

Seabird density in the Olympic Coast National Marine Sanctuary 1995-2007

Jessica Lopez





Outline



- About Me
 - OCNMS Introduction
- Background on Project and Data
 - Questions
 - Methods
 - Results
 - Next Steps



About Me

Hawaii Pacific University
Nancy Foster Scholar
Masters Thesis:

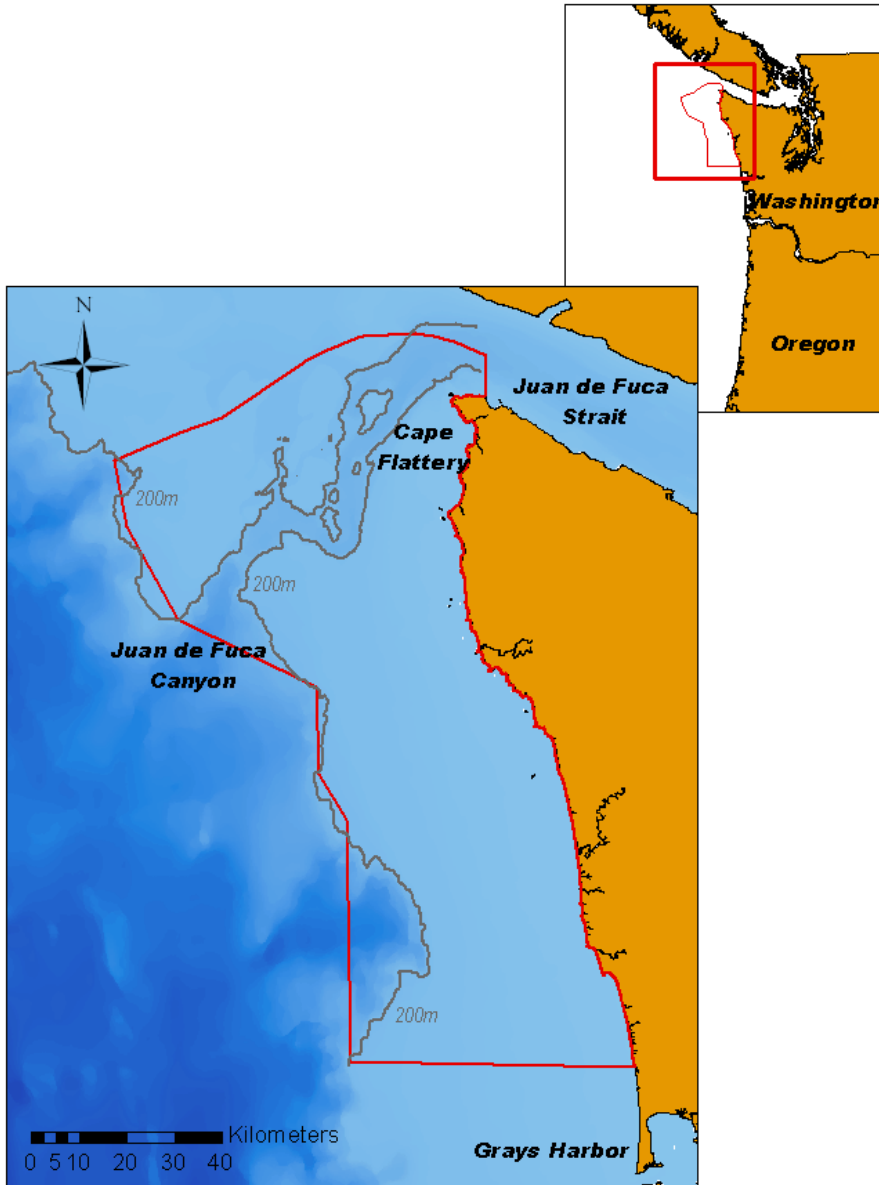
Persistent organic pollutants in the Hawaiian monk seal (*Monachus schauinslandi*) from the main Hawaiian Islands



Field research supervisor
PIFSC Hawaiian monk seal program

Olympic Coast National Marine Sanctuary

- Designated in July 1994
- 3,310 square miles
- Extends 25-50 miles seaward of coastline
- Diverse Habitats
- Important Key species



Seabirds in OCNMS

- OCNMS utilized by ~100 species of seabirds
- Many nest in areas adjacent to OCNMS
- Many are protected by federal and state laws
 - Endangered Species Act
 - Migratory Bird Treaty Act
 - Washington state law
- Surveyed annually via NOAA ship
- Seasonal surveys on r/v Tatoosh

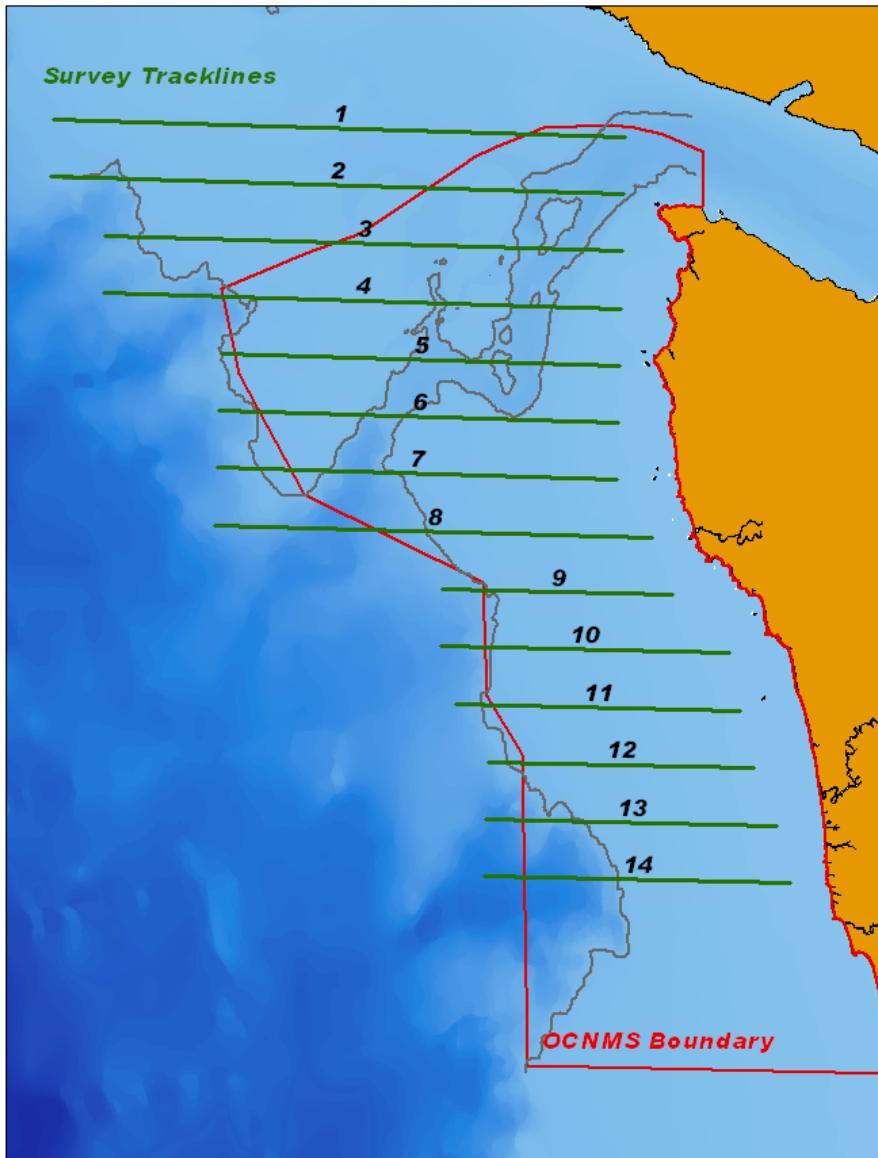


Summer Surveys:



Year	Ship	Dates
1995	R/V MacArthur I	July 20 – 27
1996	R/V MacArthur I	June 27 – July 9
1997	R/V MacArthur I	July 7 – 21
1998	R/V MacArthur I	June 24 – July 5
2000	N/V Agate Passage	June 16 – 25
2002	R/V MacArthur II	June 11 – 19
2004	R/V MacArthur II	May 22 – 31
2005	R/V MacArthur II	June 4 – 13
2007	R/V MacArthur II	June 28 – July 10

Survey Methods



- 14 Transects
- 1-2 observer
- 300m survey width
- Data Recorded:
 - Species
 - Number
 - Location
 - Behavior

