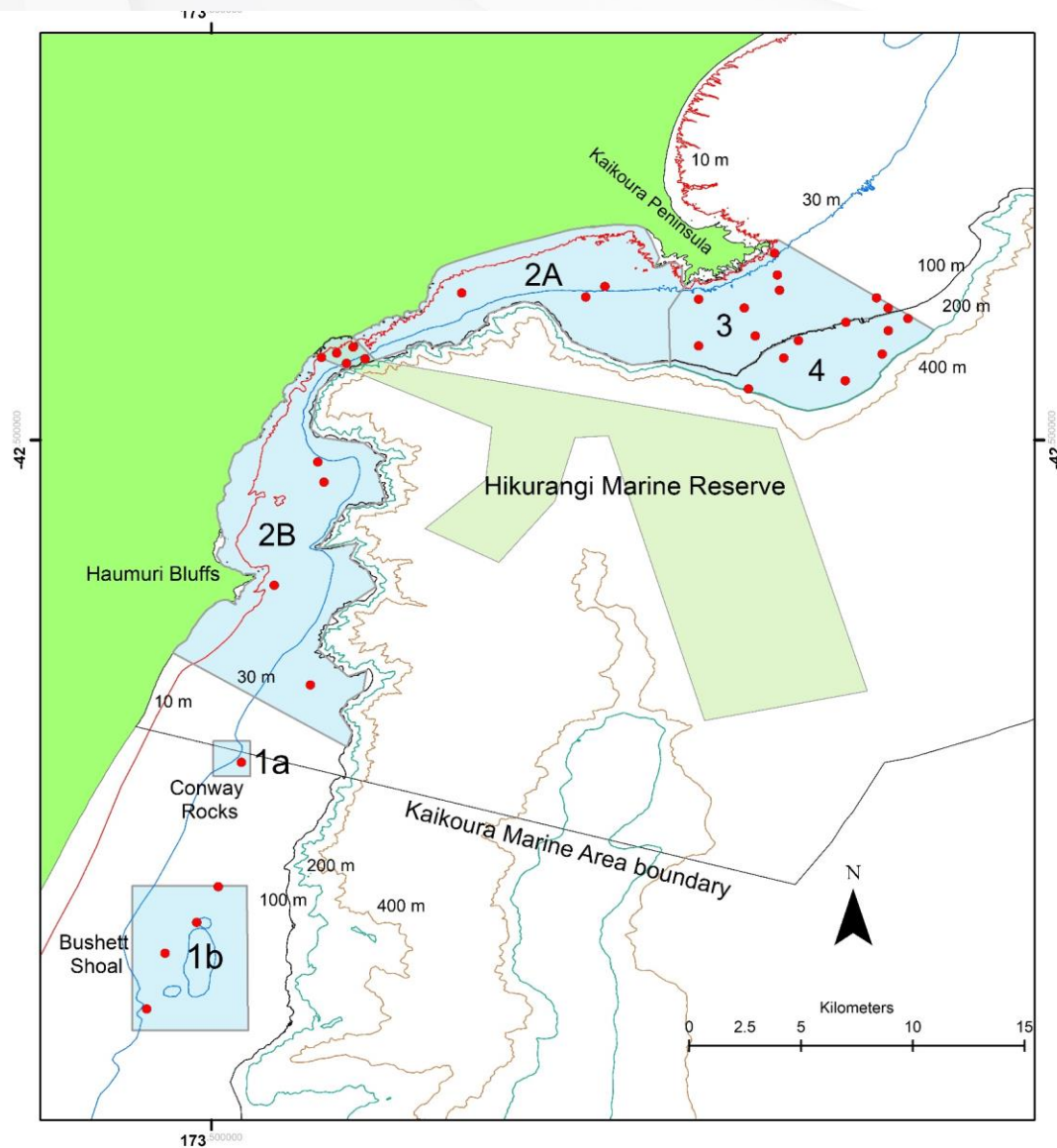
Climate, Freshwater & Ocean Science



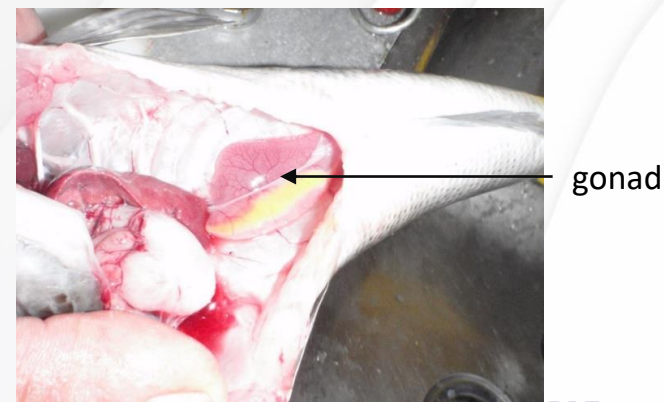
An underwater photograph showing several blue cod fish trapped inside a fishing pot. The pot is constructed from a diamond-shaped mesh net supported by a wooden frame. The fish are silvery with a dark lateral stripe. The water is clear and blue. The text "Blue cod inside a pot" is overlaid in the upper center of the image.

