

# At-sea distribution of Black Petrel, *Procellaria parkinsoni*, on Great Barrier Island, Hauraki Gulf, New Zealand



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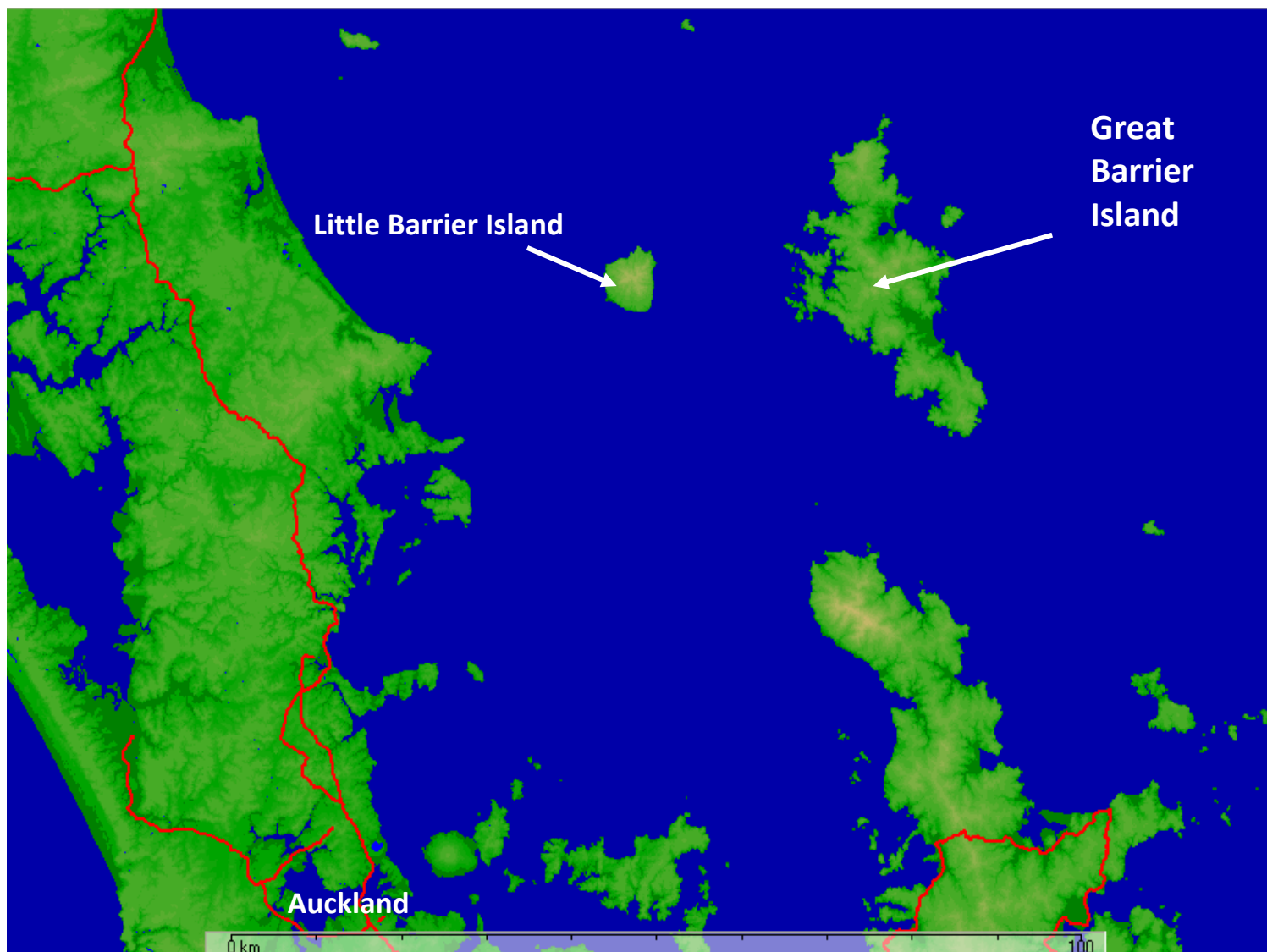
# BLACK PETREL RESEARCH PROJECT



- Medium-sized petrel (average 700 g)
- All black (with pale sections on bill)
- Endemic to New Zealand
- Previously found throughout North Island and NW Nelson
- On Great Barrier Island (c. 5000 birds)
- On Little Barrier Island (c. 250 birds)



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- **Breed from October to June**

- Adults return to the colony in mid-October to clean burrows, pair and mate, then depart on “honeymoon”
- Return to colony in late November to lay a single egg
- Incubate egg for 57 days
- Eggs hatch from late January through February
- Chicks fledge after 107 days (from mid-April through to late June)
- Adults and chicks migrate to South America for winter