Priority Species

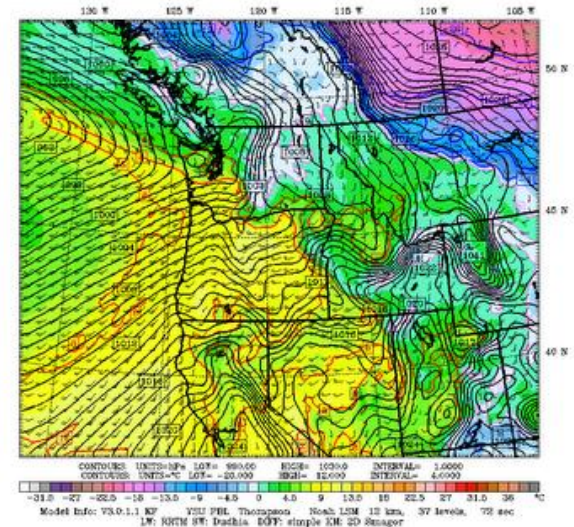
Common Name	Scientific Name	Protective Status	Relative Abundance	Breeds in Sanctuary
Black-footed albatross	<i>Diomedea nigripes</i>	MBTA, FE	Common	N
Sooty shearwater	<i>Puffinus griseus</i>	MBTA	Very Abundant	N
Pink-footed shearwater	<i>Puffinus creatopus</i>	MBTA	Common	N
Northern fulmar	<i>Fulmaris glacialis</i>	MBTA	Abundant	N
Fork-tailed storm petrel	<i>Oceanodroma furcata</i>	MBTA	Abundant	Y
Brandt's cormorant	<i>Phalacrocorax pelagicus</i>	MBTA , WSC	Uncommon	Y
Cassin's auklet	<i>Ptychoramphus aleutica</i>	MBTA, FSC, WSC	Common	Y
Rhinoceros auklet	<i>Cerorhinca monocerata</i>	MBTA	Common	Y
Common murre	<i>Uria aalge</i>	MBTA , WSC	Abundant	Y
Tufted puffin	<i>Lunda cirrhata</i>	MBTA, FSC, WSC	Uncommon	Y

Protected categories:

FE Federally Endangered, under the Endangered Species Act.
FSC Federal Species of Concern, under the Endangered Species Act
MBTA Migratory Bird Treaty Act
WSC Washington State Candidate

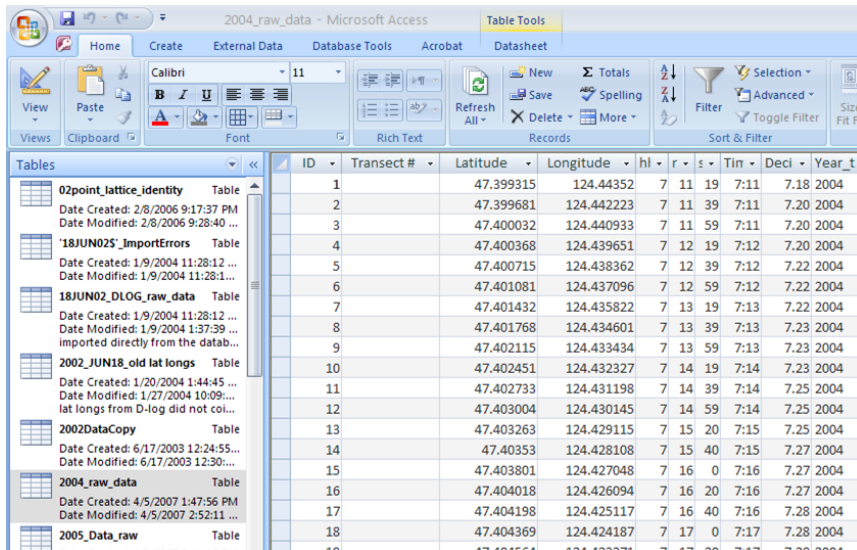


- 
- QUESTIONS



Data Challenges

- Different data collection software
- Different survey techniques
- Varying levels of processing



2004_raw_data - Microsoft Access

Table Tools

Home Create External Data Database Tools Acrobat Datasheet

Views Clipboard Font Rich Text Records Sort & Filter

Tables

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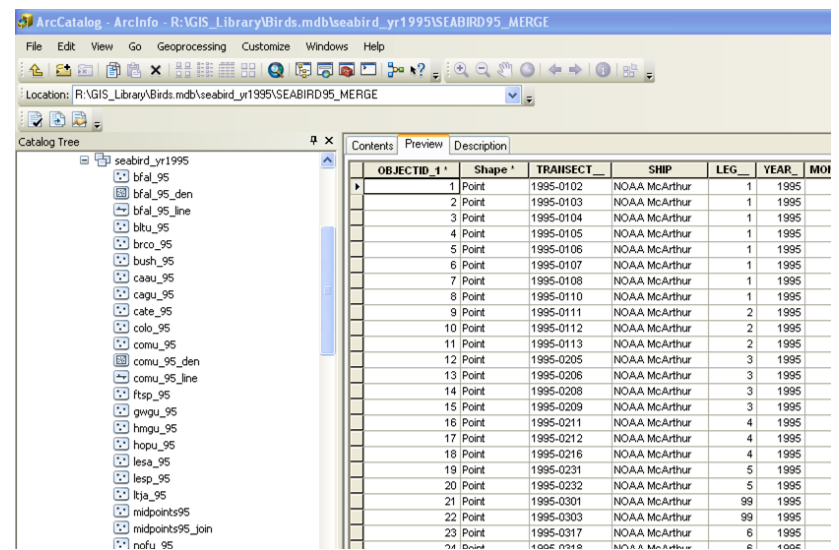
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Date Modified: 6/17/2003 12:30:00 ...

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2005_Data_raw Table
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2		47.399681	124.442223	7	11	39	7:11	7.20	2004
3		47.400032	124.440933	7	11	59	7:11	7.20	2004
4		47.400368	124.439651	7	12	19	7:12	7.20	2004
5		47.400715	124.438362	7	12	39	7:12	7.22	2004
6		47.401081	124.437096	7	12	59	7:12	7.22	2004
7		47.401432	124.435822	7	13	19	7:13	7.22	2004
8		47.401768	124.434601	7	13	39	7:13	7.23	2004
9		47.402115	124.433434	7	13	59	7:13	7.23	2004
10		47.402451	124.432327	7	14	19	7:14	7.23	2004
11		47.402733	124.431198	7	14	39	7:14	7.25	2004
12		47.403004	124.430145	7	14	59	7:14	7.25	2004
13		47.403263	124.429115	7	15	20	7:15	7.25	2004
14		47.40353	124.428108	7	15	40	7:15	7.27	2004
15		47.403801	124.427048	7	16	0	7:16	7.27	2004
16		47.404018	124.426094	7	16	20	7:16	7.27	2004
17		47.404198	124.425117	7	16	40	7:16	7.28	2004
18		47.404369	124.424187	7	17	0	7:17	7.28	2004
19		47.40454	124.423271	7	17	20	7:17	7.29	2004



ArcCatalog - ArcInfo - R:\GIS_Library\Birds.mdb\seabird_yr1995\SEABIRD95_MERGE

File Edit View Go Geoprocessing Customize Windows Help

Locations: R:\GIS_Library\Birds.mdb\seabird_yr1995\SEABIRD95_MERGE

Catalog Tree

seabird_yr1995

- bfa1_95
- bfa1_95_den
- bfa1_95_line
- bku_95
- brco_95
- bush_95
- caau_95
- cagu_95
- cate_95
- colo_95
- comu_95
- comu_95_den
- comu_95_line
- ftsp_95
- gwgu_95
- hmgu_95
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- ltja_95
- midpoints95
- midpoints95_join
- nofu_95