Blue cod inside a pot



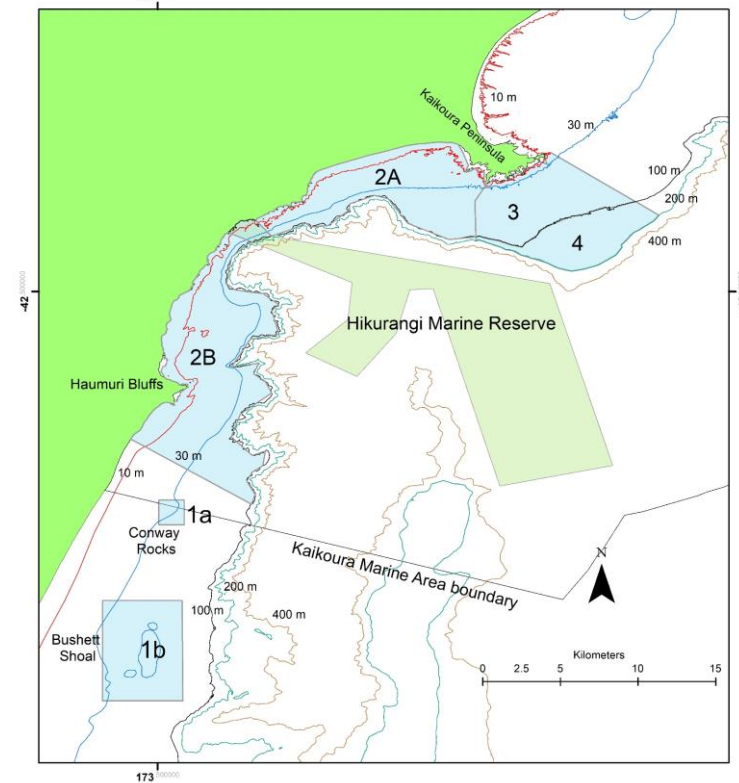
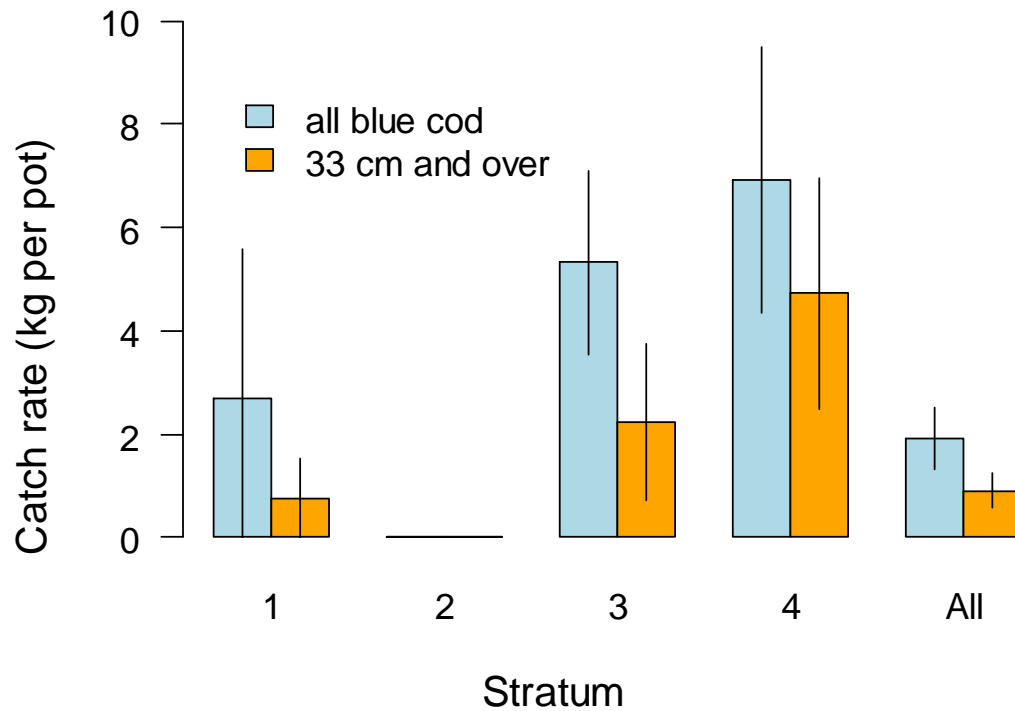


