

Hector's dolphin survey after the Kaikōura Earthquake



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K.O.R.I

'Marine Life of Kaikōura', by Katie Eshelman

Kaikōura Ocean Research Institute

Network of educators and researchers committed
to protecting what's here

Founded in 2012

Registered Charity in New Zealand

www.kori.org.nz



Weekly Little Penguin Monitoring

Kaikōura's Penguin Education and Awareness Programme (PEAP)





Original objectives

- Catalogue
- Determine 'hotspots'
- Document distribution & abundance Kaikōura's Hector's dolphins
- Increase awareness in our community



KORI Coastal Surveys Data Sheet
Survey Sightings

Kaikoura Ocean Research Institute
www.kkori.org

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*shallow water

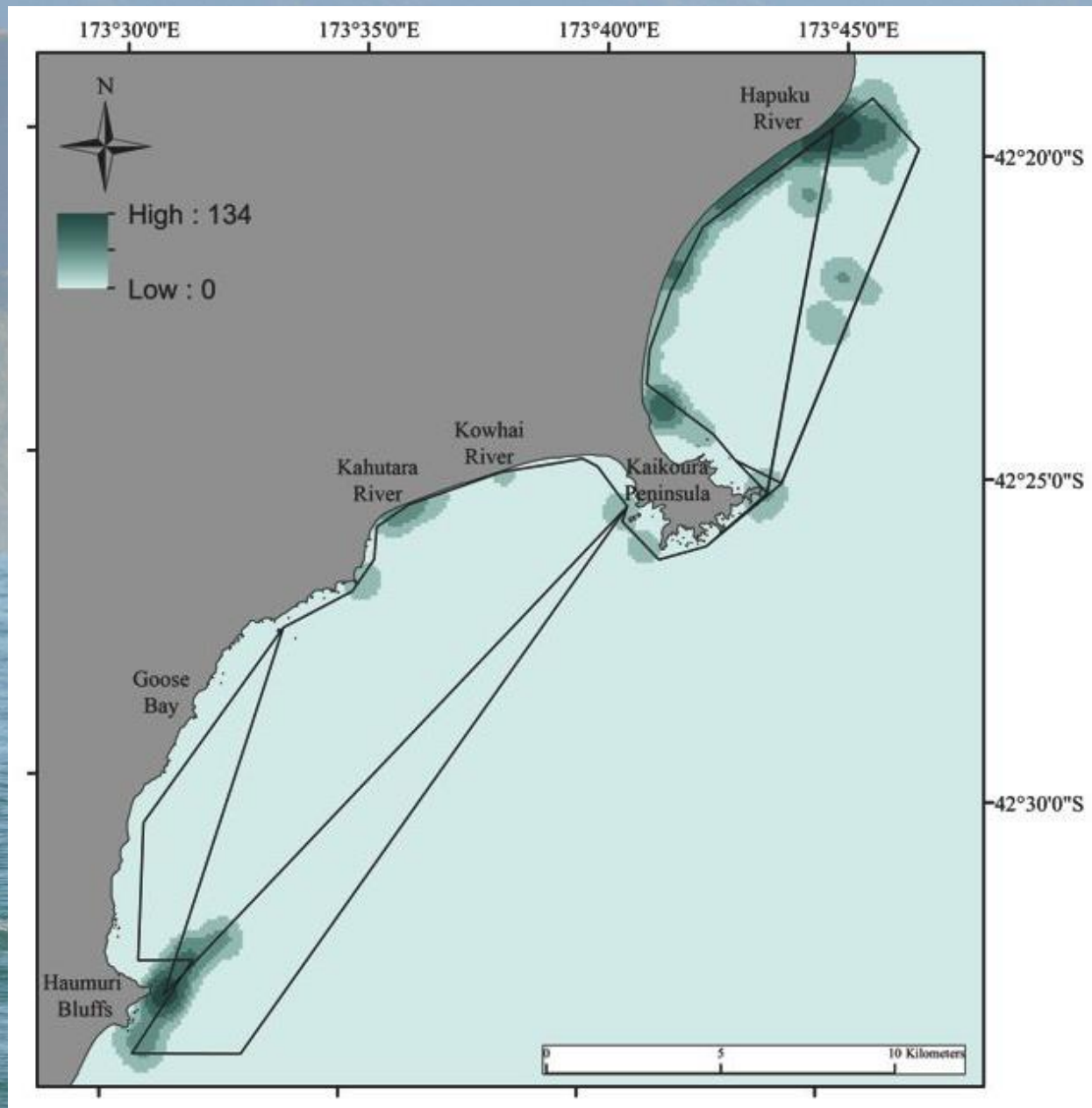
(0 – 10 m)