Contents Preview Description

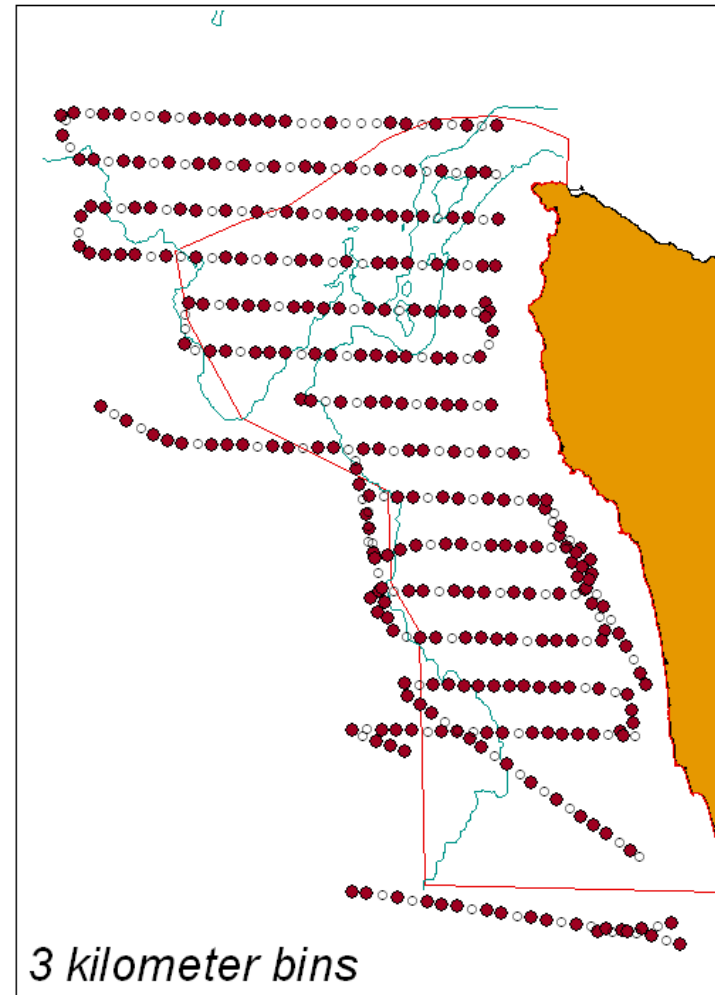
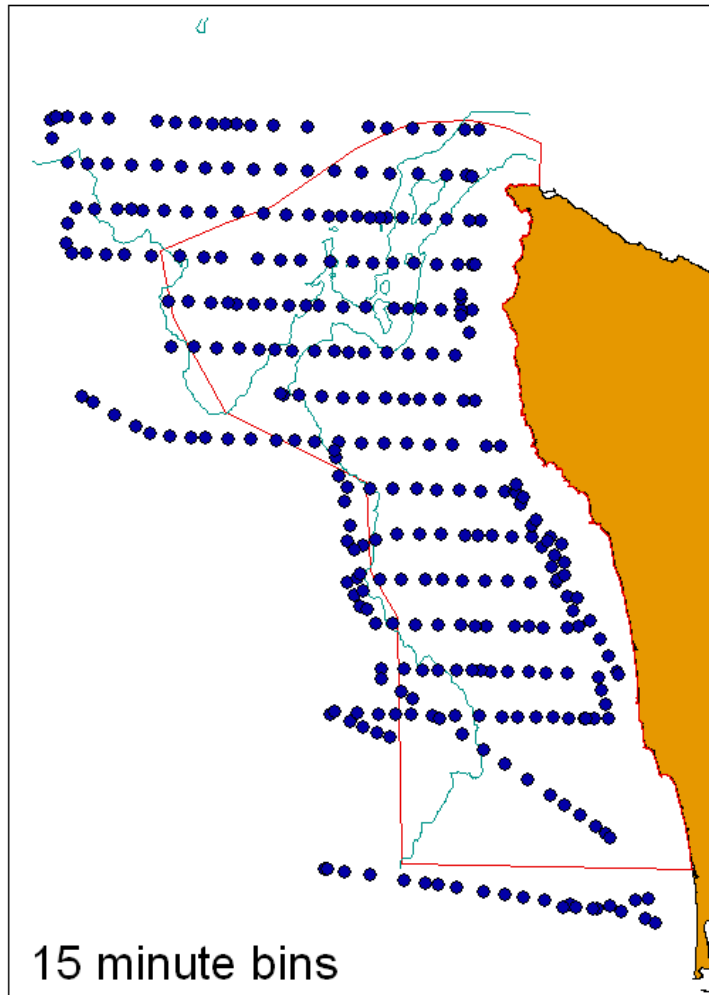
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20	Point	1995-0232	NOAA McArthur	5	1995	
21	Point	1995-0301	NOAA McArthur	99	1995	
22	Point	1995-0303	NOAA McArthur	99	1995	
23	Point	1995-0317	NOAA McArthur	6	1995	
24	Point	1995-0319	NOAA McArthur	6	1995	



Binning method

- 1995-1997: Data collected by hand, lat/long recorded every 15 minutes.
- 1998-2000: Lat/long collected and converted to 15 minute bins.
- 2002-2007: Location data used
- All years converted to 3 kilometer bins for this project.

Binning method

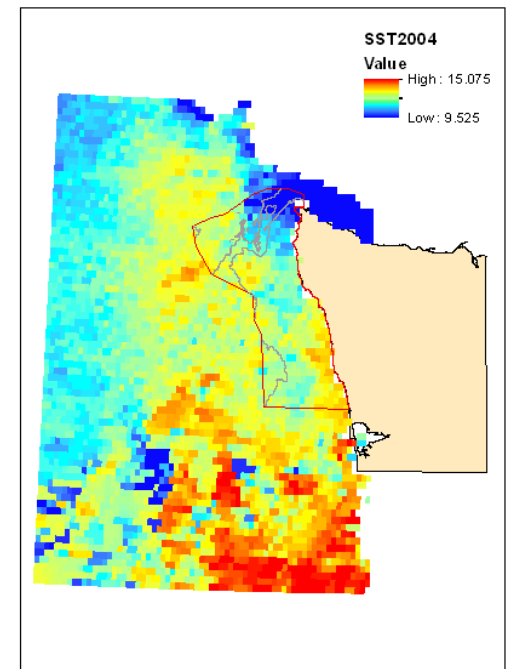
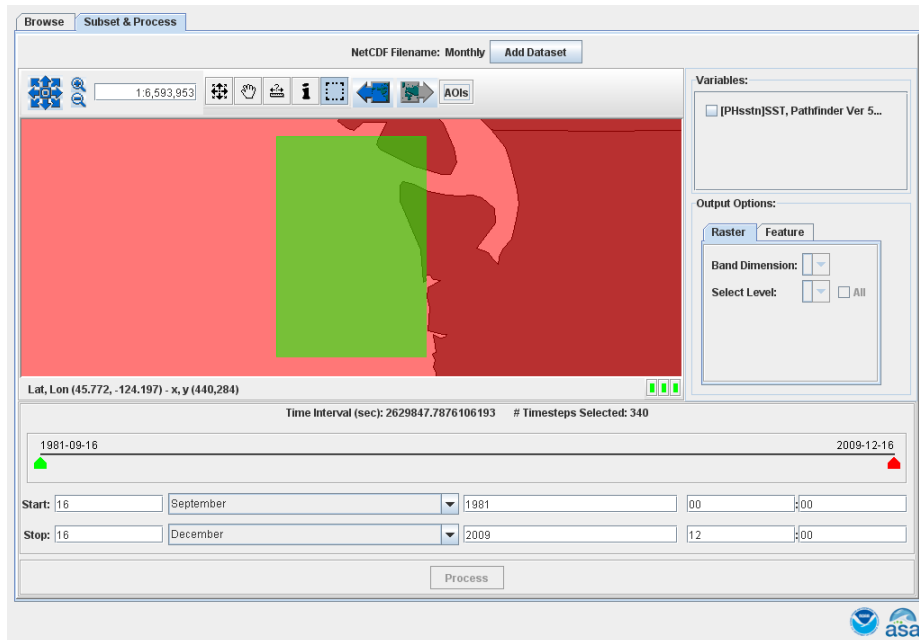


Final Methods

- Final Method:
 - 3 kilometer bins
 - Density (# birds/area)
 - Compare years (graphically)
 - Focus on four Priority Species to start
- 6 Environmental variables examined (Regression analysis):
 - Sea Surface Temperature (2000, 2004, 2005)
 - Chlorophyl-a (1998-2005)
 - Depth
 - Latitude
 - Distance to land
 - Distance to shelf break (200m isobath)

Oceanographic Data: Environmental Data Collector (EDC)

- Sea Surface Temperature:
 - Pathfinder Ver 5.0 4.4 km grid, night, monthly
- Chlorophyll-a (Ocean color):
 - Sea-viewing Wide Field-of-View Sensor (SeaWiFS)