- **Black petrels caught by commercial and recreational fishers both in New Zealand and overseas**
  - Since 1996, **38** have been caught in NZ waters by local commercial fishers (mainly on domestic tuna long-line and on snapper fisheries)
  - Anecdotal capture reports from recreational fishers
  - Unknown level of fisheries impact overseas



- **Long-term research project on Great Barrier Island (since 1995/96 breeding season)**

- Long-term mark-recapture programme
- Determine baseline population dynamics, including an accurate population estimate
- Determine breeding success (and causes of failures)
- Determine at-sea distribution of the Great Barrier Island black petrel population (and identify areas of risk from fisheries)
- Determine population trends (including survival and recruitment)



## Mount Hobson (Hirakimata) Study Site



- Covers 35 hectares around the summit.
- **403** numbered burrows
- **396** study burrows (including **154** in nine census grids)
- Burrows are accessed through entrance or study hatch

## PROJECT OUTLINES:

- Three trips per breeding season
- Population parameters:
  - ✓ Mark-recapture of adults at the colony
  - ✓ Monitor study burrows
  - ✓ Estimate population (and determine trends)
  - ✓ Determine breeding success (and causes of failures)
- **At-sea distribution:**
  - ✓ Deploy Lotek geo-locator and GPS loggers
  - ✓ Determine foraging range, migration routes and behaviour at sea
  - ✓ Determine risk from fisheries





## AT-SEA DISTRIBUTION

- Deploy devices in December
- Retrieve devices in January/February
- All placed on breeding adults
- **Four types of tracking devices used:**
  - **Lotek™ light loggers**
  - SIRTrak™ GPS loggers
  - BASTrak™ light loggers
  - Oxford University (UK) GPS loggers



## LOTEK GEO-LOCATOR LOGGERS

Date		♂	♀	U	Total	Retrieved	No. of burrows	No. of days worn	
Deployed	Retrieved							Mean ( $\pm$ SEM)	Range
Dec. 05	Feb. 06	7	3	1	11	11	9	45 $\pm$ 2	42-57
Dec. 07	Jan. 08	7	1	0	8	8	8	33 $\pm$ 1	30-35
Dec. 07	Dec. 08	12	4	0	16	16	13	360 $\pm$ 1	354-369
Dec. 07	Feb. 09	1	0	1	2	2	2	418 $\pm$ 3	415-421
Dec. 07	-	1	0	1	2	0	2	-	-
Dec. 08	Feb. 09	5	1	2	8	8	8	50 $\pm$ 2	44-62
Dec. 09	Feb. 10	15	12	14	41	41	34	50 $\pm$ 1	43-65
Dec. 09	-	1	2	1	4	0	3	-	-
<b>TOTAL</b>		<b>49</b>	<b>23</b>	<b>20</b>	<b>92</b>	<b>86 (93%)</b>	<b>79</b>	<b>113 <math>\pm</math> 13</b>	<b>30-421</b>



## ANALYSIS:

- Kernel plots of distribution during various stages of breeding cycle
- Average trip length and maximum distance from colony
- Distance, speed and direction of travel between locations
- Time spent in specific locations (& identify feeding areas)
- Behaviour (resting, foraging, direct flight etc.)
  - **PART 1: ENVIRONMENTAL VARIABLES**
    - Relating areas of use to chlorophyll-a, sea-surface temperature, depth, etc.
  - **PART 2: OVERLAP WITH FISHERIES**
    - Relate areas of use to proximity to fishing activities, risk, interaction, etc.



## BREEDING CYCLE BREAKDOWN:

PHASE		START DATE	END DATE
BREEDING	Pre-egg laying	1 October	15 November
	Incubation	16 November	31 January
	Guard and chick rearing	1 February	15 May
NON-BREEDING		16 May	30 September



