

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



ELIZABETH BELL¹, Joanna Sim, Leigh Torres, Scott Schaffer and Ed Abraham

1. Wildlife Management International Limited, PO Box 45, Spring Creek, Marlborough 7244, New Zealand, biz@wmil.co.nz

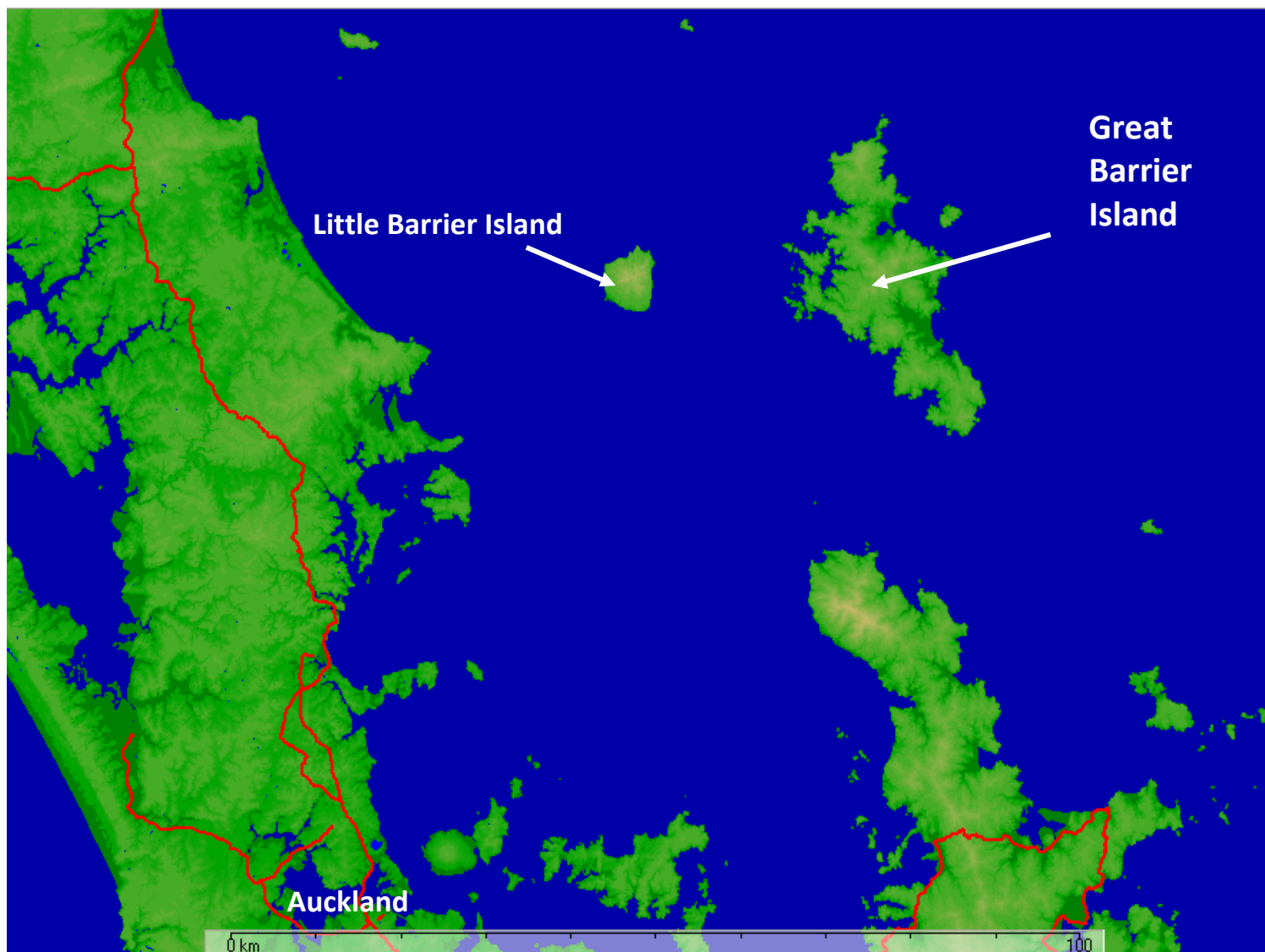
BLACK PETREL RESEARCH PROJECT



- 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



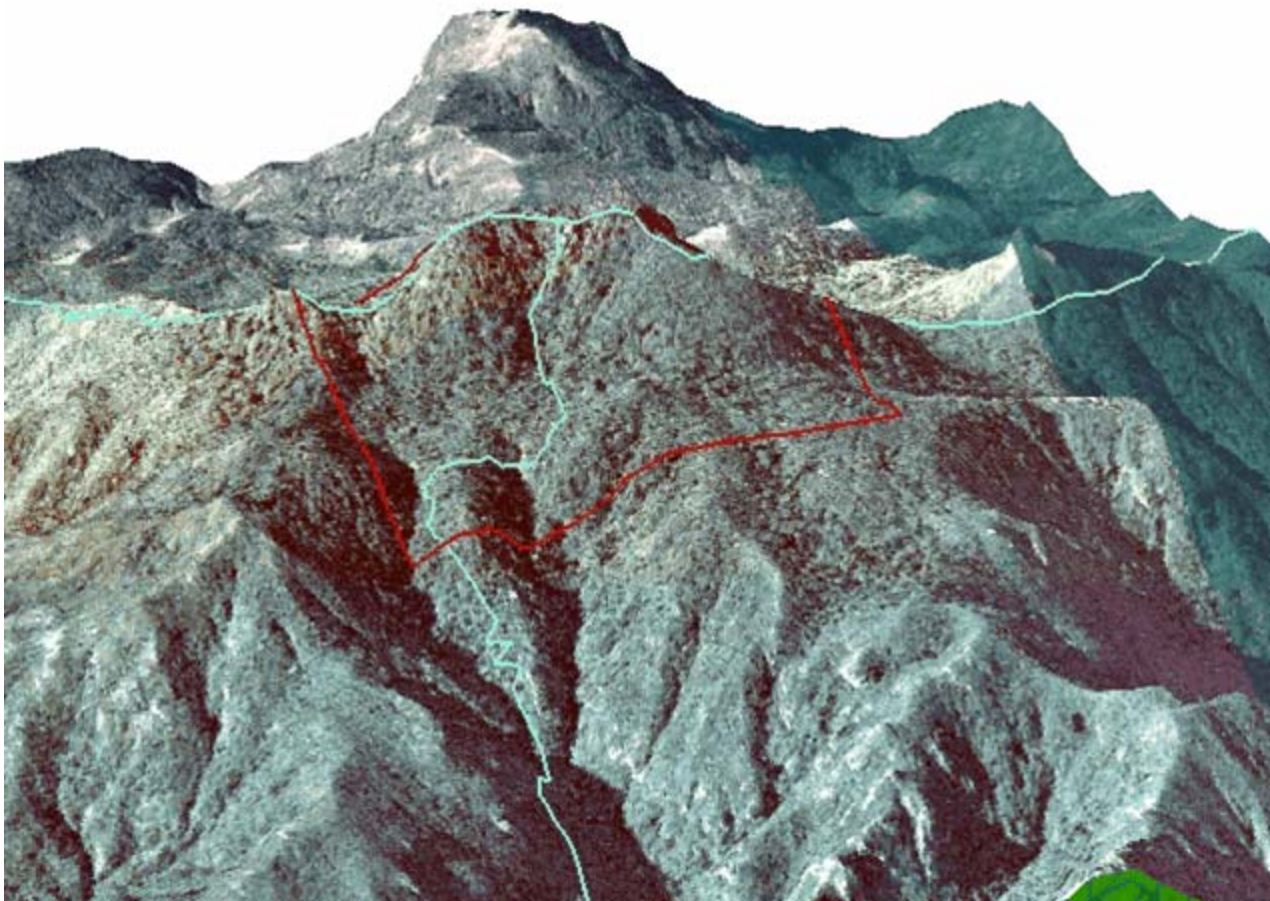
- **Black petrels caught by commercial and recreational fishers both in New Zealand and overseas**
 - Since 1996, **38** have been caught in NZ waters by local commercial fishers (mainly on domestic tuna long-line and on snapper fisheries)
 - Anecdotal capture reports from recreational fishers
 - Unknown 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	-	-
TOTAL		49	23	20	92	86 (93%)	79	113 \pm 13	30-421