- 29 random sites from 11–121 m depth were surveyed in December 2017
- Six pots were set at each site (=174 pots)
- Captured blue cod were
  - weighed
  - measured for length
  - sex determined from visual examination of the gonad
  - otoliths (= ear bones) removed for determining age



# Blue cod abundance

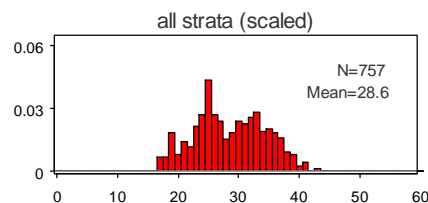
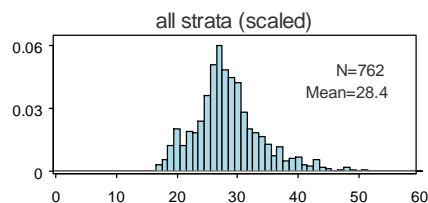
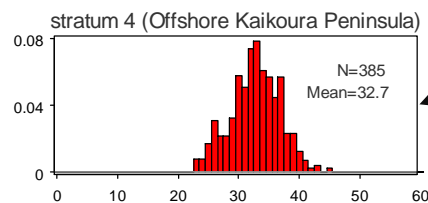
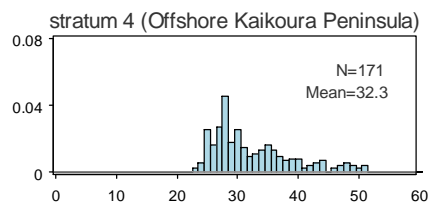
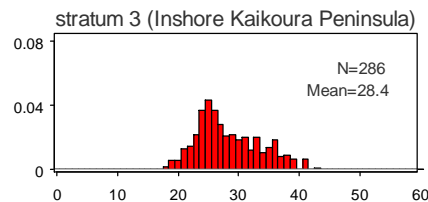
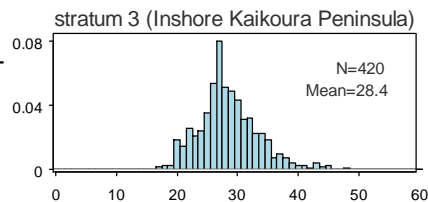
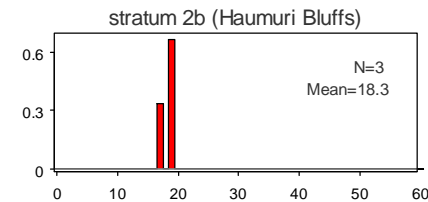
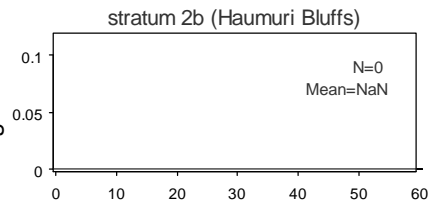
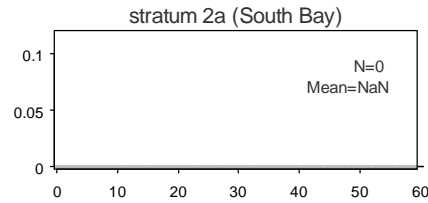
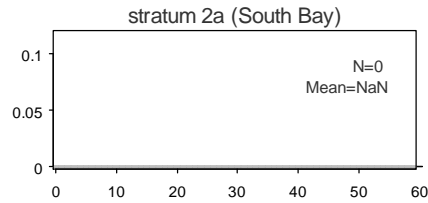
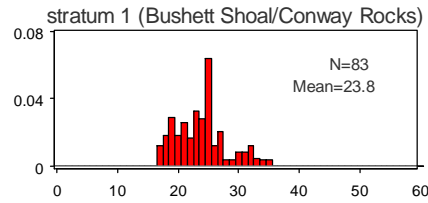
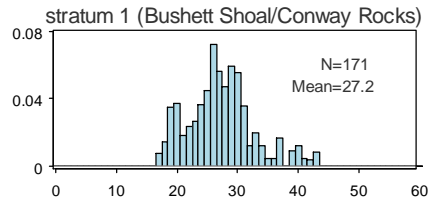
Kaikoura 2017 (random sites)