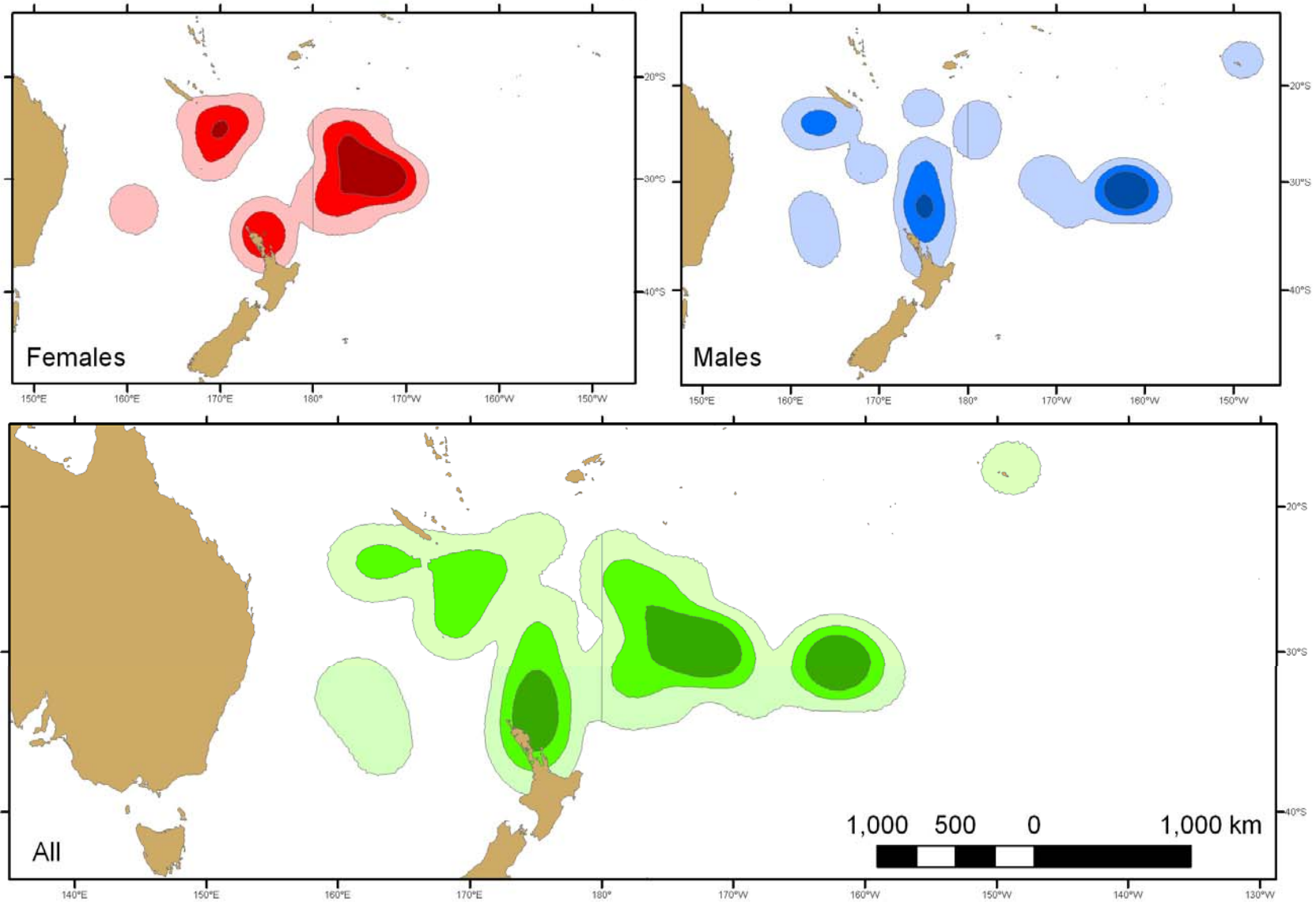
## SUMMARY:

### DISTRIBUTION PATTERNS:

- Varied between breeding phases
  - Stretched from Tasman Sea to Australian coast and east to 160°W
  - Generally centred over Hauraki Gulf
  - Females foraged further north during incubation
- Migration to South America using a southerly route and more northerly one the return journey to NZ
- Concentrated distribution off the Ecuador coast during non-breeding