Priority Species



Black-footed Albatross (BFAL)
Phoebastria nigripes



Northern Fulmar (NOFU)
Fulmaris glacialis



Pink-footed Shearwater (PFSH)
Puffinus creatopus



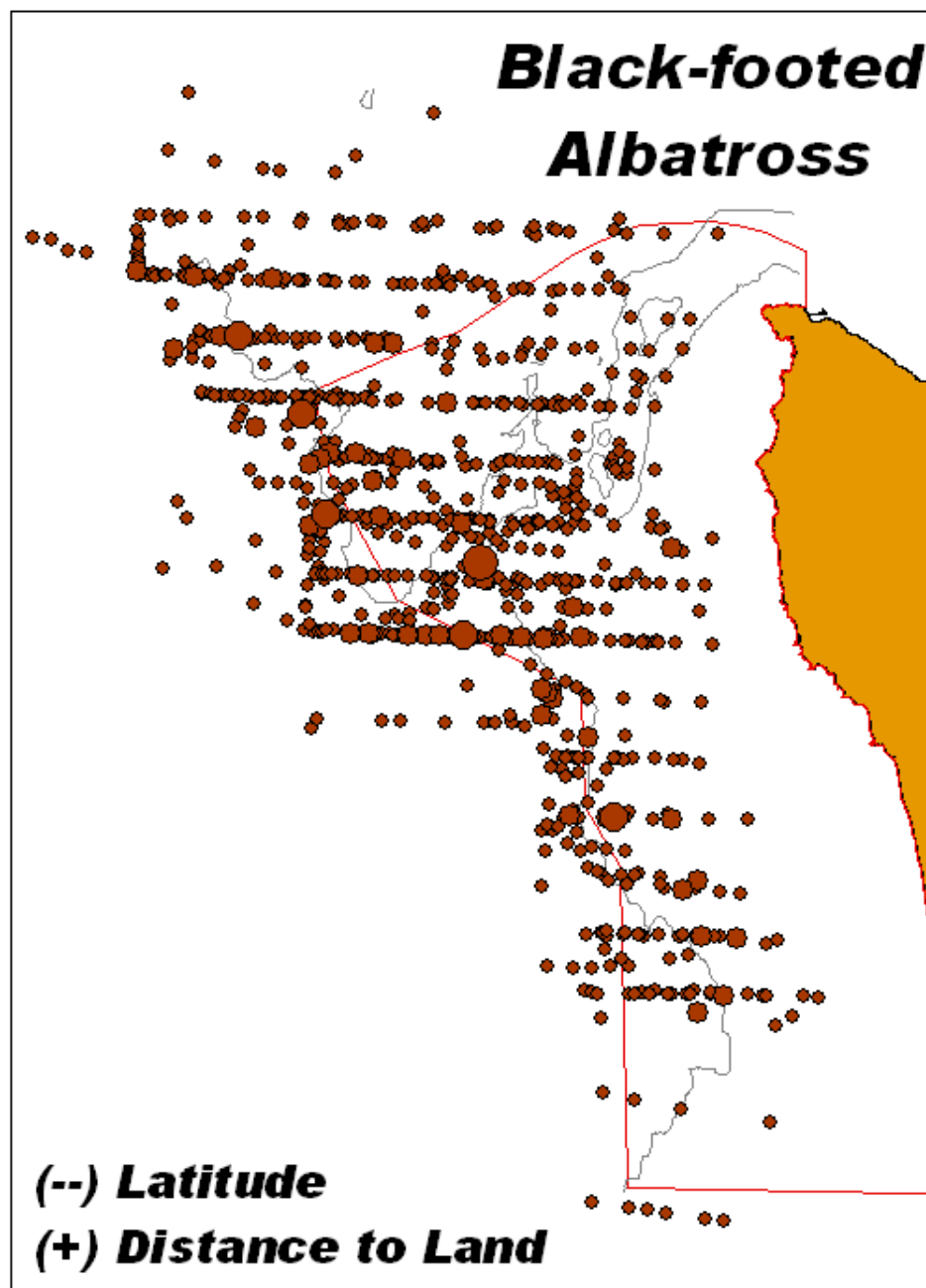
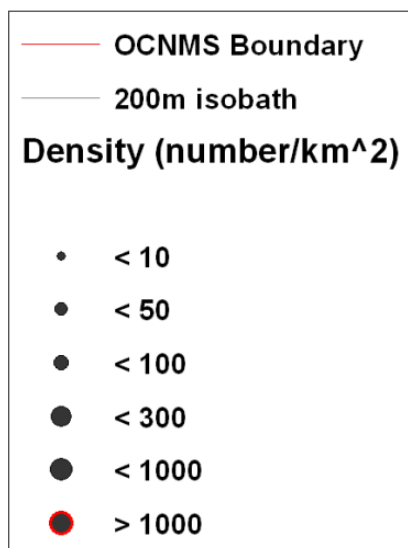
Sooty Shearwater (SOSH)
Puffinus griseus

Preliminary Results

Number of birds observed /survey day

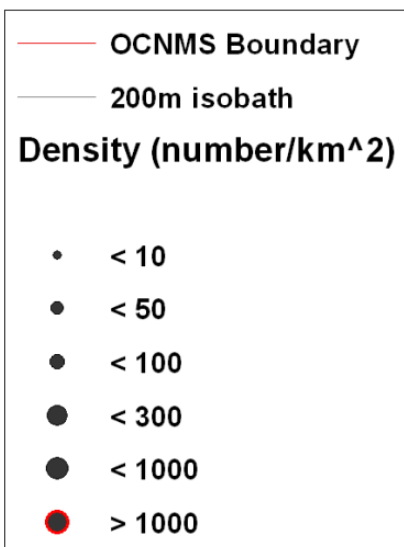
	BFAL	NOFU	PFSH	SOSH
1995	27.7	22.3	33.1	258.7
1996	24.6	771.4	21.3	898.0
1997	32.9	210.0	14.1	263.6
1998	24.3	301.8	20.9	300.9
2000	55.6	27.6	26.6	1,500.8
2002	23.5	38.7	38.0	3,551.7
2004	45.9	53.6	54.1	253.6
2005	24.8	5.9	16.3	182.0
2007	27.4	7.0	53.9	681.2