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



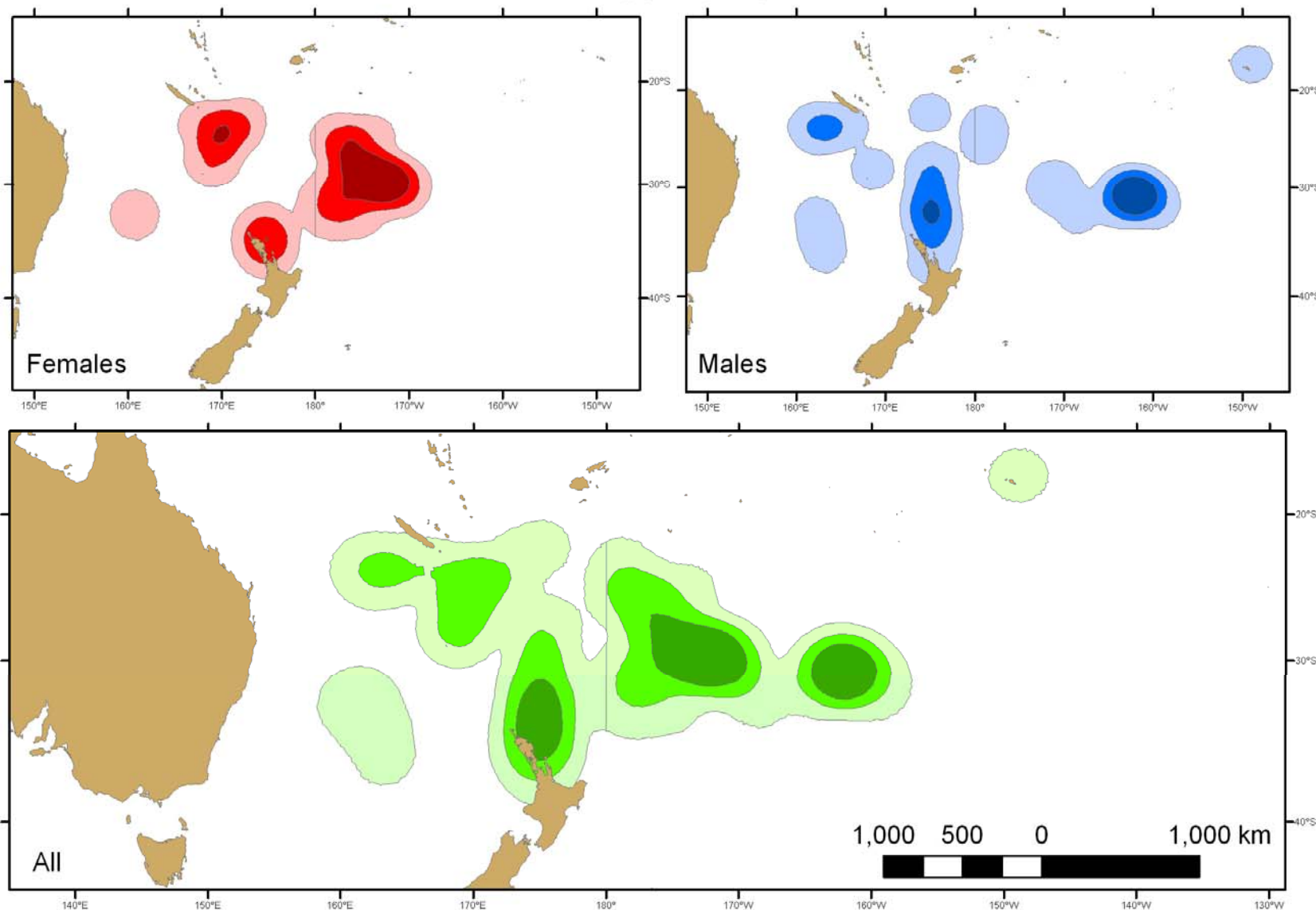
SUMMARY:

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

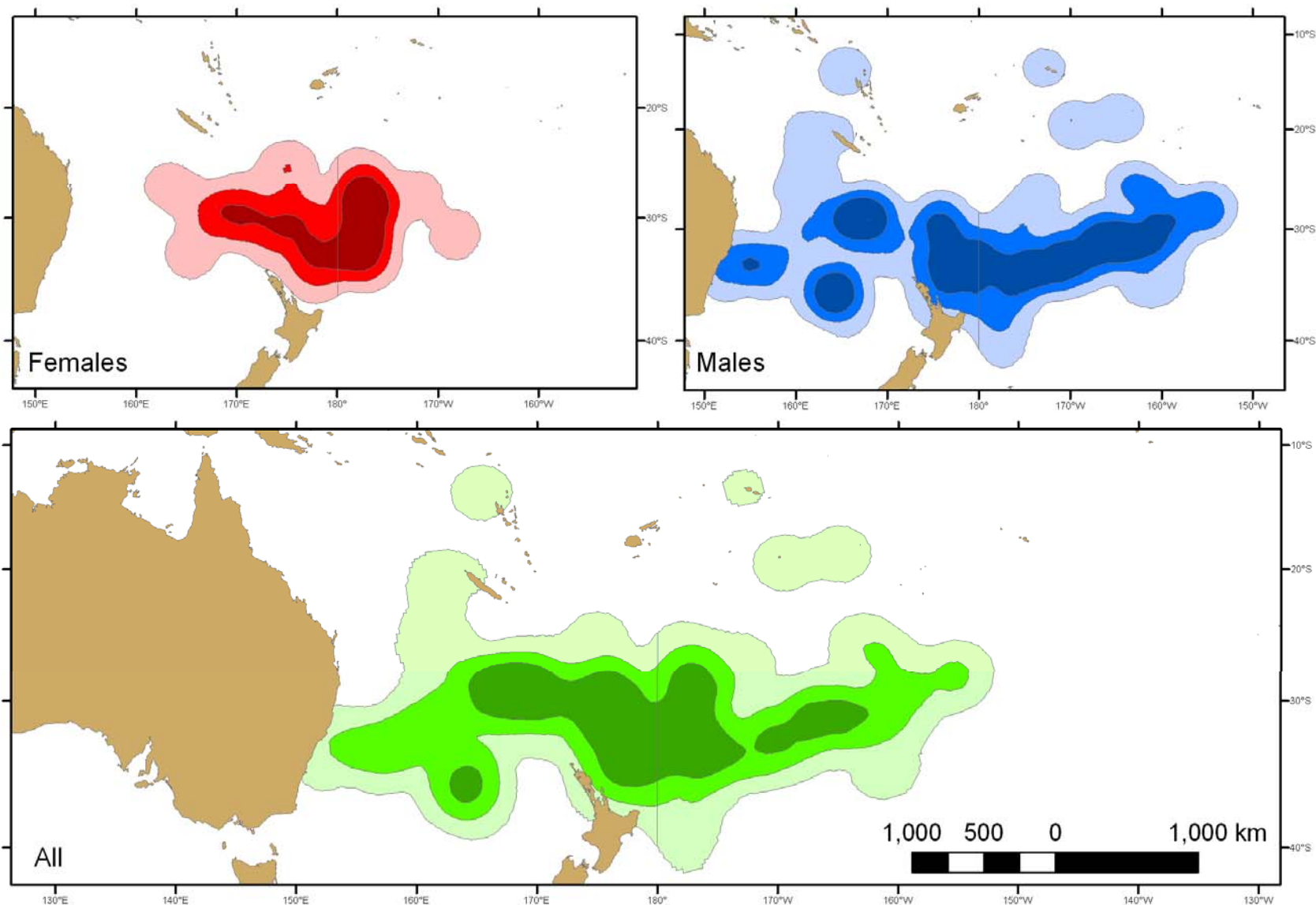
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Pre-egg laying 2008



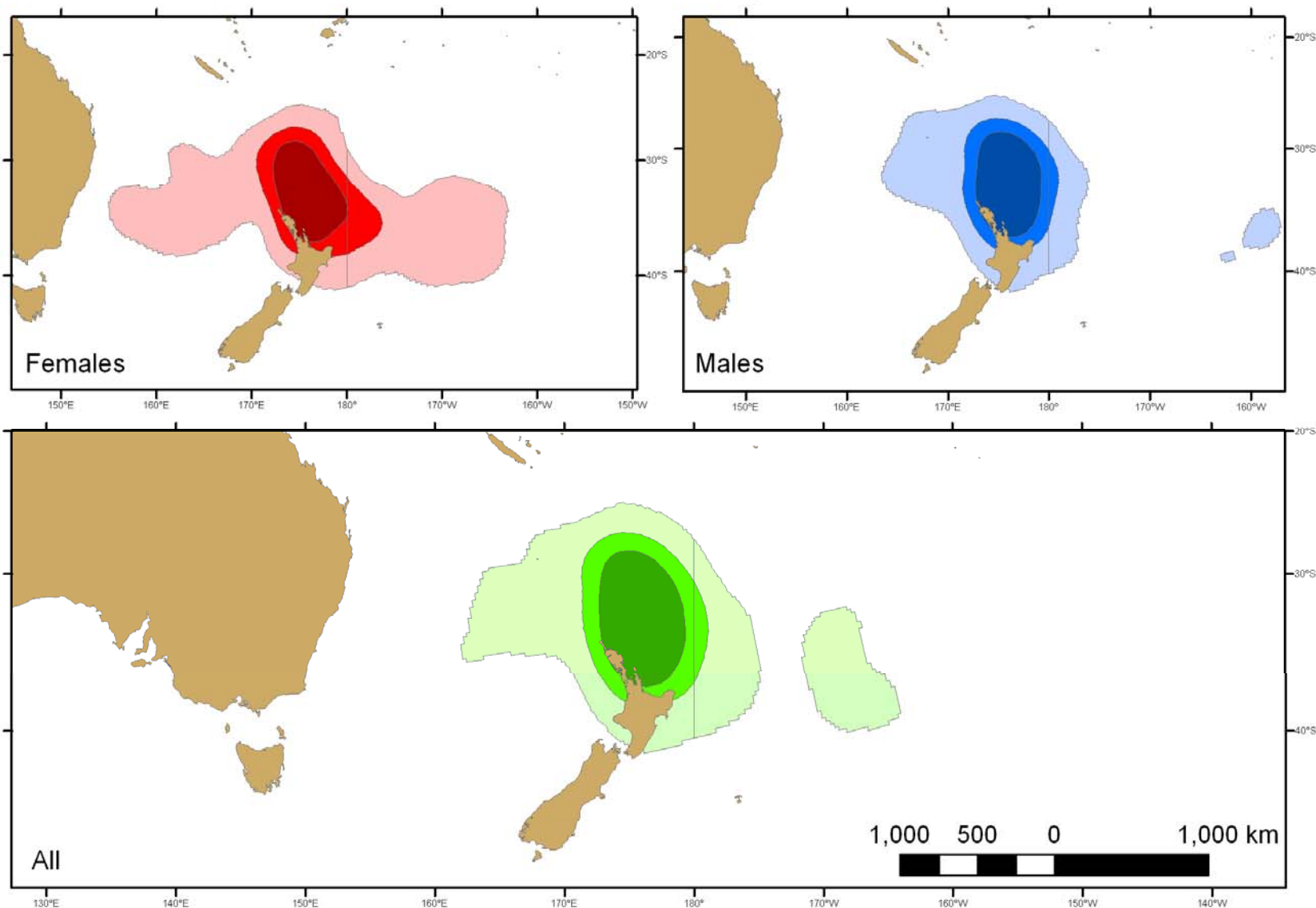
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Incubation 2008