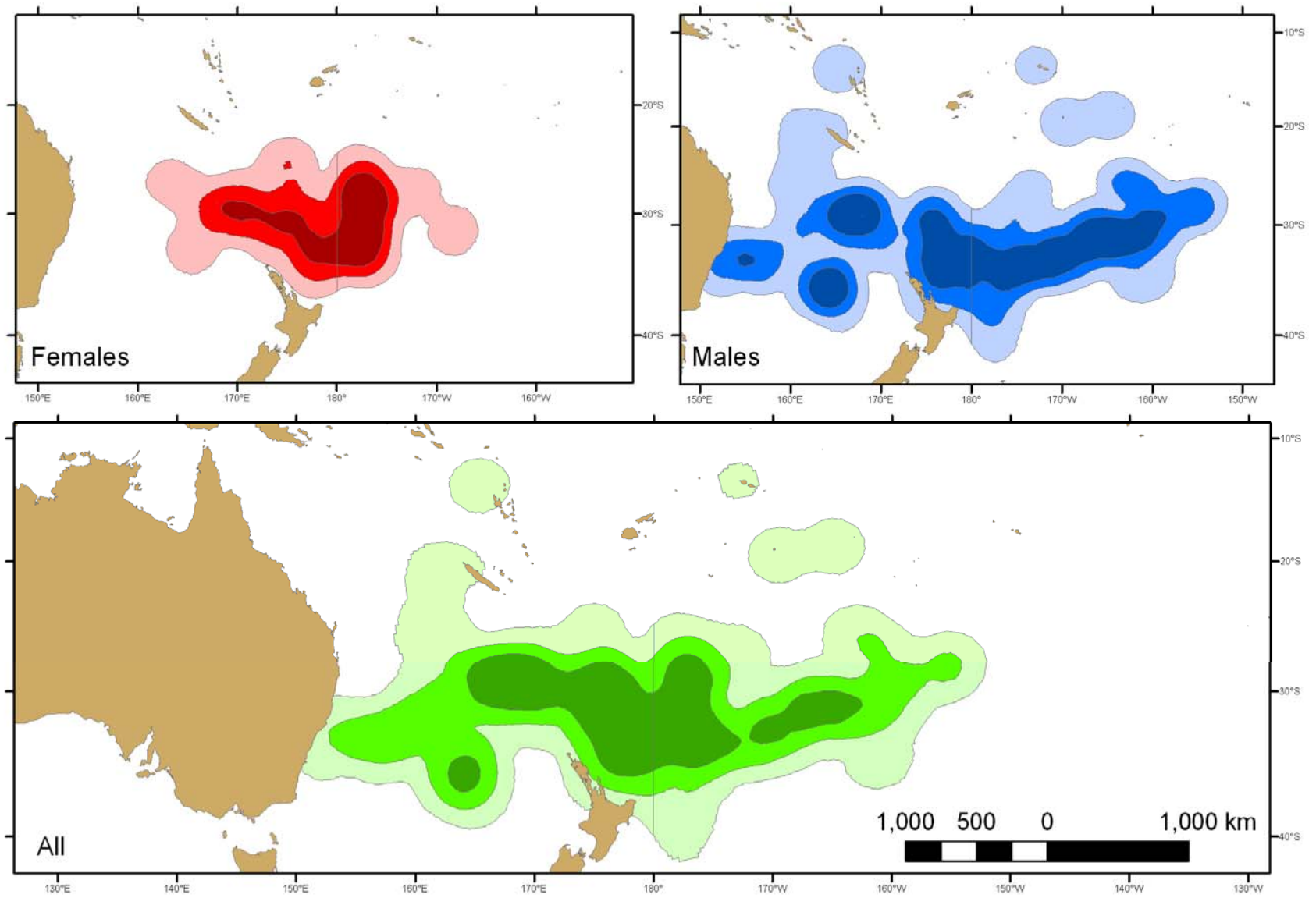
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## Pre-egg laying 2008



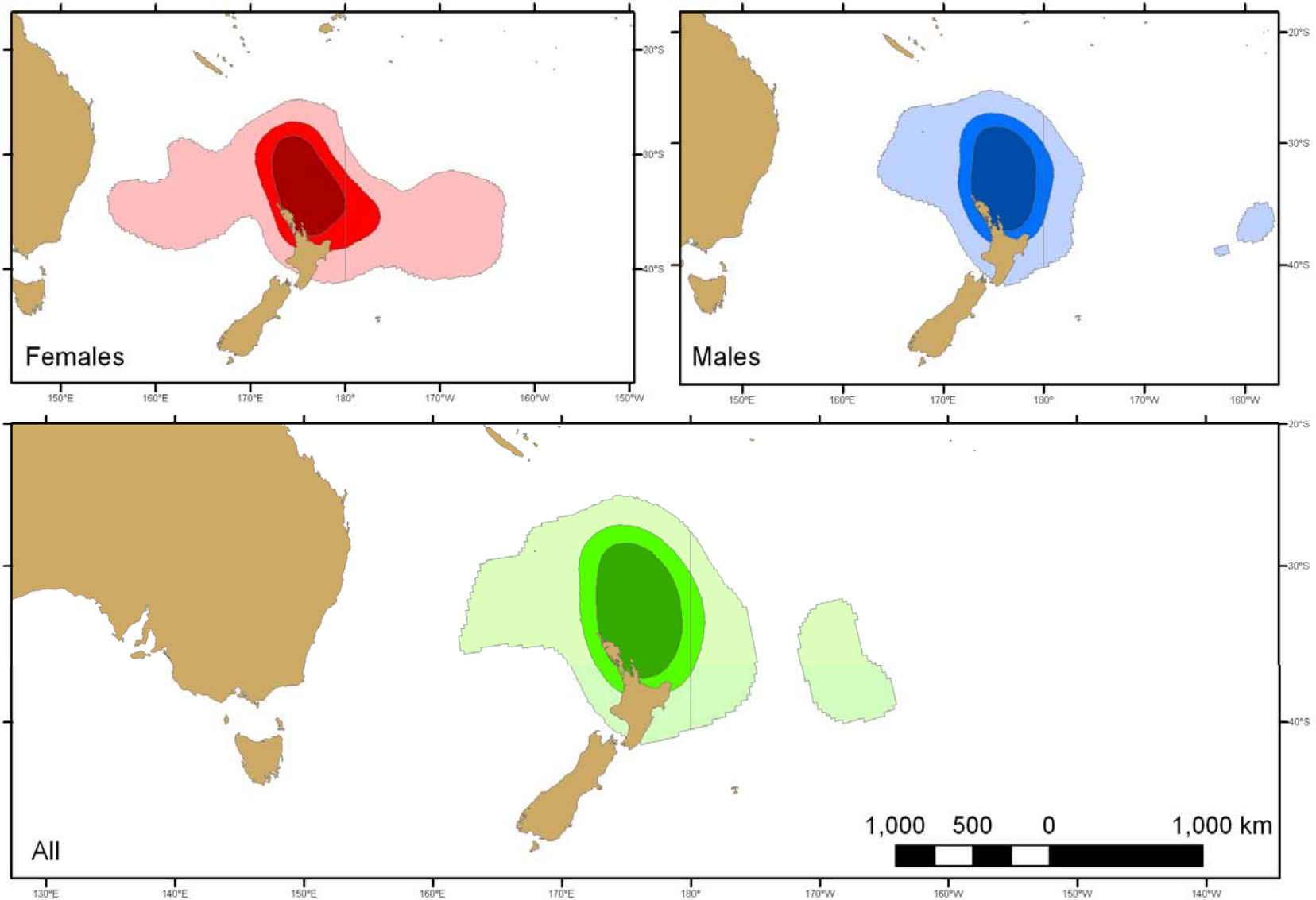
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## Incubation 2008