1995-2007



1995-2007

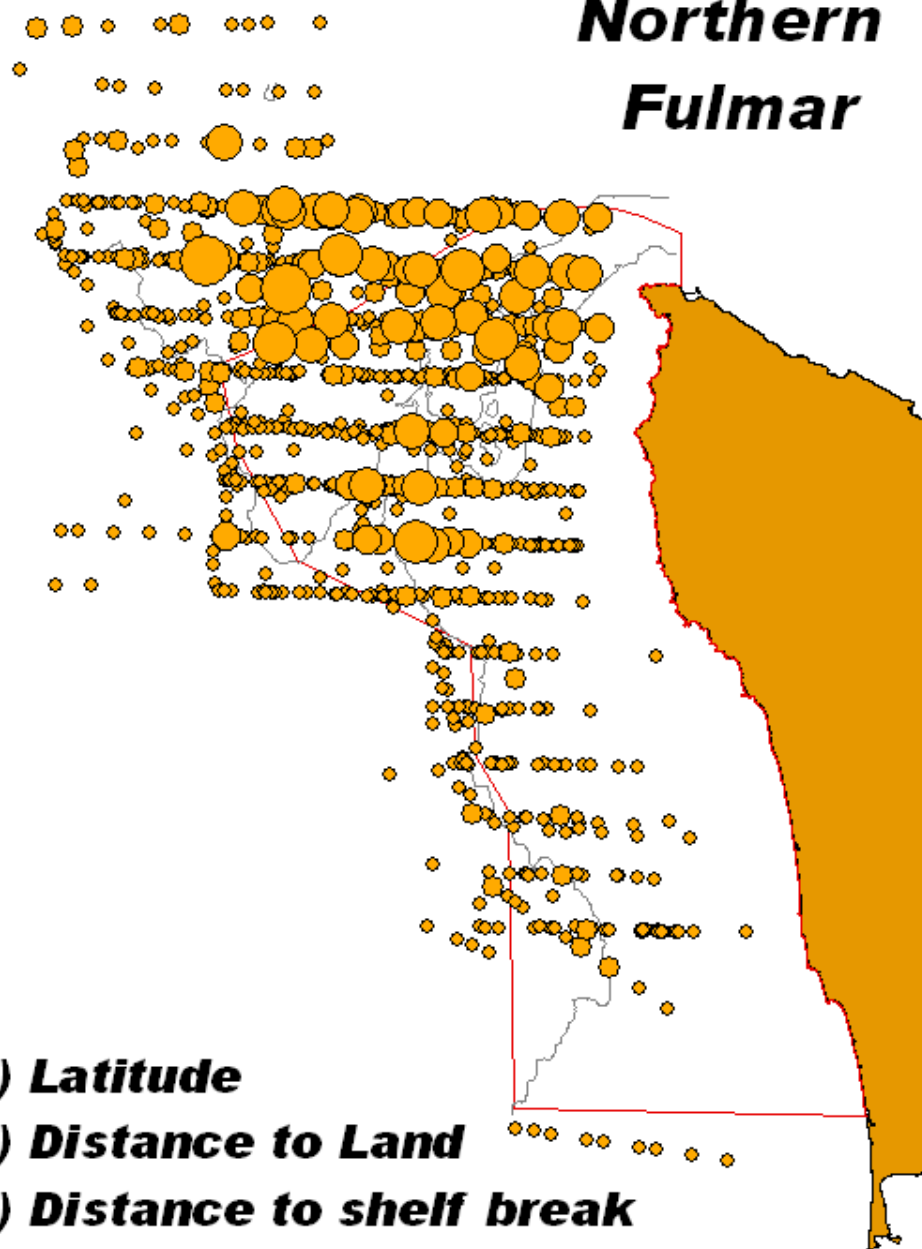
Northern Fulmar



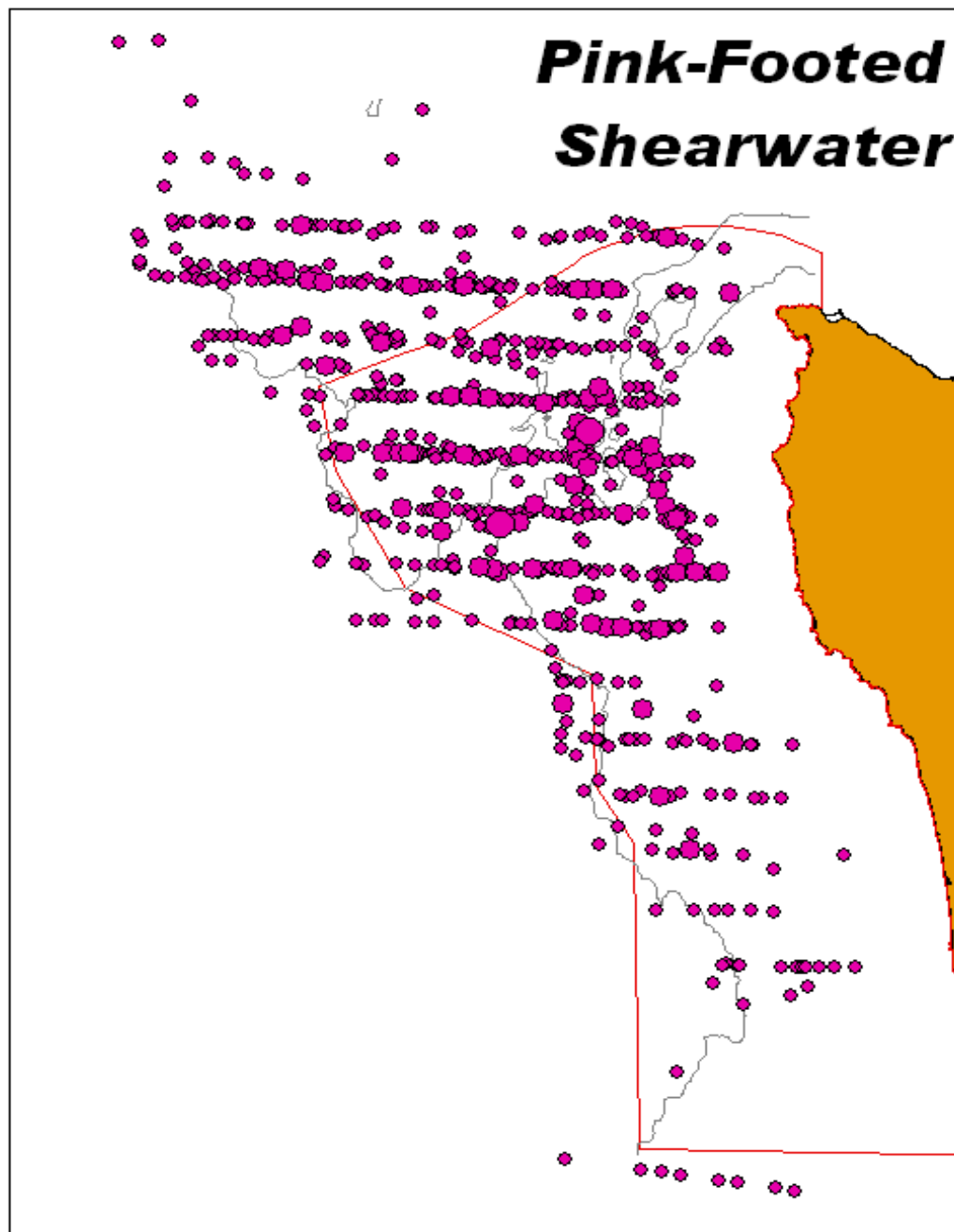
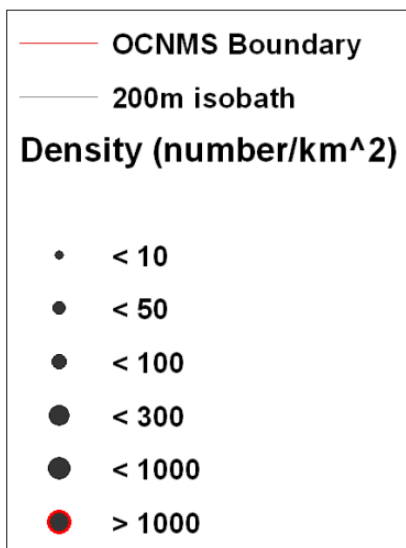
(+) **Latitude**