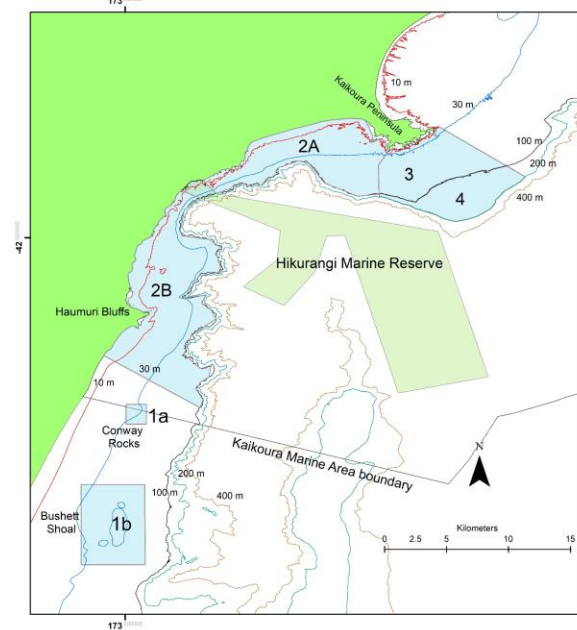
# Kaikoura 2017 (random sites)

## Males

## Females



Length (cm)