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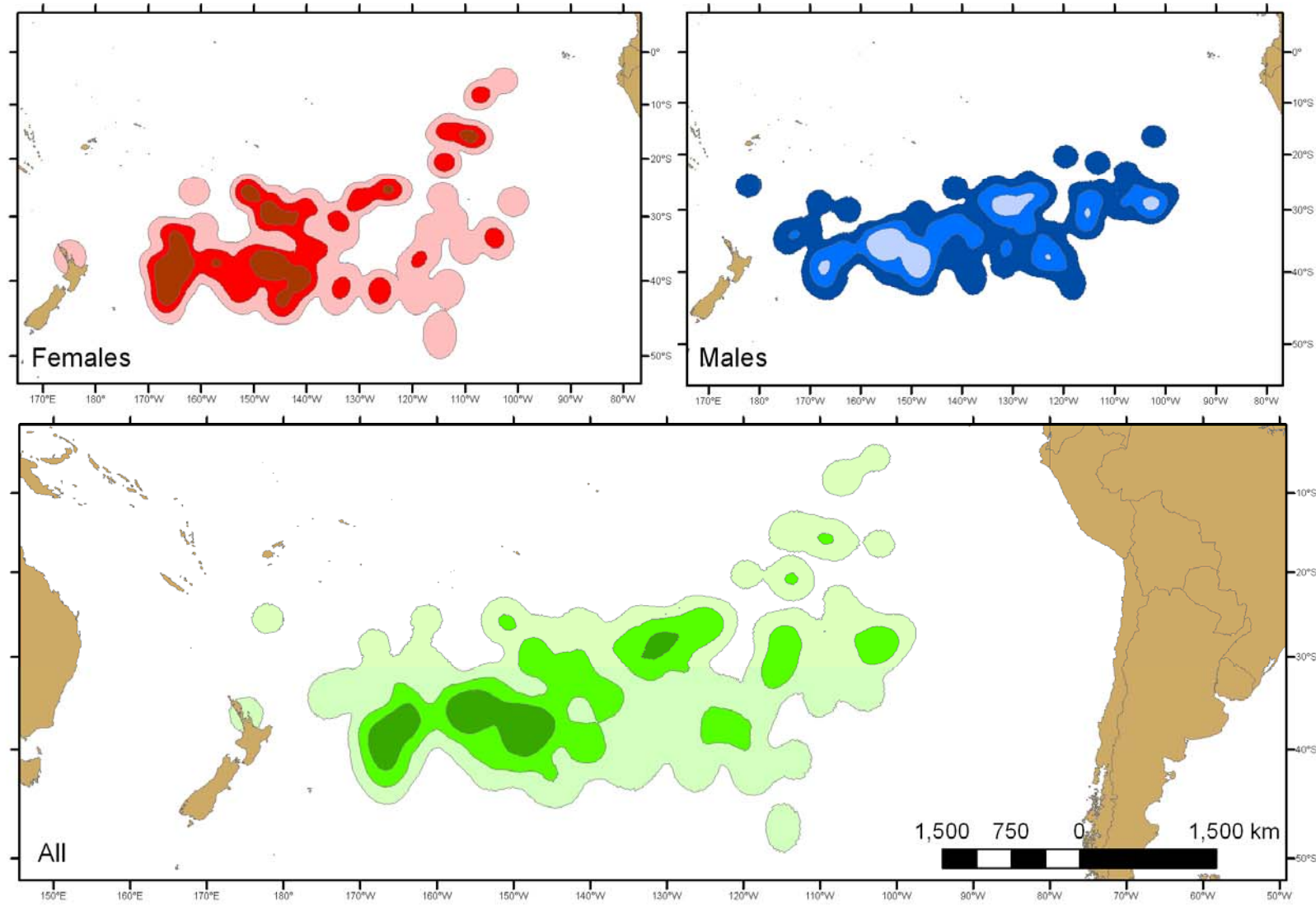
## Chick Rearing 2008