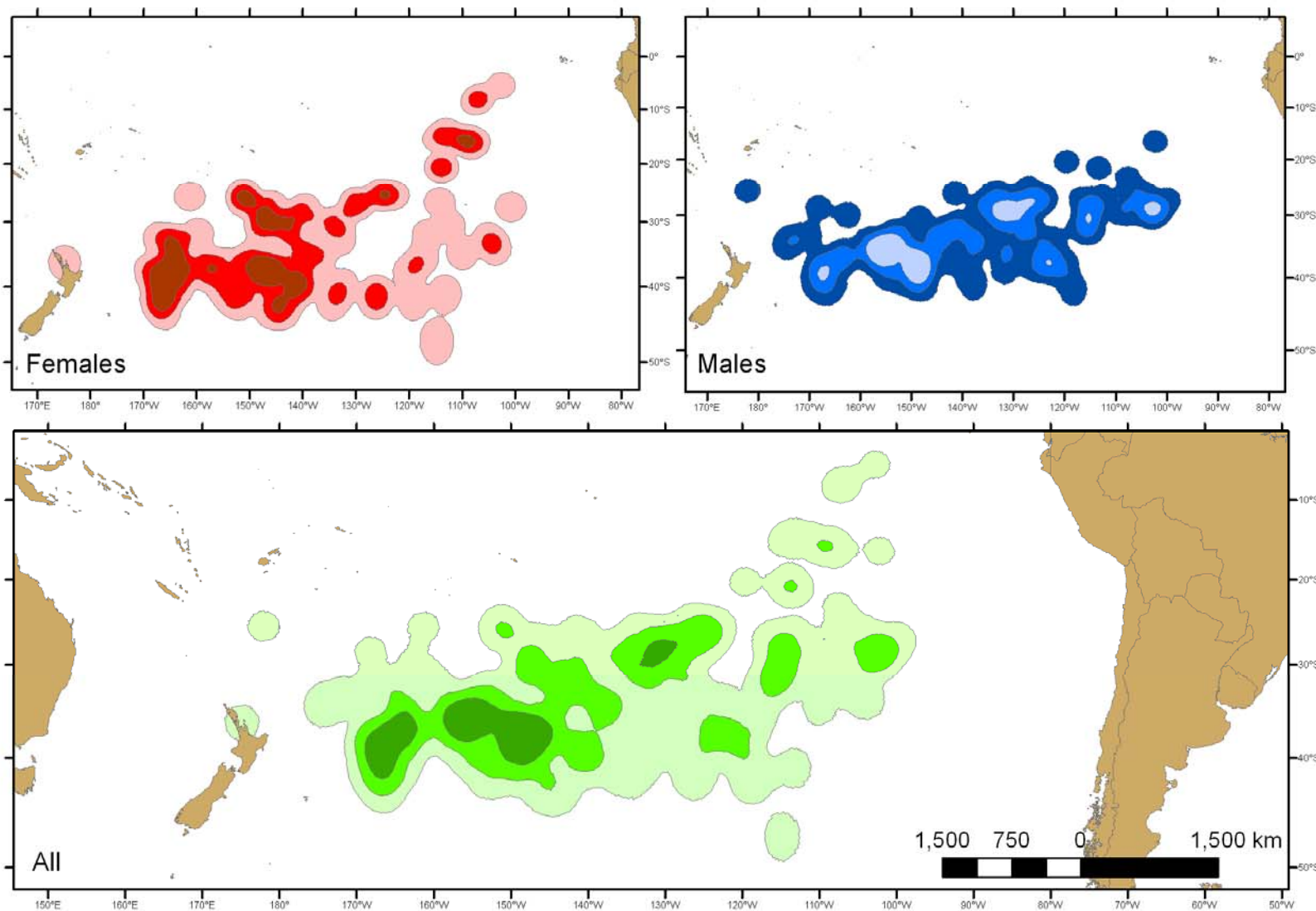
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Chick Rearing 2008