Males and females were larger in offshore Kaikoura Peninsula

Twice as many females than males in offshore Kaikoura Peninsula

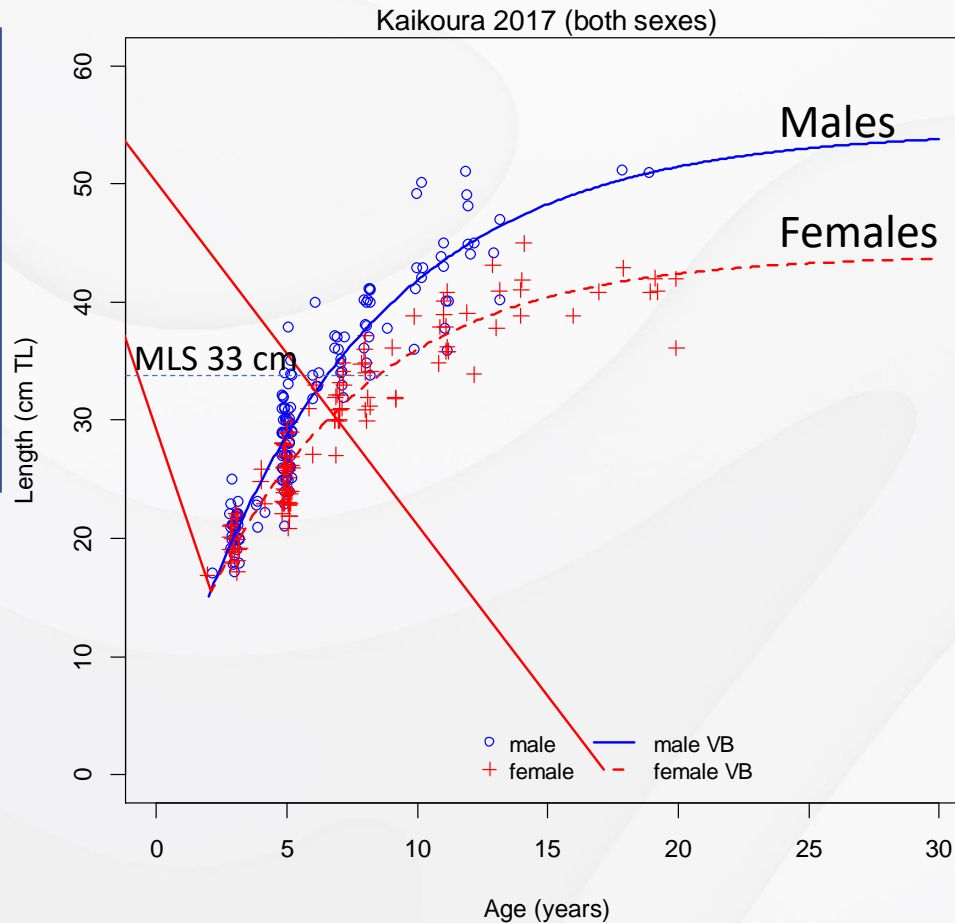
Spawning occurring in offshore Kaikoura



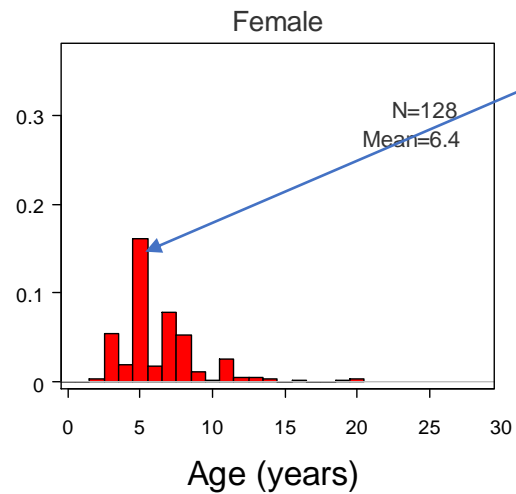
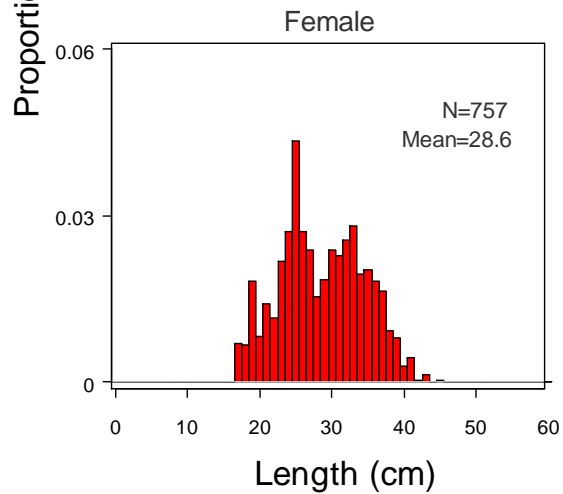