(--) **Distance to Land**

(+) **Distance to shelf break**

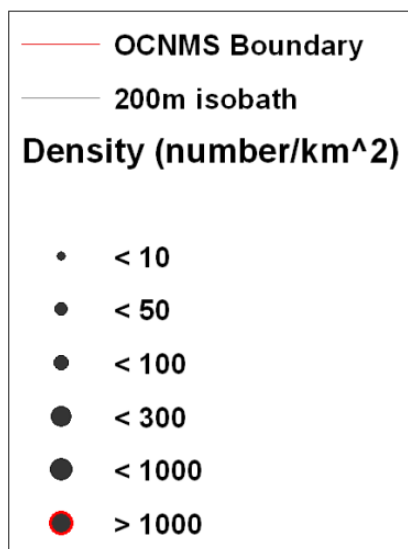


1995-2007



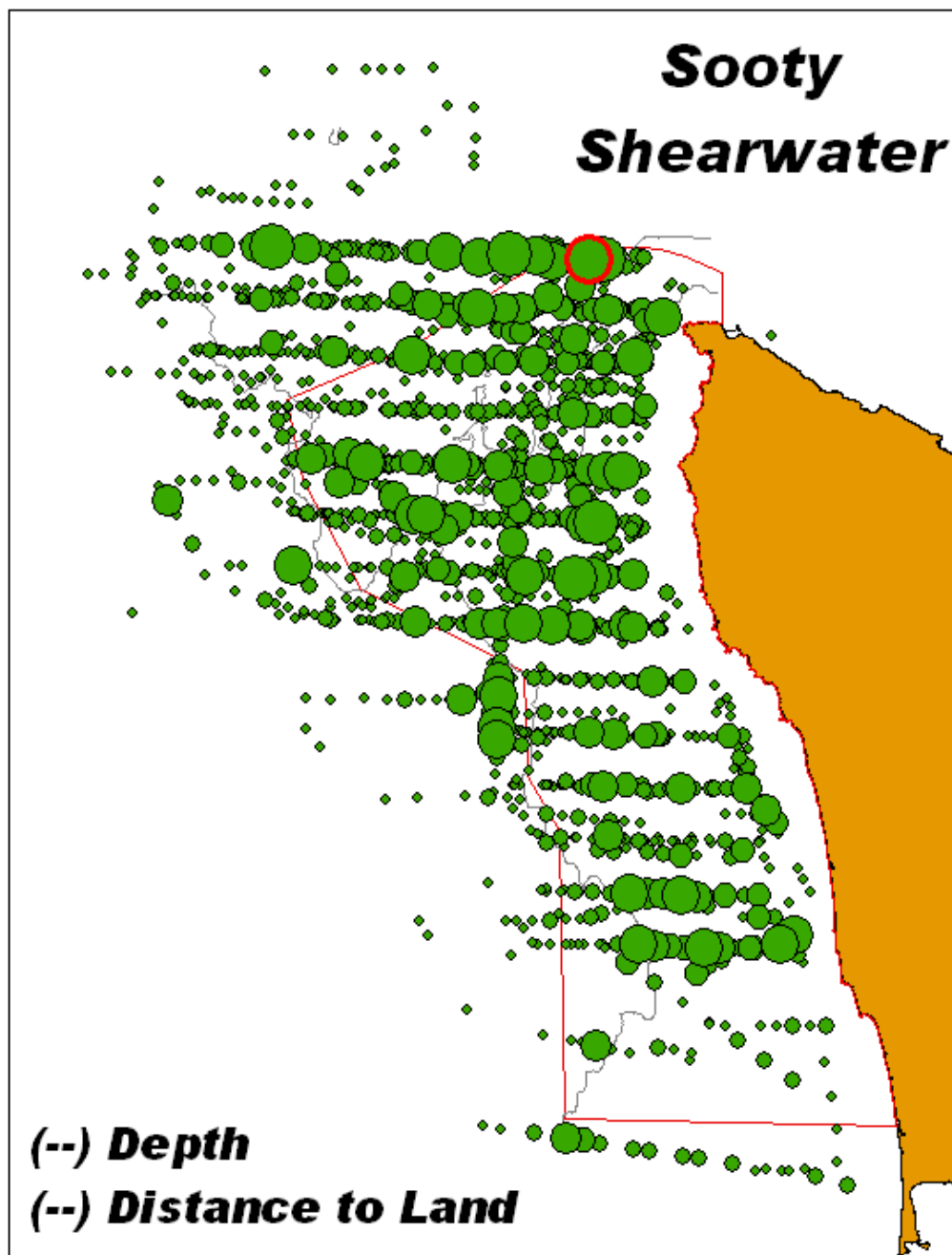
1995-2007

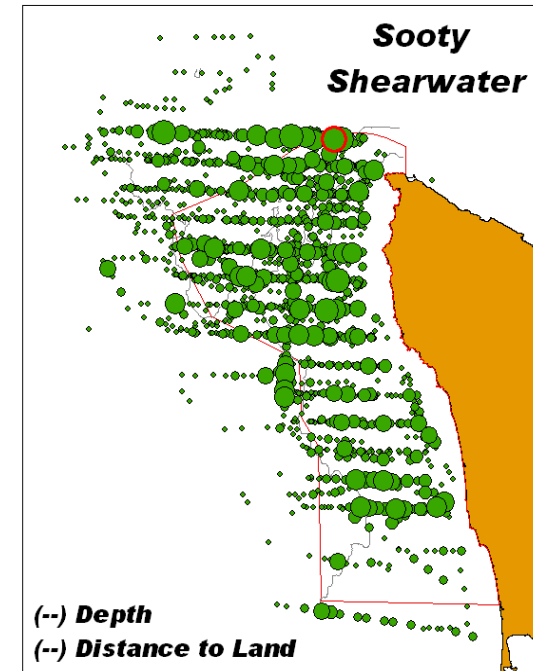
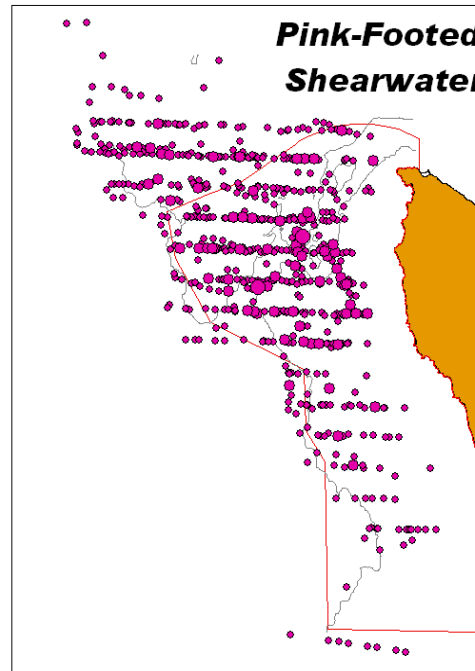
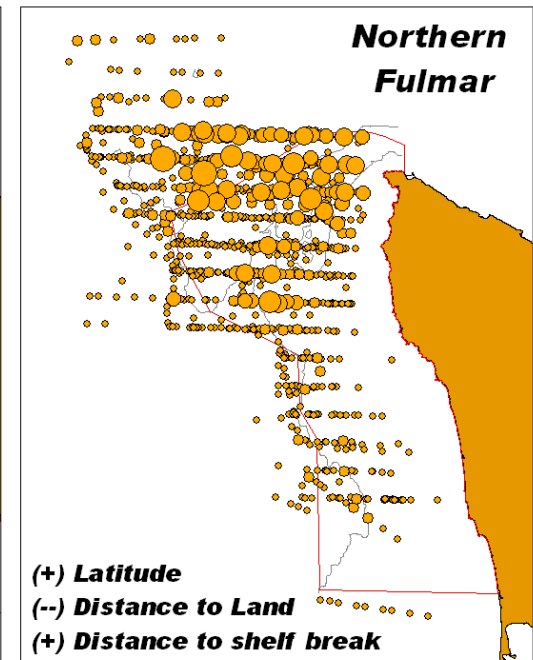
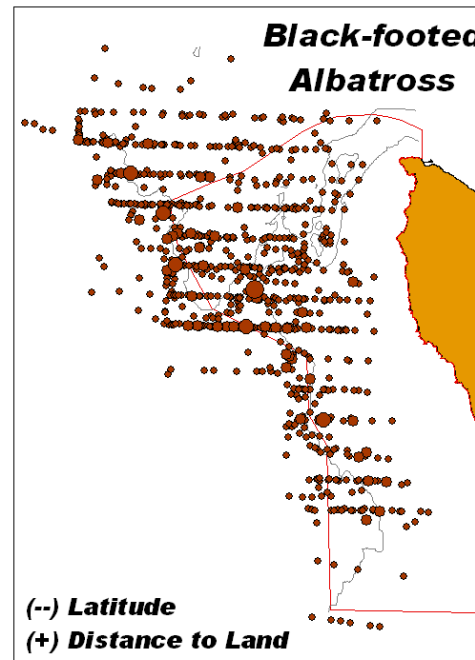
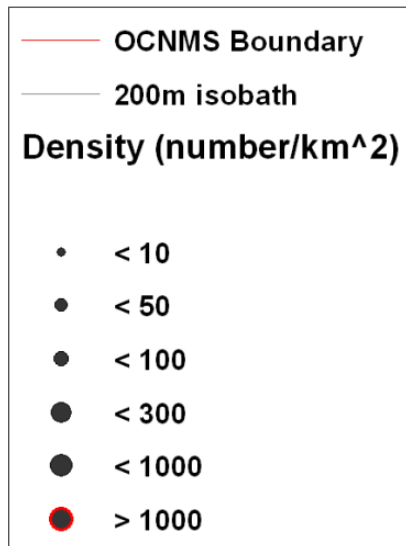
Sooty Shearwater