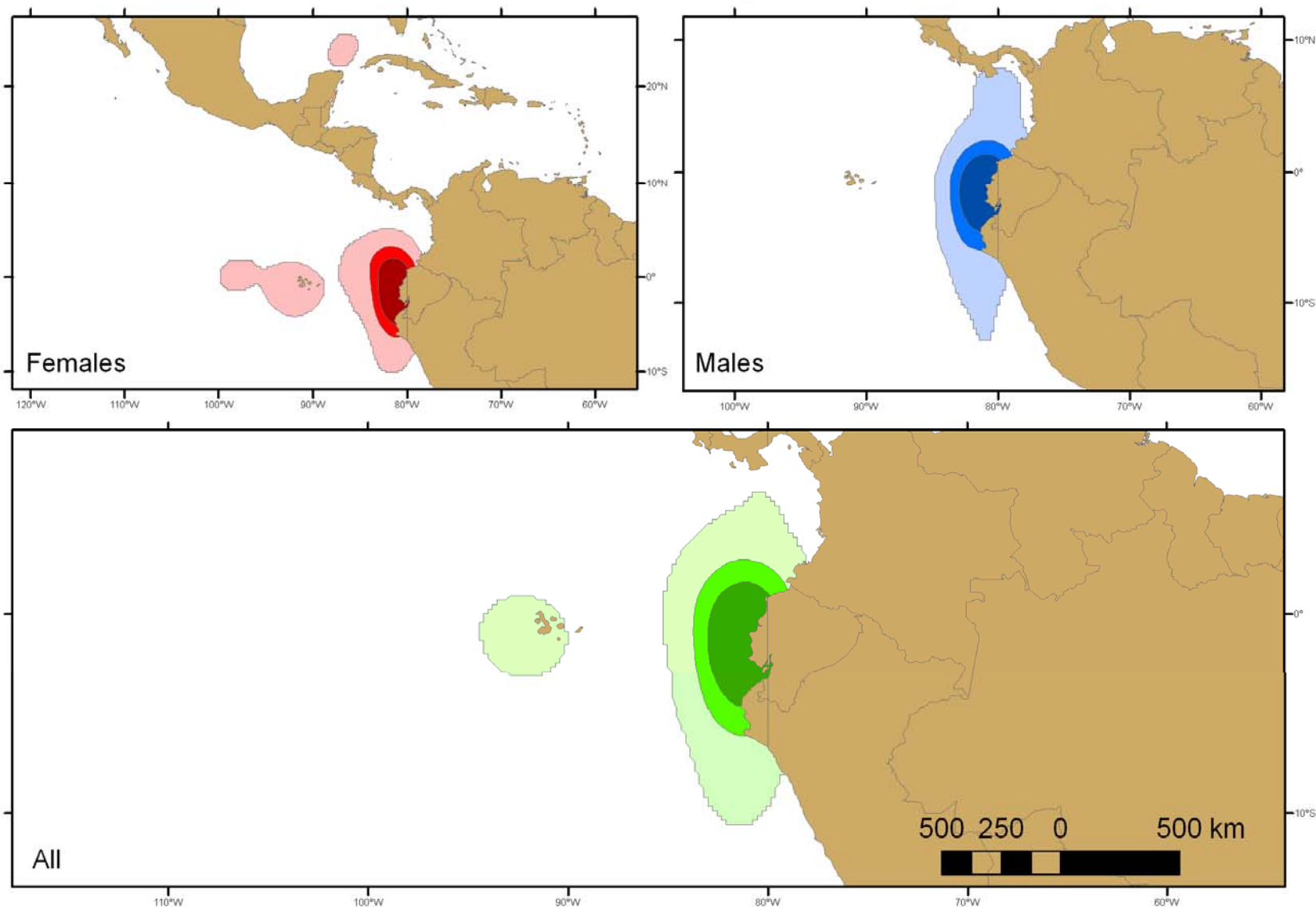
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Migration East 2008