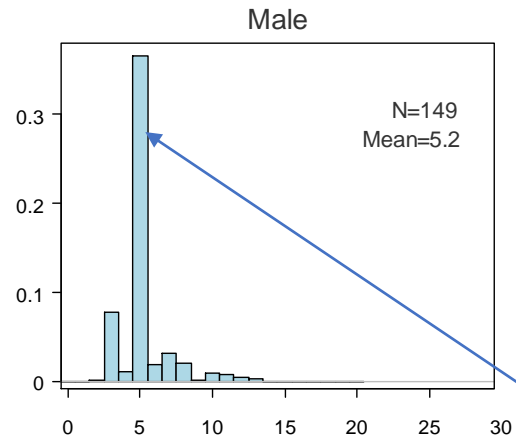
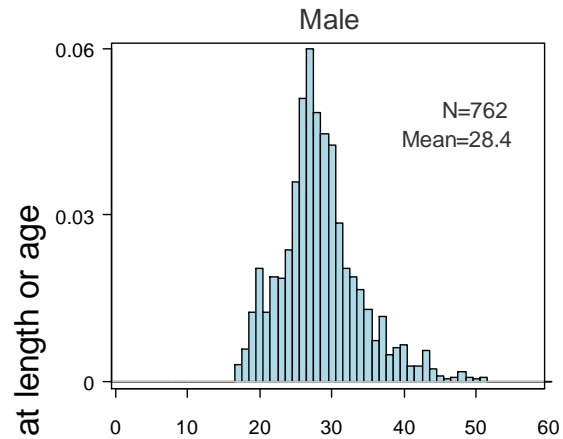
## Blue cod otolith (ear bone)

Blue cod can  
change sex from  
female to male

Age at MLS:  
males - 6 years  
Female - 8 years



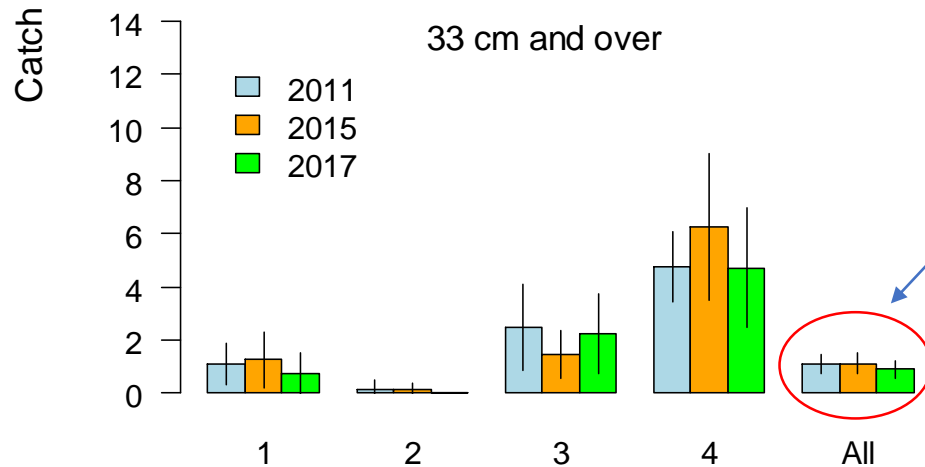
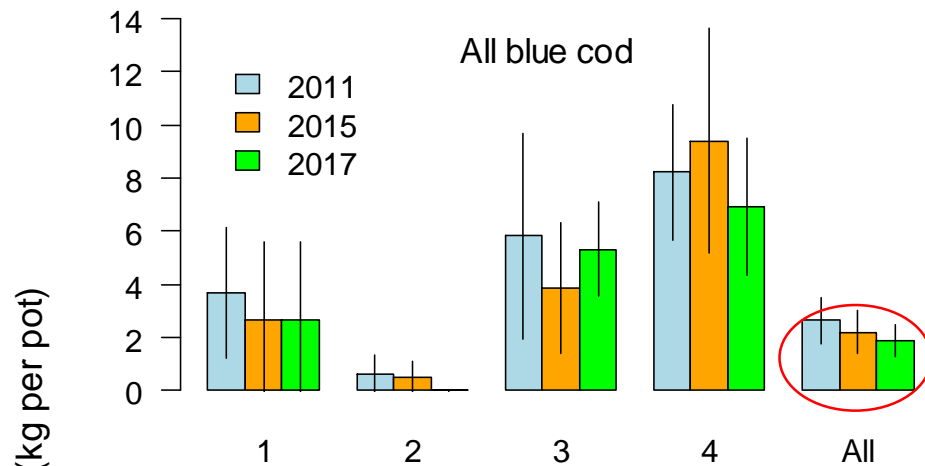
Annual  
growth  
rings