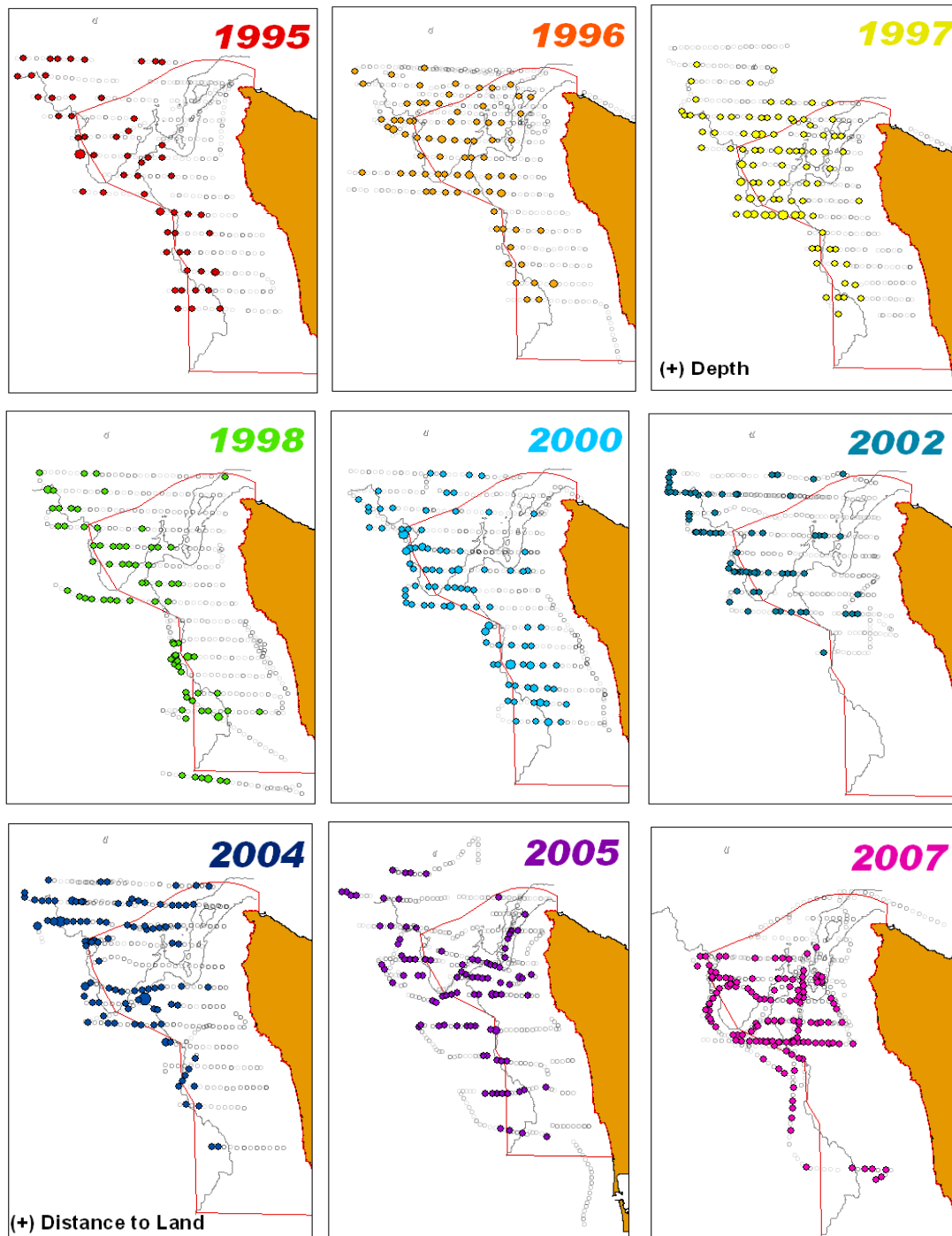
(-- Depth

(-- Distance to Land





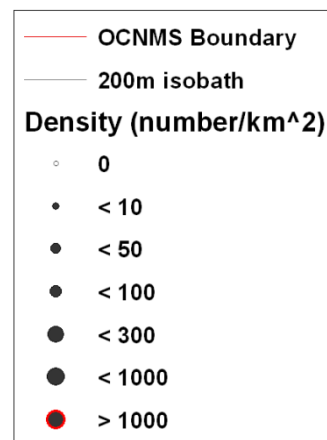
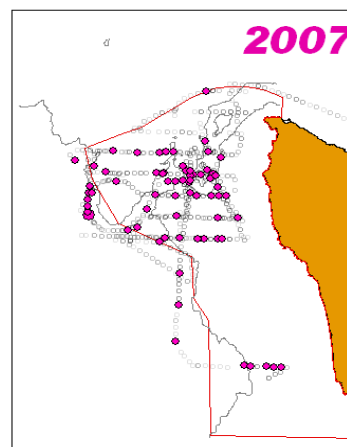
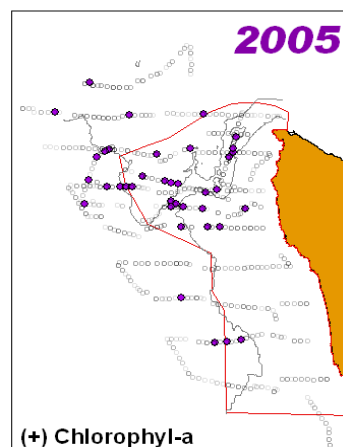
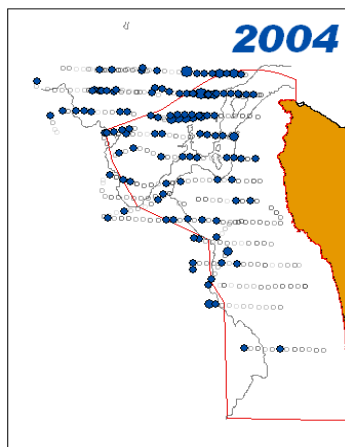
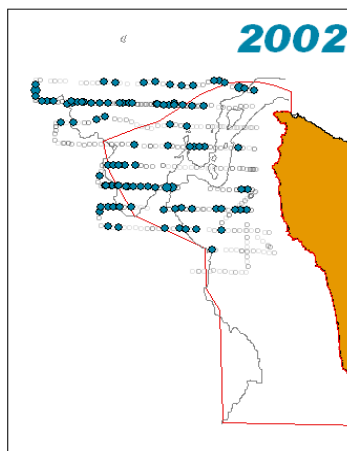
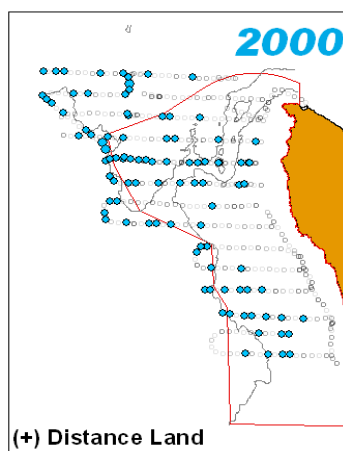
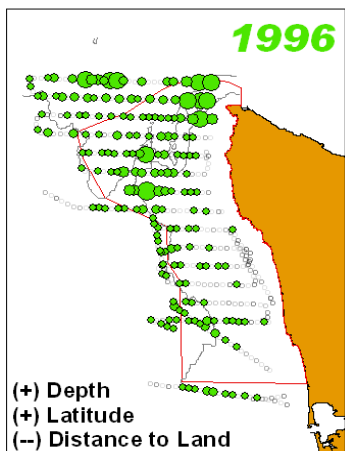
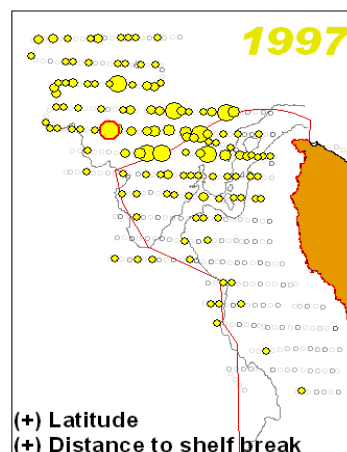
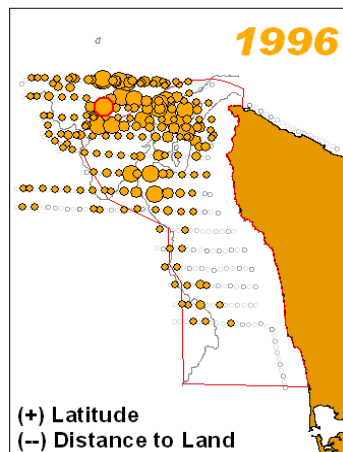
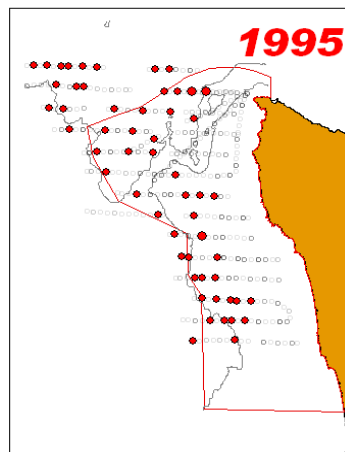
Black-footed Albatross