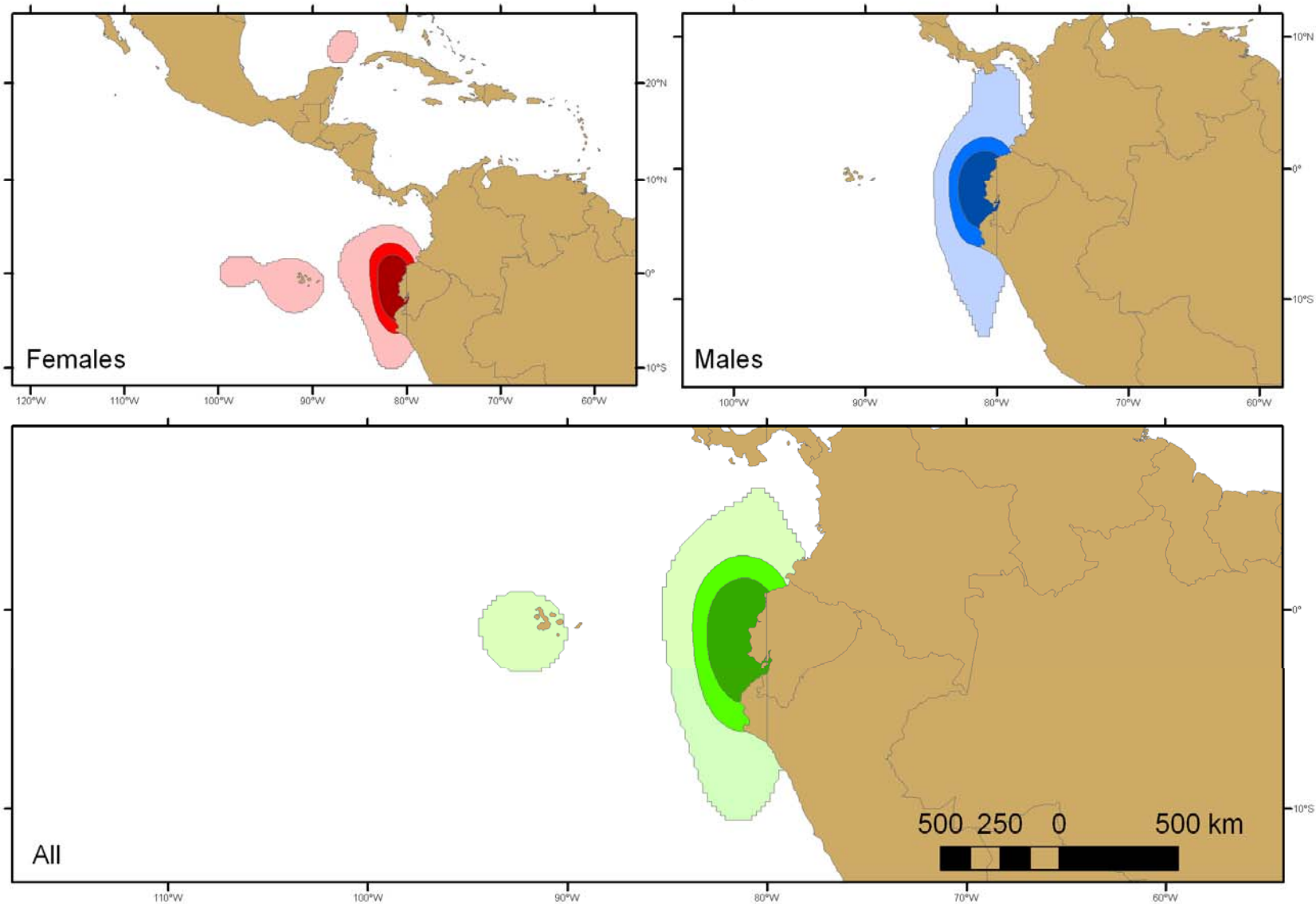
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## Migration East 2008