*close to shore

*murky water (>4 m)

*more in summer & fall

(compared to
winter & spring)



Weir & Sagnol 2015

KRHD 2016 CATALOGUE

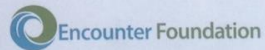
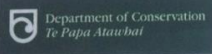
Kaikoura's Hector's Dolphins



July 2016 Edition



For the most up to date information, or to log a sighting, please go to www.kori.org.nz



KR023

Scarborough



LEN



KR021
Hapuku
FEMALE
North



TEN



KR019

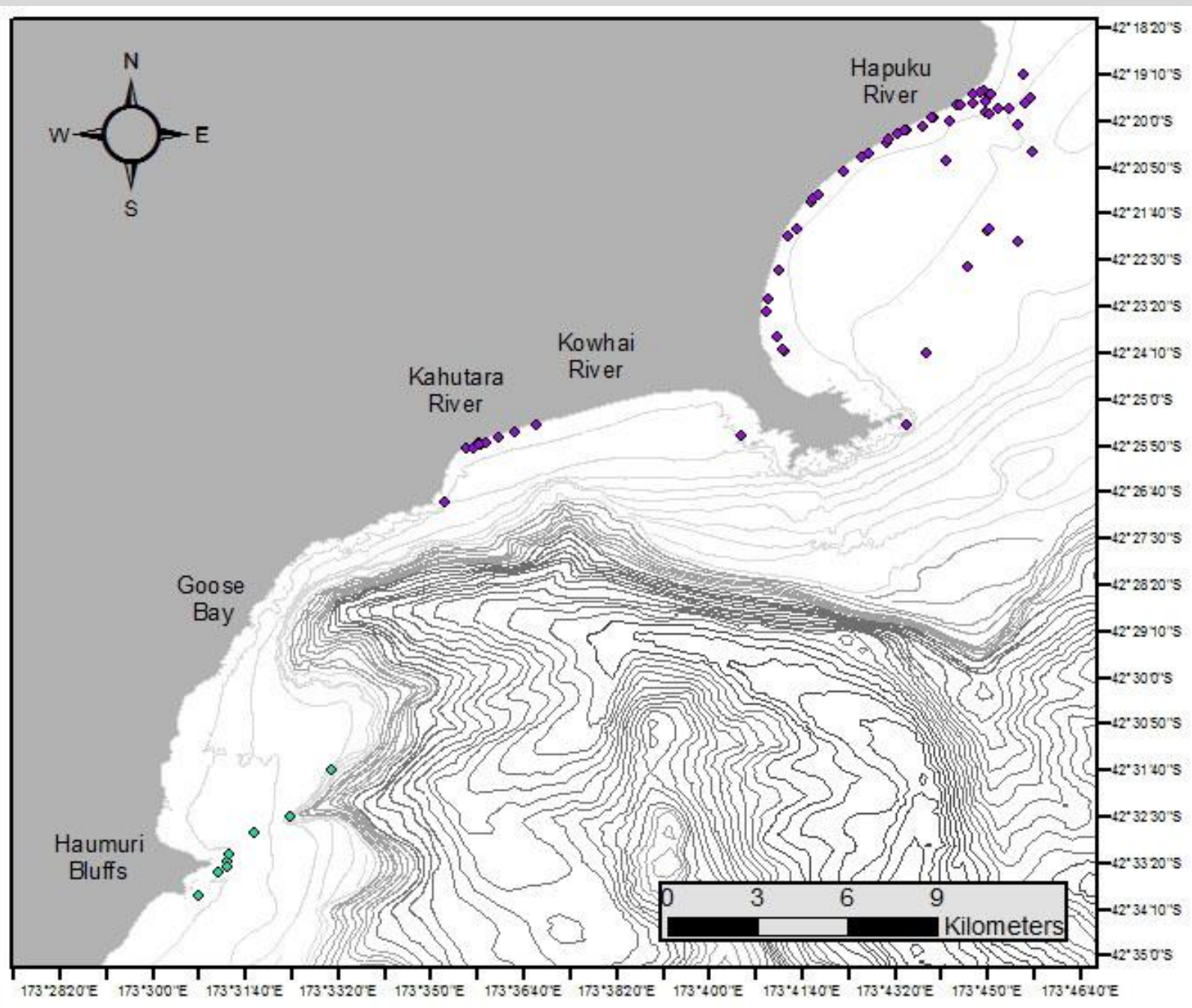
Esplanade

FEMALE

North



LEN



Abundance Estimation

‘How many?’