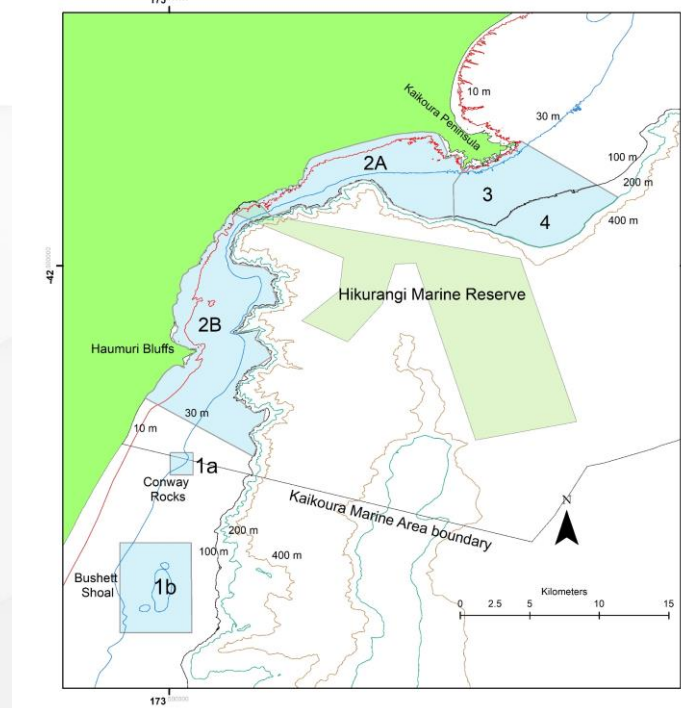
Strong 5-year- old modes

# Blue cod abundance over time

## Kaikoura random site surveys



Stratum

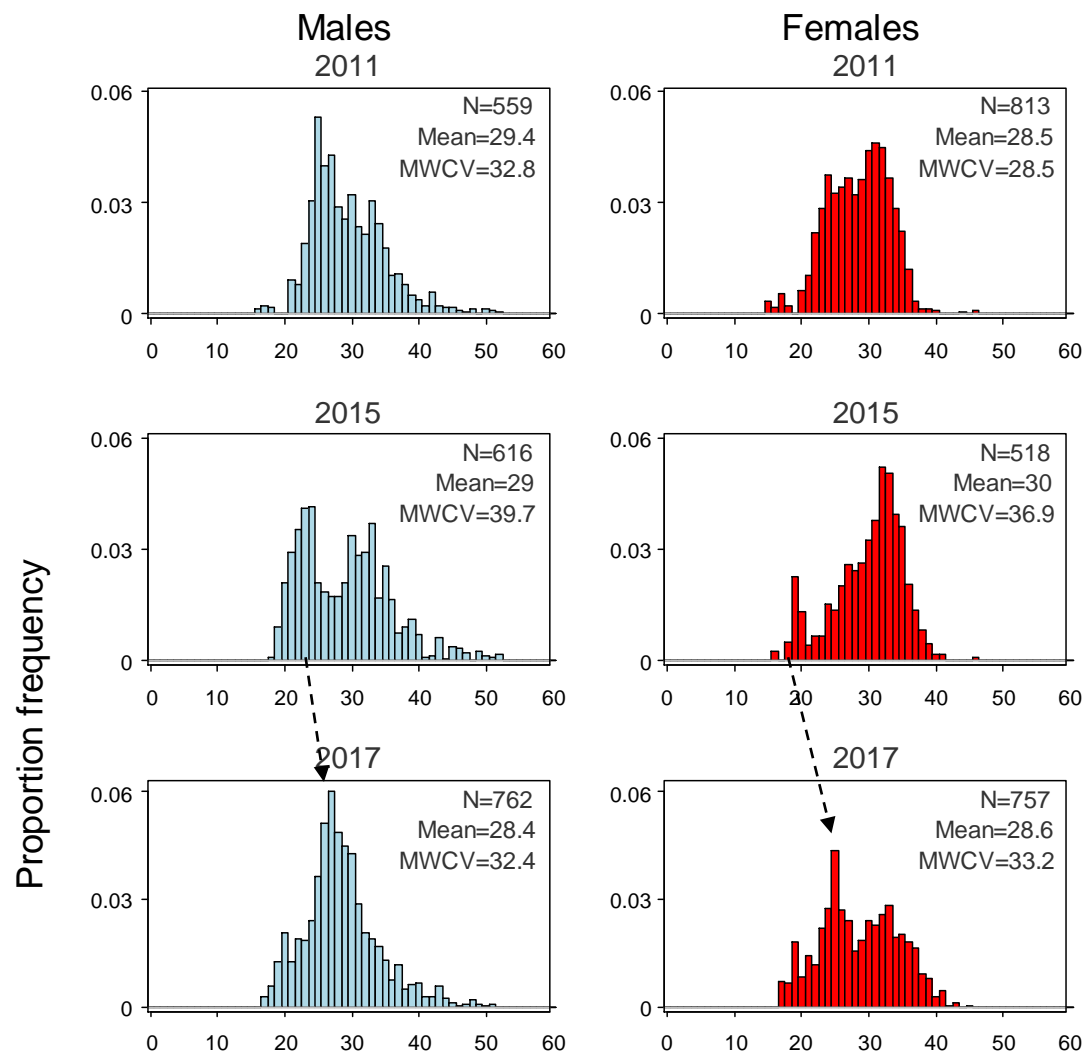


Abundance stable over time



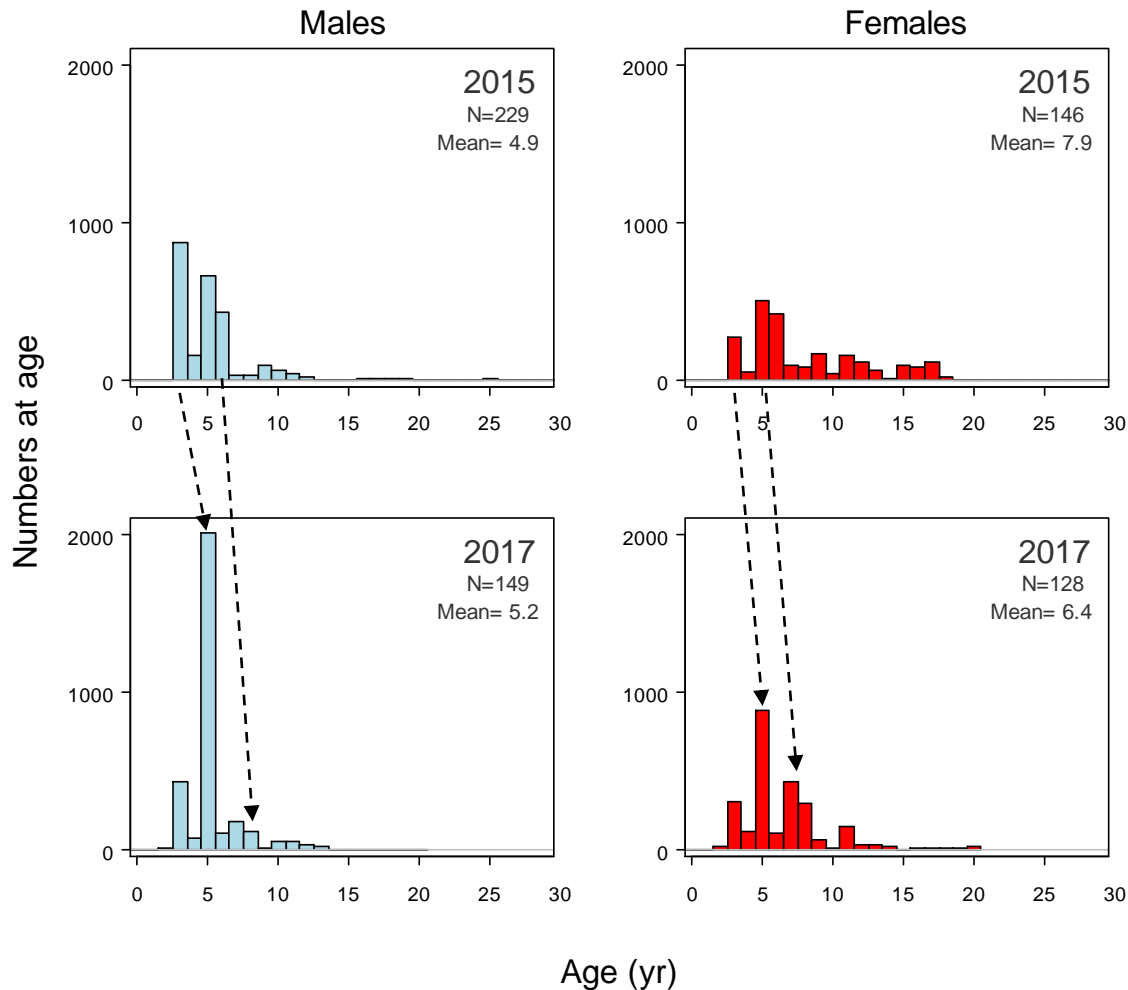
# Blue cod size over time

Kaikoura (random site surveys)



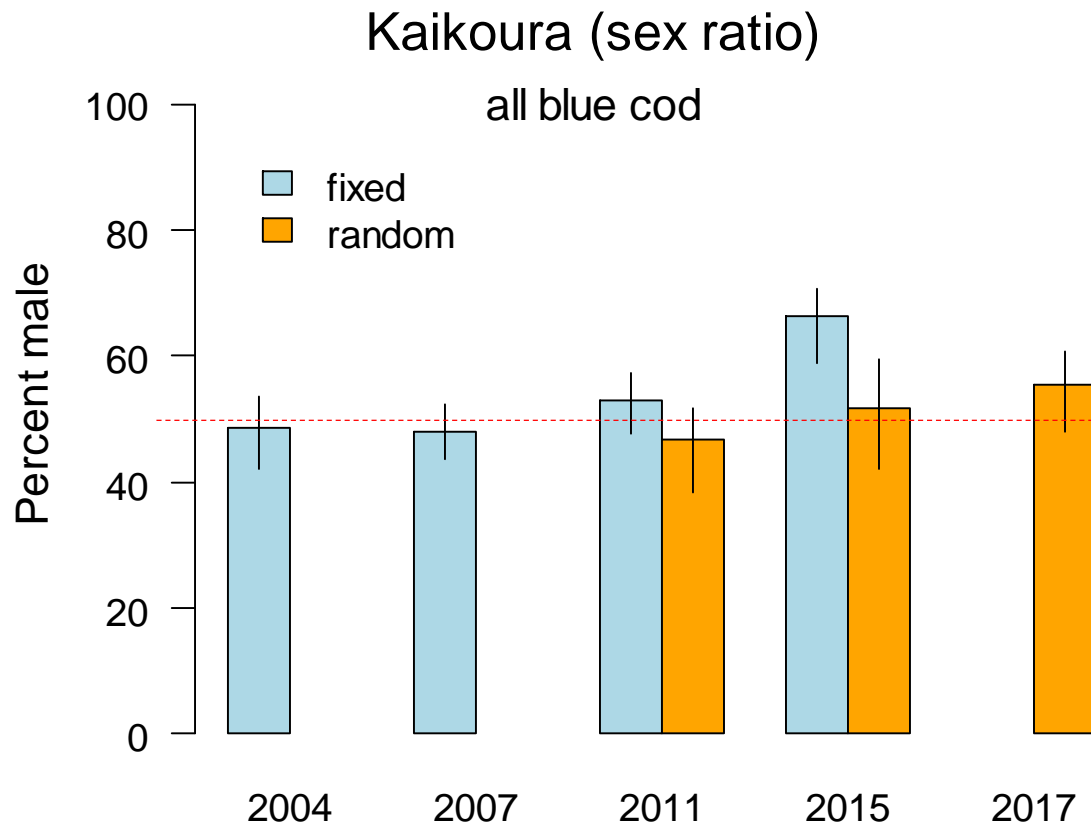
Evidence of strong recruitment progressing through the population over time.

# Blue cod age over time



- Only 2015 and 2017 surveys have aged fish
- Clear progression of age classes
- In 2015 most fish were 3-years-old
- In 2017 most fish were 5-years-old

# Blue cod sex ratio over time



Sex ratio balanced and close to 50% male with no trends



## Summary

1. No trends in abundance
2. Blue cod minimum legal size in the Kaikōura Marine Area is 33 cm, corresponding to ages of about 6 years for males and 8 years for females.
3. Strong recruitment of 3 year old fish in 2015 progressed to strong 5 year old mode in 2017.
4. Sex ratio about 50% male – no trend.
5. There were no observed changes in blue cod abundance, size and age composition, and sex ratio in 2017 that could be attributed to the 2016 earthquake.



## Acknowledgments

- Funding – MPI project KAI2016-09
- NIWA science sea going staff – Mike Page and Andy Miller
- NIWA vessel *Ikatere* skipper and crew
- Otolith preparation – Keren Spong
- Otolith reading – Dane Buckthought and Cameron Walsh