1995-2007

(+) Distance to land
(--) Latitude

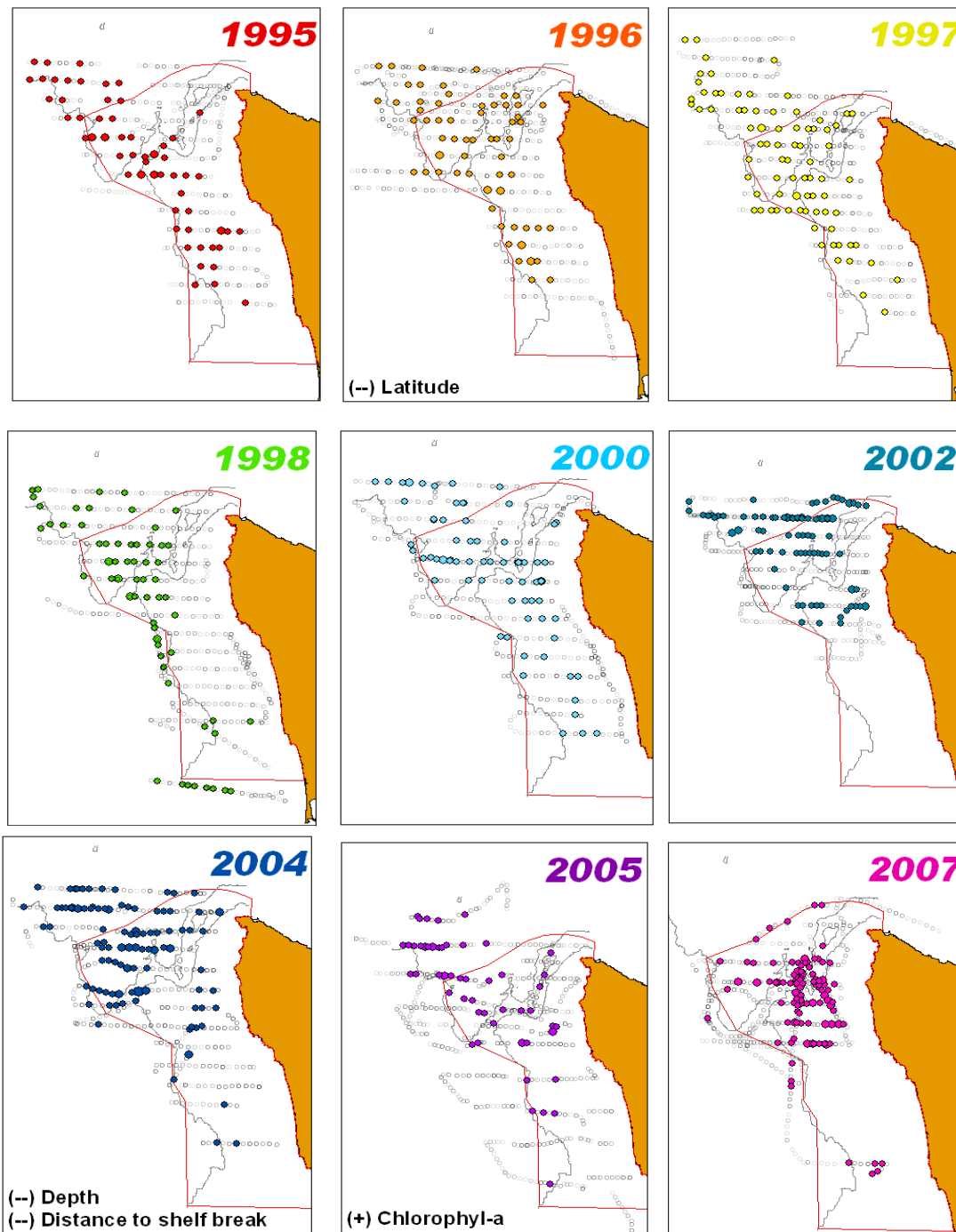
Northern Fulmar



1995-2007

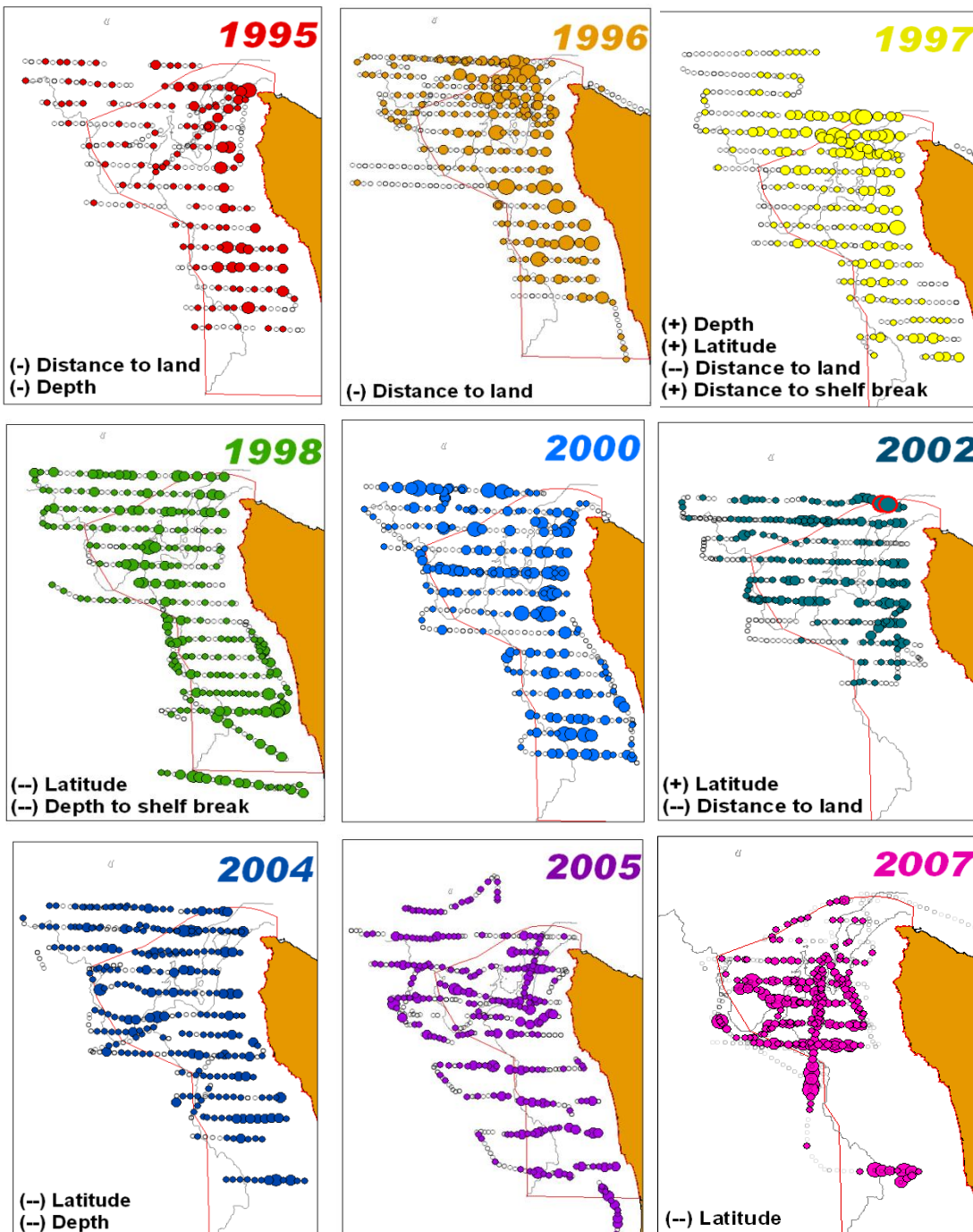
(+) Latitude
(--) Distance to land
(+) Distance to shelf break

Pink-footed shearwater



1995-2007
No significant
correlations

Sooty Shearwater



1995-2007

(-- Distance to land
 (-- Depth

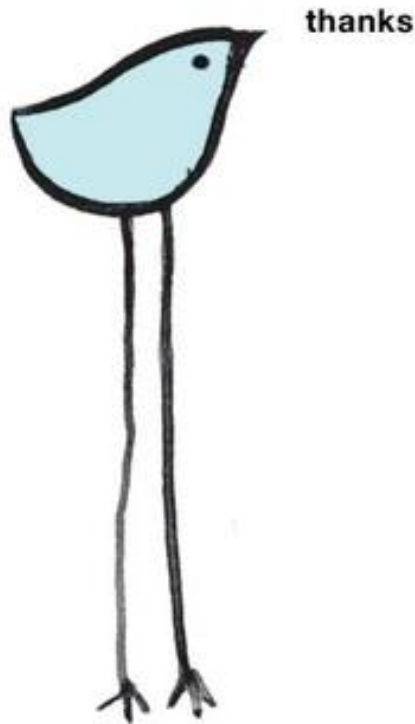
Next Steps

?

- Look at more species
- Compare years:
 - ANOVA
 - Control for effort
- Get more robust SST and Chlorophyll data
- Investigate additional drivers/variables
 - Wind? Current? Prey availability? Upwelling?
- Incorporate near-shore survey data



Acknowledgements



- Mitchell Tarrt
 - Ed Bowlby
- Nancy Wright
- Katie Brenkman
 - Liam Antrim
 - Rick Fletcher
 - Barb Blackie
 - OCNMS Staff

Questions?