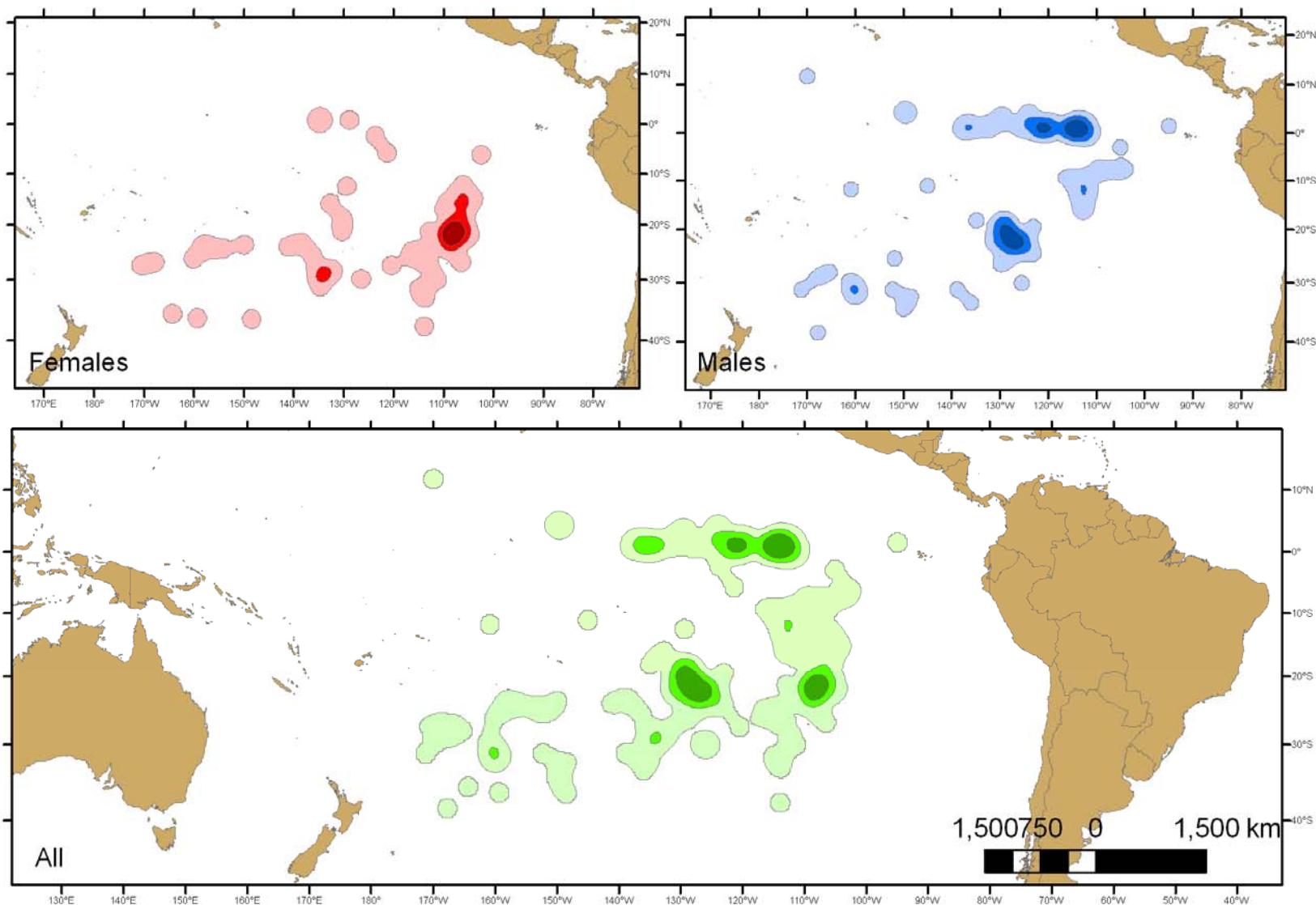
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Non-breeding 2008