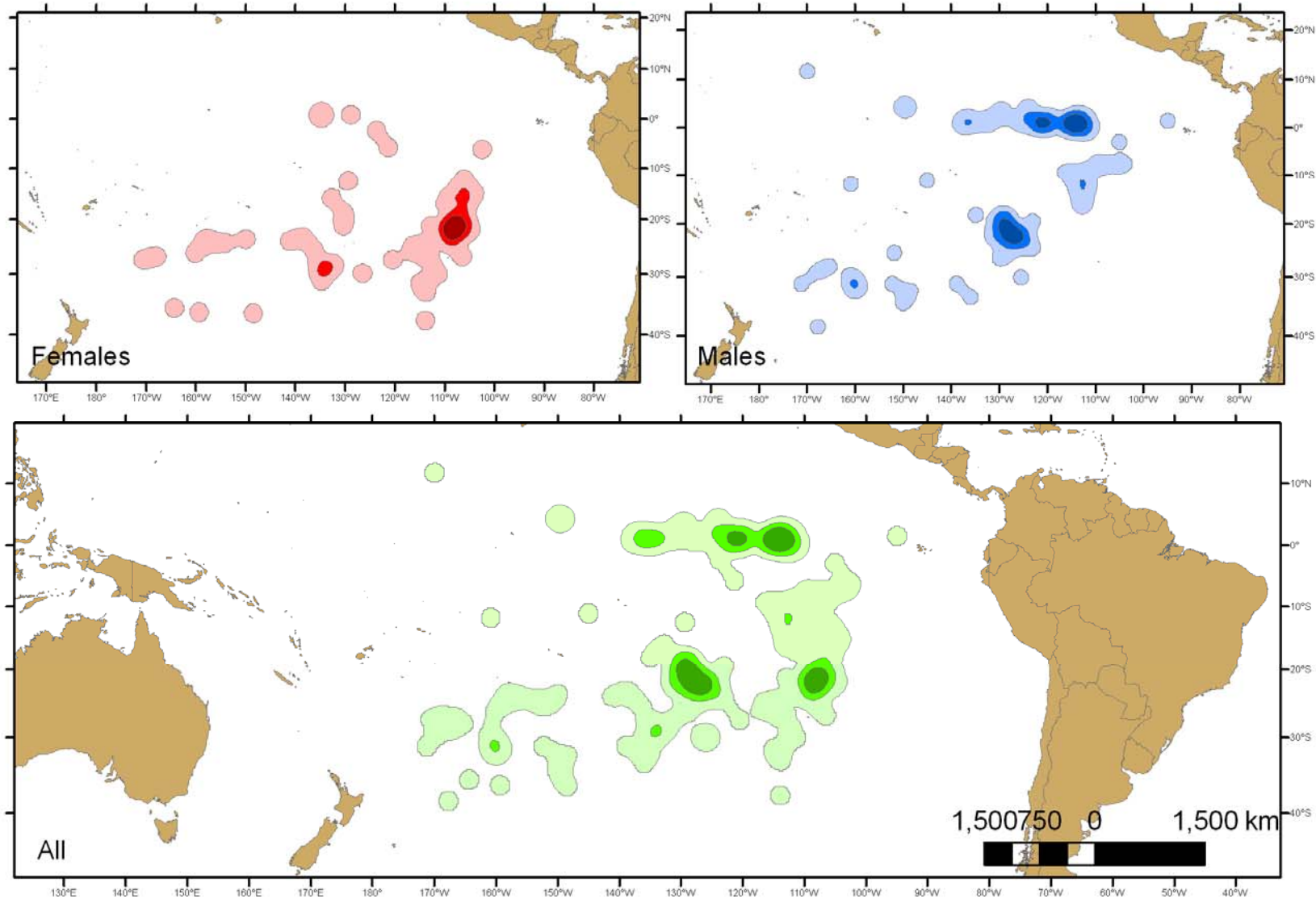
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Non-breeding 2008



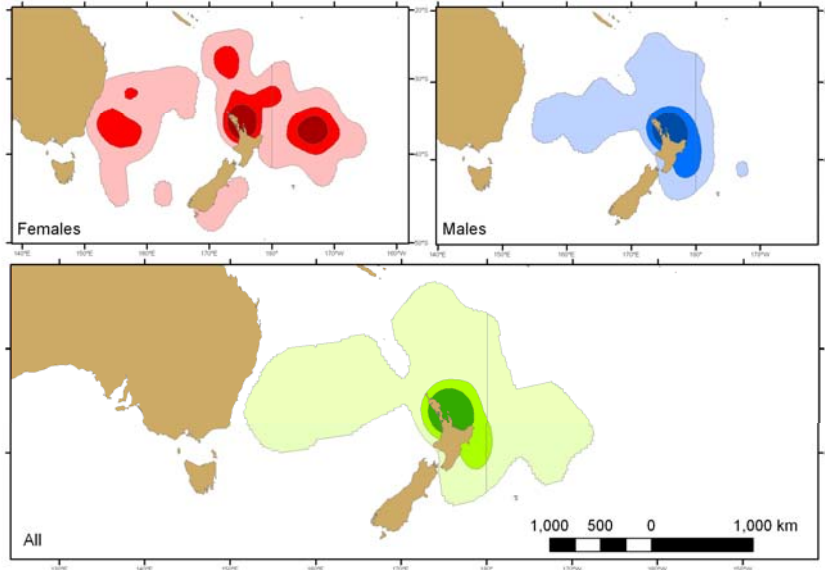
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## Migration West 2008