- Photo-identification (Weir & Sagnol 2015)
Hapuku – Haumuri
304 individuals (95% CI = 211 – 542)
- Aerial surveys (MacKenzie & Clement 2014)
Kaikoura and Clarence coastline
358 individuals (95% CI = 129 – 995)
- Genetic mark recapture (Hamner et al. 2016)
Point Gibson – Ward Beach
North of Kaikoura Canyon 314 (95% CL: 216 – 483)
South of Kaikoura Canyon 102 (95% CL: 68 – 175)

November 2016...





Google Earth

Objectives for the past year:

1. To survey Hector's dolphins along coastal Kaikōura in 2017/2018 in a manner consistent with previous surveys .
2. To analyse historical and 2017/2018 Hector's dolphin survey information to characterise any impact of the 2016 Kaikōura earthquakes.

Surveys

- 112 surveys total (including 31 from this contract)
- 69 pre-earthquake and 43 post earthquake

Sightings

- 372 sightings of Hector's dolphins (groups and solo encounters)
- 254 pre-earthquake and 118 post earthquake

Individuals with obvious and distinct markings

- 80 (2013 – 2018)



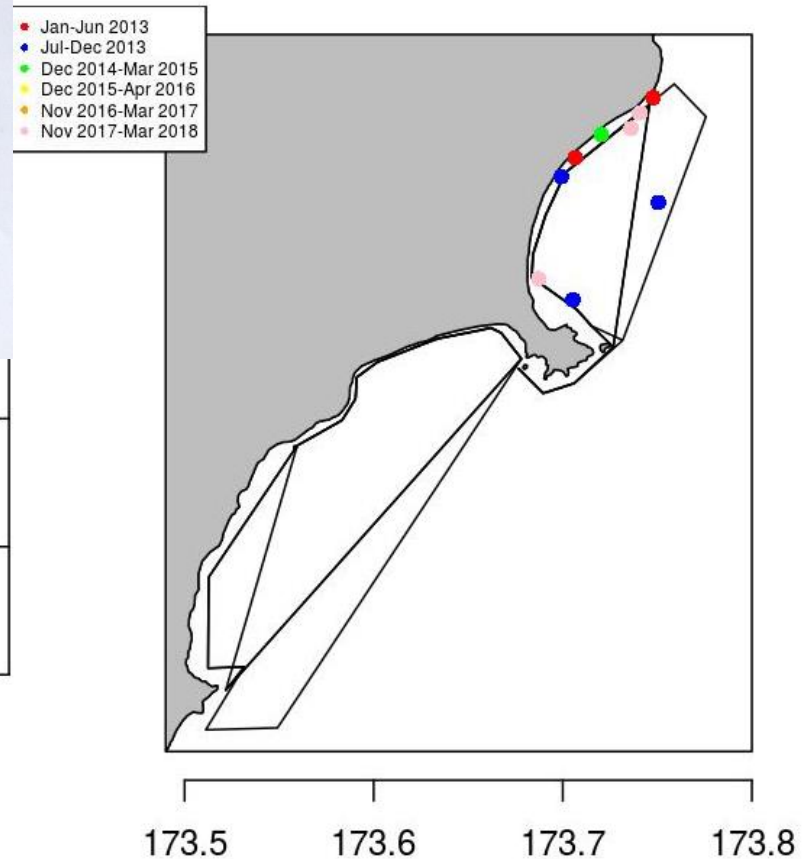


KR021
Hapuku
FEMALE
North



TEN

Sighting location marked HD, ID=21