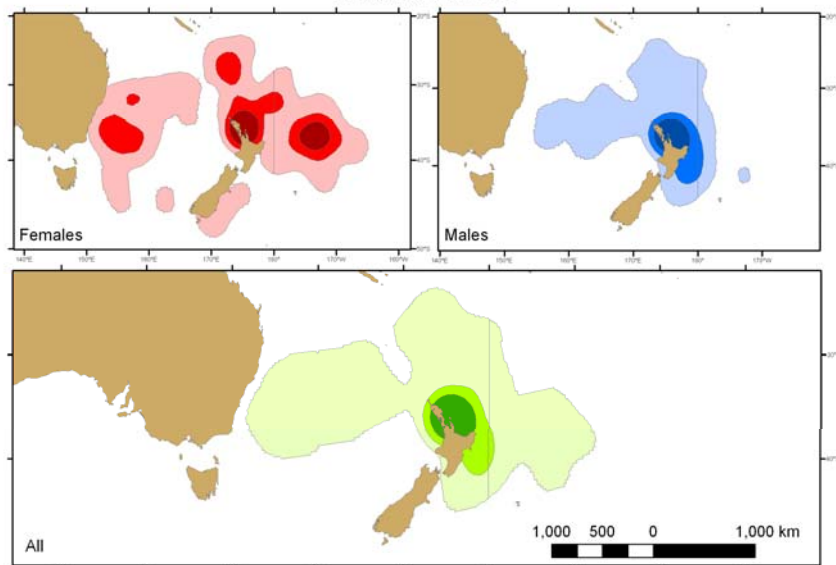
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Migration West 2008

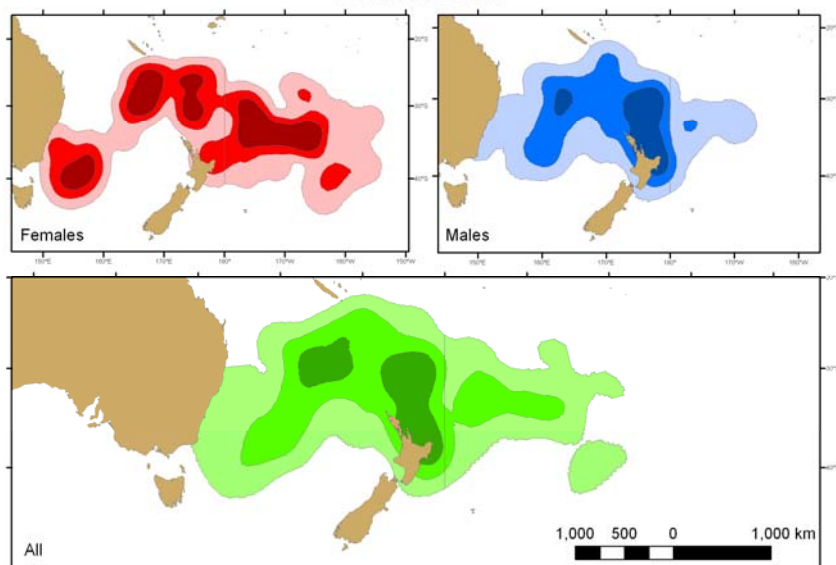


Comparison between breeding seasons

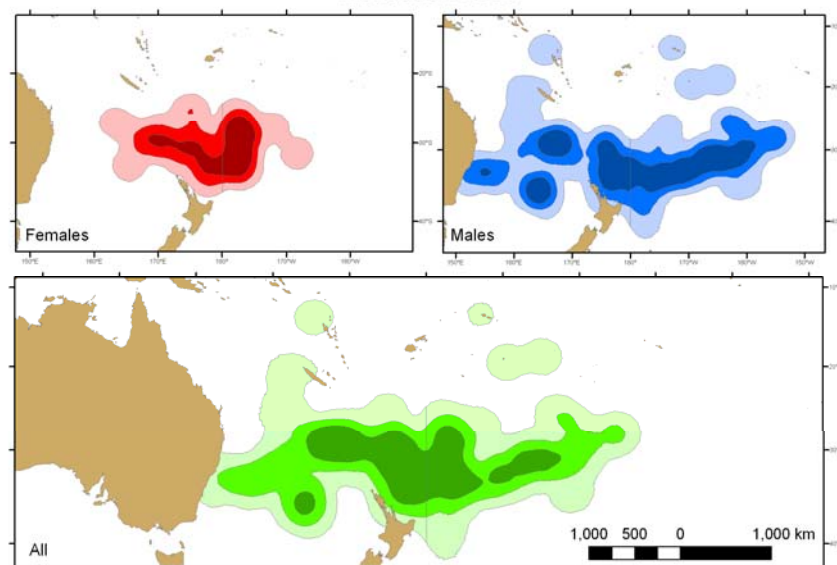
Incubation 2005



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⁻³) 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⁻³) 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 as PDF files**



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Any questions?