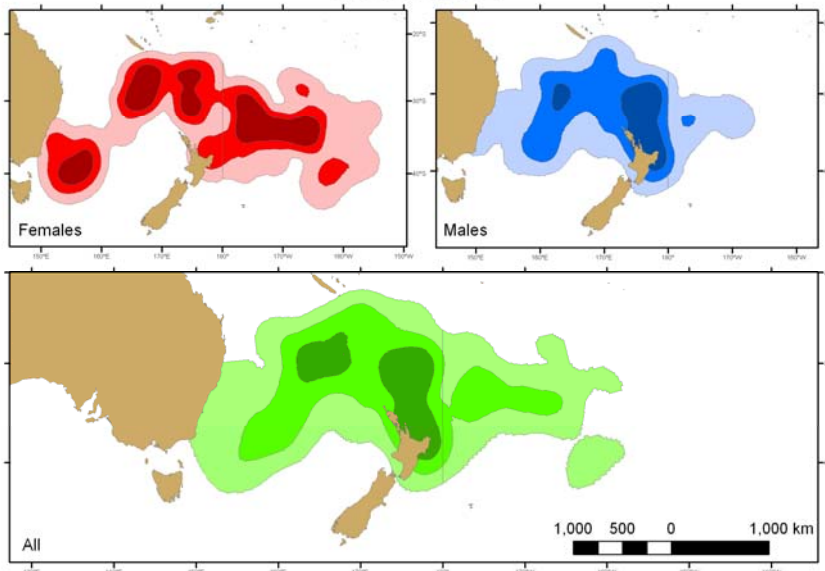


## Comparison between breeding seasons

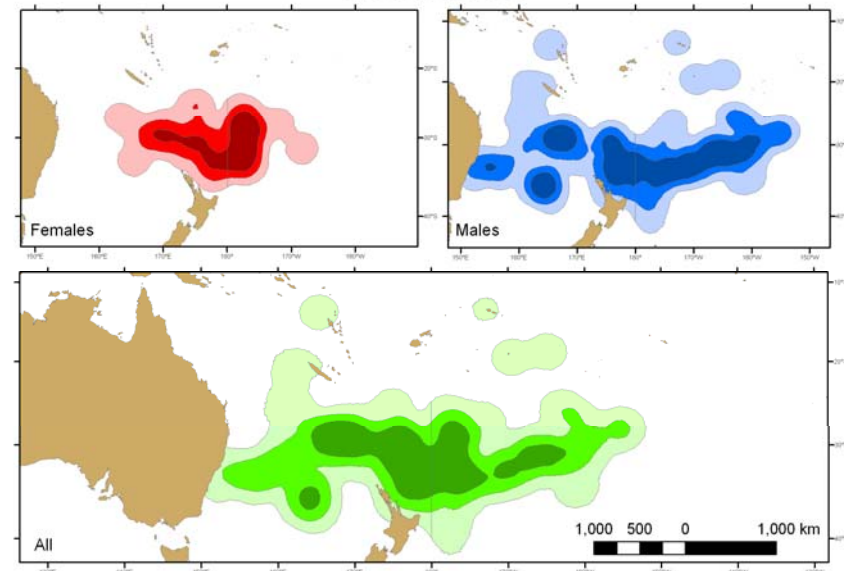
Incubation 2005



Incubation 2007



Incubation 2008



## SUMMARY:

### HABITAT USE:

- Pre-egg:
  - Cool water (20°), deep areas (5000 m) with less slope (2% rise), moderate chlorophyll-a (0.1 mg m<sup>-3</sup>) and low sea-surface height (0.05 m)
- Incubation:
  - Moderate chlorophyll-a, cool water (22.5°), low sea-surface height (0.02 m), shallower depths (2500 m) and less slope (1.42% rise)
  - Chick-rearing:
    - Moderate chlorophyll-a, cool water (22°), moderate sea-surface height (0.1 m), moderate depths (3000 m) and less slope (2% rise, females used areas with greater slope than males)
- Non-breeding:
  - Shallow (1000 m), more productive (0.7 mg m<sup>-3</sup>) and warm water (24°)
  - Females occupying areas with greater slope than males

## PART 2: FISHERIES OVERLAP

### SUMMARY:

- Annual fisheries effort varies
- Limited to overlap during the breeding season (and separated into each aspect of the breeding cycle)
  - Rates of overlap varied between breeding phases
  - Rates of overlaps varied between breeding seasons
  - Most overlap during the incubation phase
  - Most overlap with fishing events targeting snapper
  - Most overlap in FMA1
- Additional analysis by Ed Abraham

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- **Annual reports are published by DOC and are available from [www.doc.govt.nz](http://www.doc.govt.nz) as PDF files**



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**Any questions?**