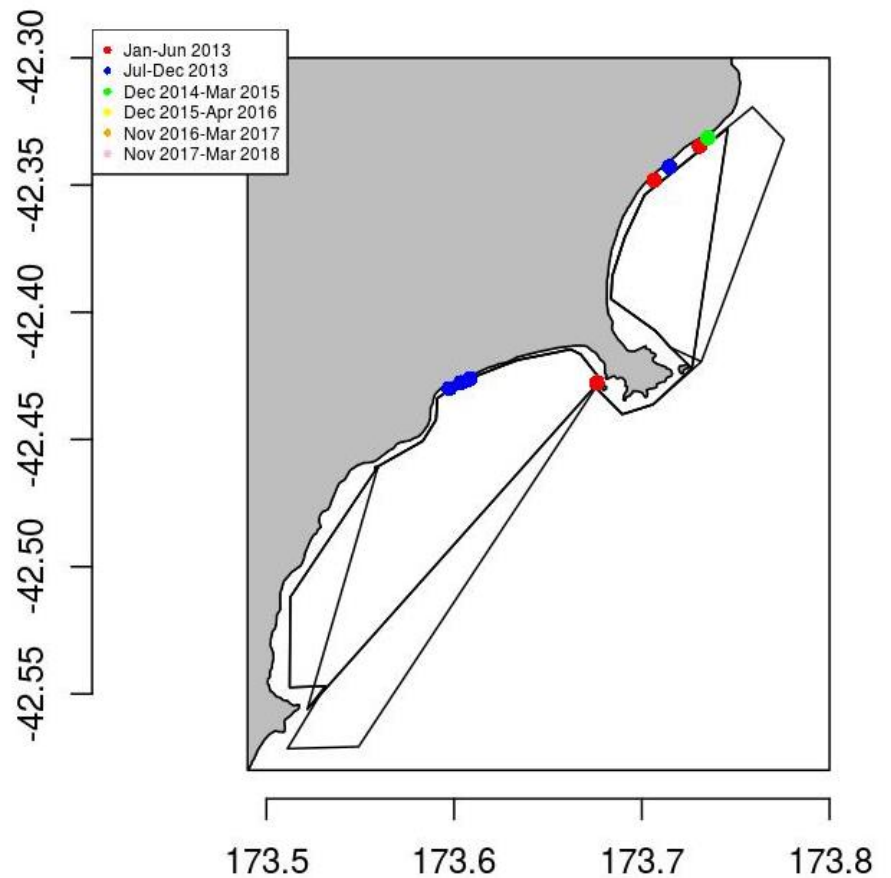
KR019
Esplanade

FEMALE

North



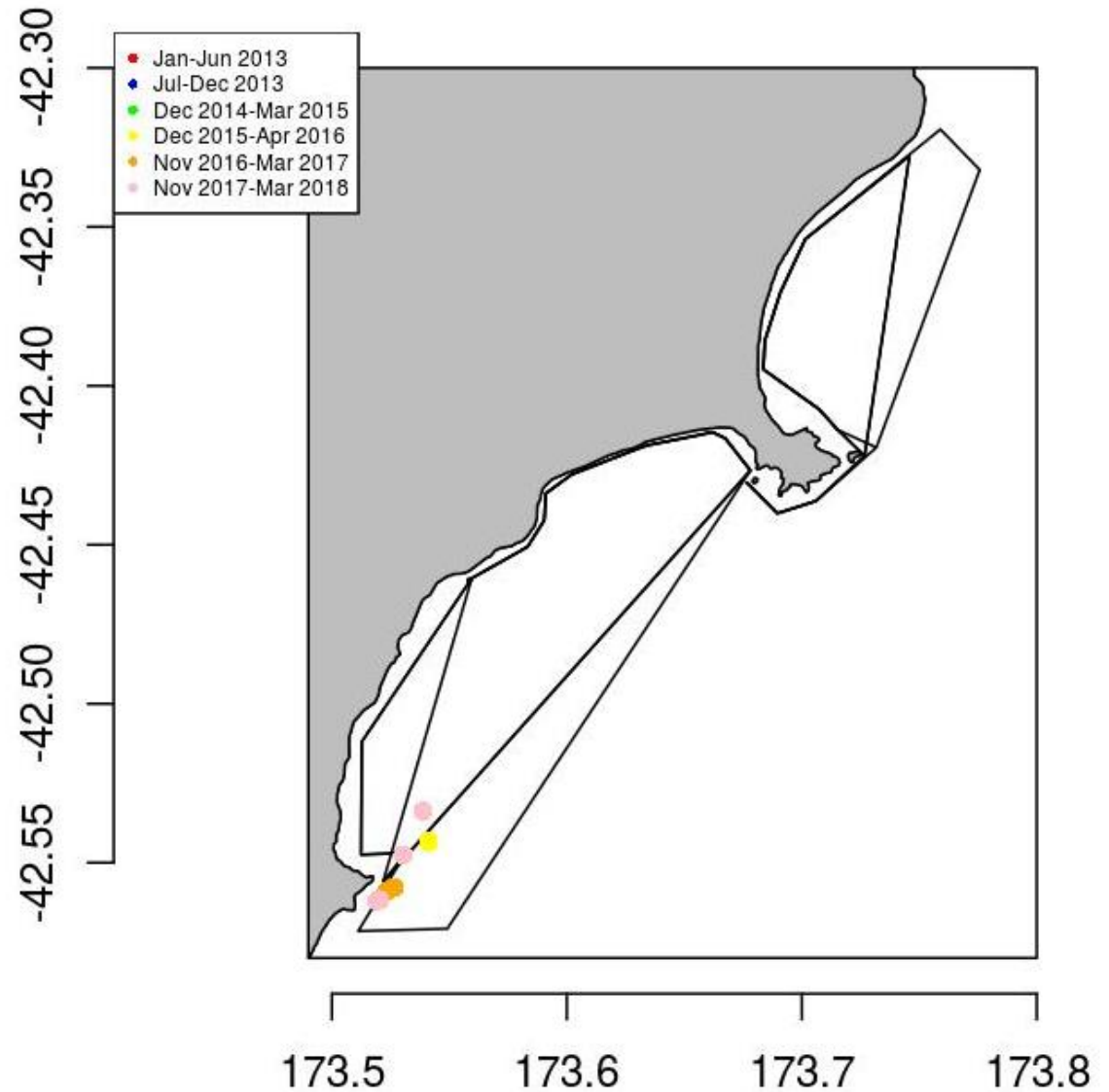
Sighting location marked HD, ID=19



KRo67 ~ Maui



Sighting location marked HD, ID=67



Mark-resight modelling

- Number of sightings per individual follows binomial distribution
 - k_t = number of survey occasions in period t
 - p_t = probability of sighting individual in a survey in period t
- Total number of sightings is random value from (truncated) normal distribution
 - mean = $U_t k_t p_t$
 - standard deviation = $\sqrt{U_t k_t p_t (1 - p_t)}$

Mark-resight modelling

- Total abundance

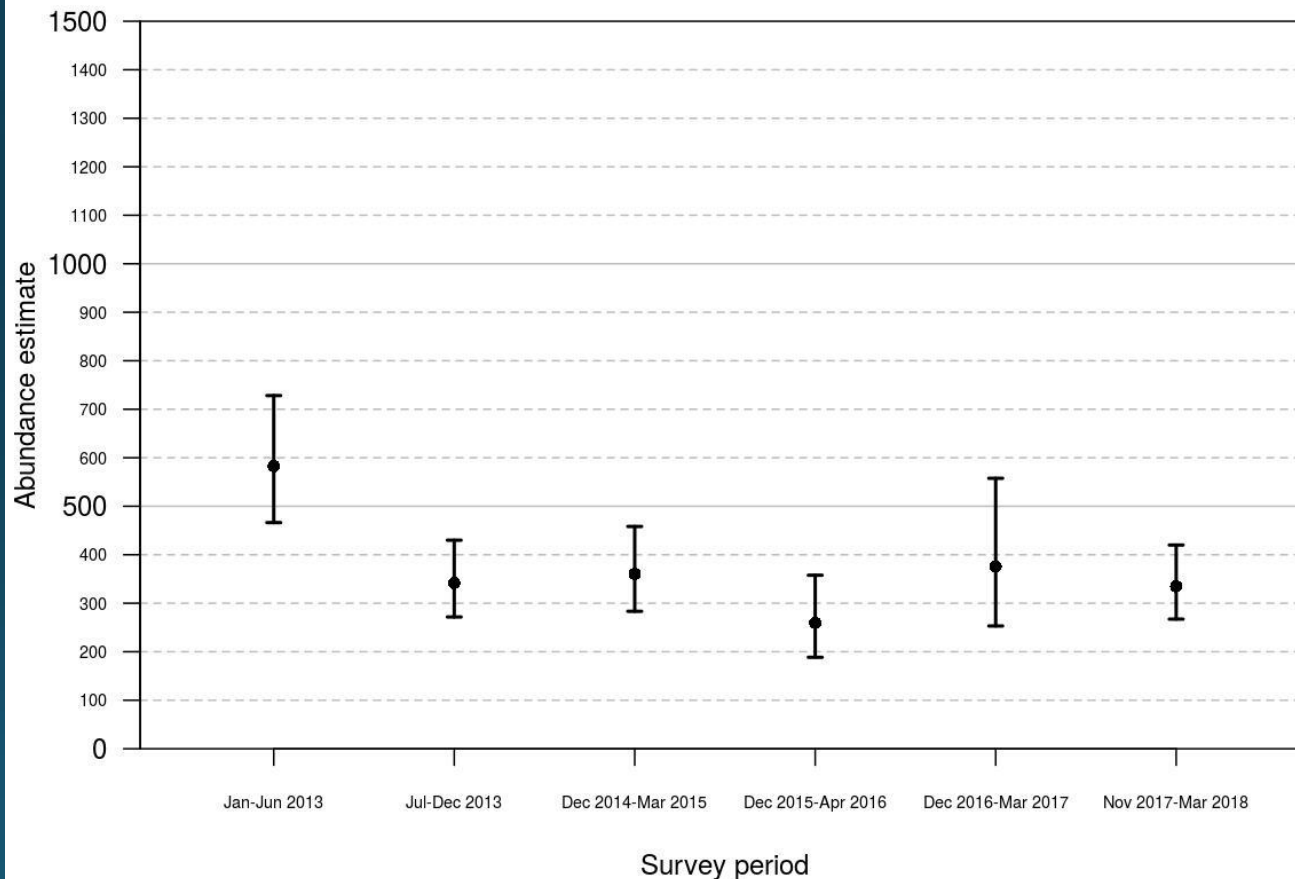
$$\hat{N}_t = \hat{U}_t + n_t / \hat{p}_t^*$$

- Standard error calculated by delta method
- Log-normal confidence intervals
- Considered two models
 - p constant across survey periods
 - period specific p

Abundance estimation

- Three configurations of the survey data
 1. Jan-Jun 2013, Jul-Dec 2013, Dec 2014-Mar 2015, Dec 2015-Mar 2016, Nov 2016-Mar 2017, Nov 2017-Mar 2018
 2. Jan-Jun 2013, Jul-Dec 2013, Dec 2014-Mar 2015, Dec 2015-Mar 2016, **Dec 2016**-Mar 2017, Nov 2017-Mar 2018
 3. Jan-Mar 2013, Dec 2014-Mar 2015, Dec 2016-Mar 2017, Nov 2017-Mar 2018

250 – 450 individuals for most survey periods
No statistically discernable change in abundance so far

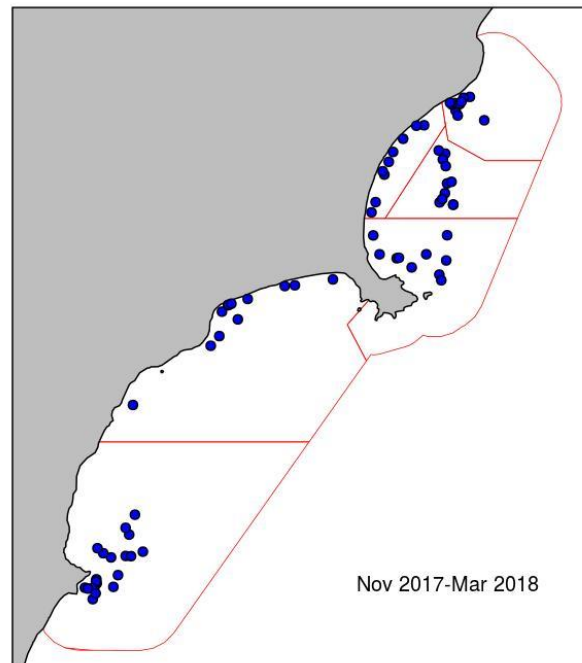
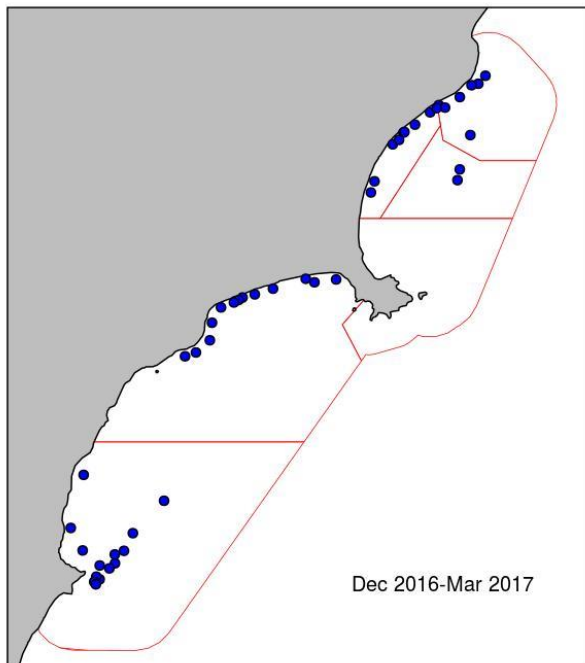
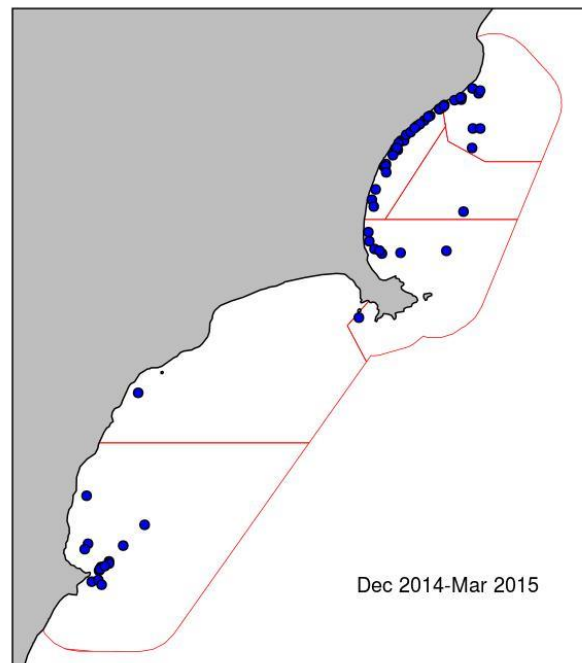
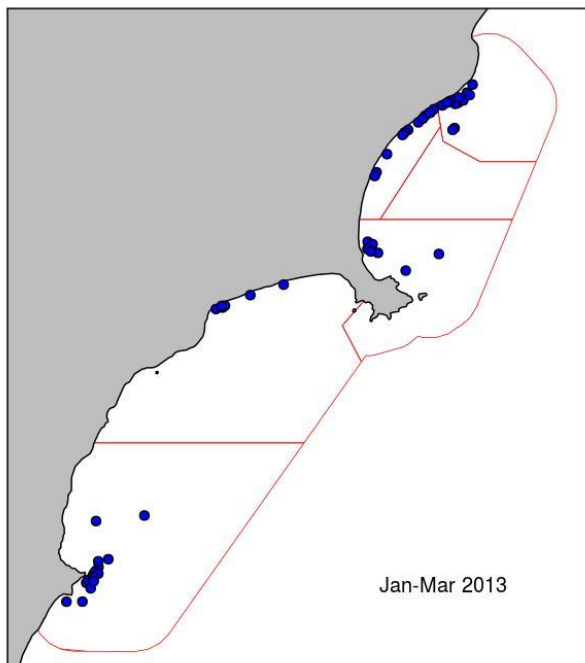


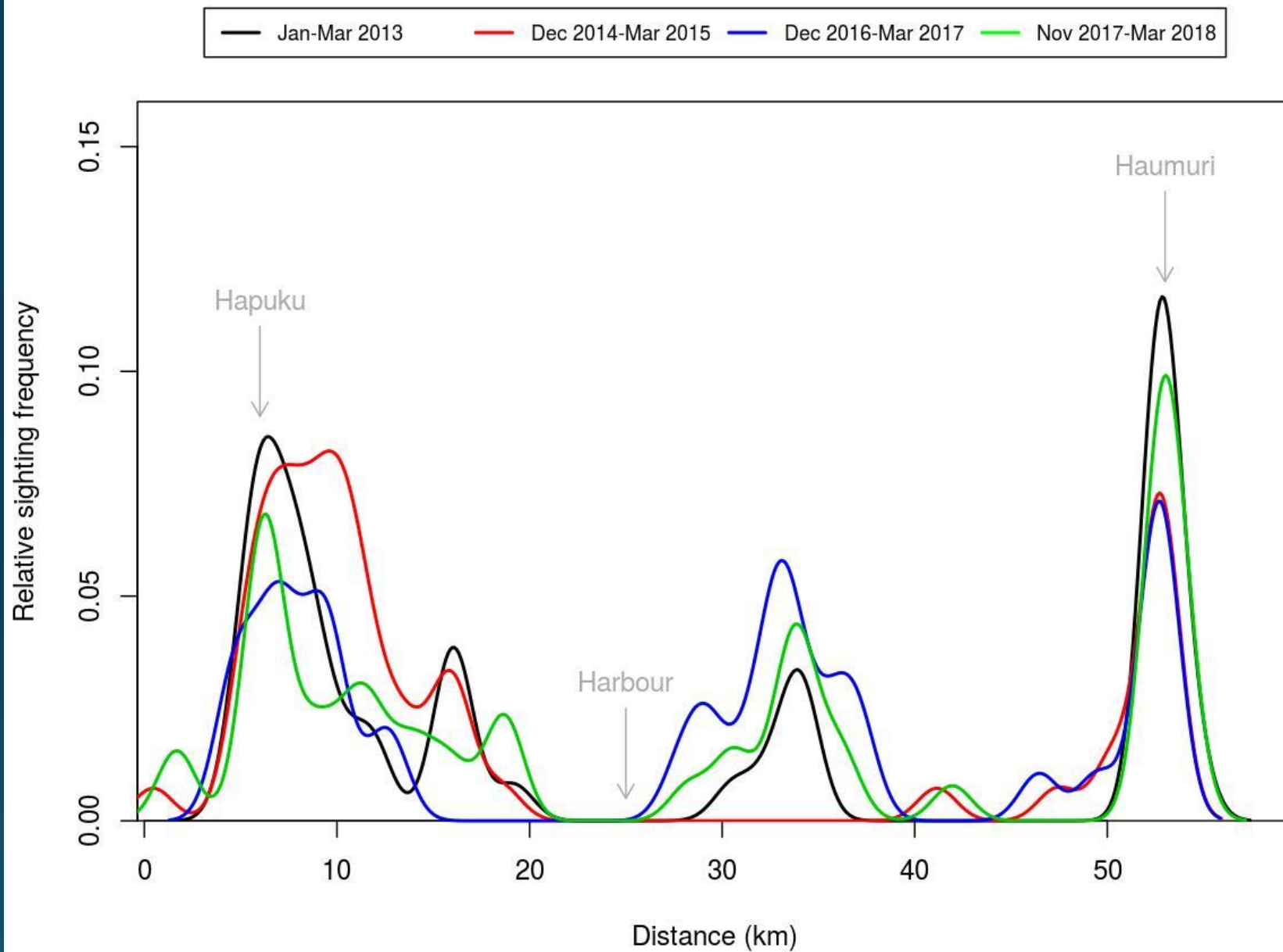
Spatial distribution

- Broad-scale changes
- Defined 6 regions within study area
- Changes in number of adults sighted per survey over time
- Evaluated with GLM
- Assumes effort within region consistent
- Used 3rd configuration of survey periods

Spatial distribution

- Predictor variables
 - Region
 - Pre/post earthquake
 - Survey period
- Pre/post earthquake and survey period partially confounded
 - not included in same model
- Interactions considered
 - expected if localized changes in distribution





Spatial distribution

- Highly ranked interaction models indicate localized changes
- Some indication of post-quake changes
- May be some localized changes in distribution, but unable to separate impacts due to the earthquake from ongoing annual variation
- Difficult to separate without longer time series

Key findings

- No detectable change in the number of Hector's dolphins in the area, so far
- Some localized changes in distribution
- So far, unable to separate impacts due to the earthquake quake from ongoing annual variation



Hector's health study underway



Acknowledgments

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