LONG-TERM MONITORING OF WILDLIFE AND ITS HABITATS IN ANTARCTICA - PHASE II

33rd Indian Scientific Expedition to Antarctica (Dec 2013 - Apr 2014)

Project Investigators: Dr. K. Sivakumar & Dr. S. Sathyakumar

Ministry of Earth Sciences

National Centre for Antarctic and Ocean Research
BACKGROUND
• Twice the size of Australia – 5th largest continent
• Covered by hard ice – avg. 2000 m thickness
• Coldest....... at -89.4 °C
• Windiest..... over 300 km/h
• Highest..... 2500 m avg. elevation
• Protected under the Antarctic Treaty of 1959

• No mining in Antarctica, *Natural Reserve devoted to Peace and Science*
India in Antarctica

- **First Indian Expedition in 1981**
- **33 expeditions so far**
- **Two Research stations**
  - **MAITRI** – 1988 onwards
  - **BHARATI** – 2012 onwards
  - **DAKSHIN GANGOTRI** - Abandoned in 1988
**Southern Ocean**

- **Sub-tropical Zone** –
  - Agulhas and Benguela currents
- **Sub-Antarctic Zone** -
  - Antarctic Circumpolar Current (Deakens 1984)
- **Antarctic Zone** - Ice-water interface

**Coastal Antarctica**

- Antarctic Coastal Current
- Marginal Ice Zones (Commins et al 2013)
- High snow drift
WII’s PARTICIPATION in ANTARCTIC EXPEDITIONS

14th Expedition (1994-95) – S. Sathyakumar

15th Expedition (1995-96) – Y.V. Bhatnagar

16th Expedition (1996-97) – S.A. Hussain & Ajai Saxena

28th Expedition (2008-09) – S. Sathyakumar & K. Sivakumar

29th Expedition (2009-10) – K. Suresh Kumar & J.A. Johnson

33rd Expedition (2013-14) – Anant Pande
STUDY AREA

Anant Pande
STUDY AREA: Southern Ocean* and Coastal Antarctica

Legend
- Indian Research Station
- Continent Boundary
- Voyage Route
PROJECT OBJECTIVES – Phase II

• Long term monitoring of status and distribution pattern and community structure of pelagic seabirds in Southern ocean and Antarctica

• Evaluate the habitat use of birds and mammals in Antarctica and identify key threat

• Monitor indicator species such as penguins and seals in the Indian sector of operation in Antarctica

Larsemann Hills

India Bay
METHODS
METHODS - Voyage Surveys

- **Southern Ocean**
  - Ship-based seabird counts
    - *snapshot method* (Tasker et al 1984)
  - Instant scan of 300 m strip width, 90° from bow
  - Daylight hours, good weather days (sea state < 5, visibility > 500 m)
  - Marine Mammals counted as and when seen during seabird survey
METHODS - Aerial Surveys

• Coastal Antarctica

- Aerial surveys for seals and penguins, India Bay and Larsemann Hills (Bester et al 2002)
- Straight line surveys from Antarctic coast up to ice-water edge, total counts
- Bell-type helicopter, 70-100 m altitude, speed ~ 80 Km/h
- Species, number, age-class (adult or pup), location, distance (approx.), reaction, photograph
- 1000-1600 hours, good weather (sunny/partly cloudy), wind < 45 km/h
Coastal Antarctica

Island surveys at Larsemann Hills for nesting locations

On-foot surveys, nest sites' location, molting sites location

Species (adult/chick/egg), number, activity, terrain type

South Polar Skua

METHODS contd...
RESULTS - Voyage Surveys

- Two voyages conducted during the expedition
- 45 species of seabirds in 1433 sightings (n= 7133)
- 8 families, one-third species globally threatened (IUCN 2014)

<table>
<thead>
<tr>
<th>Family</th>
<th># Species</th>
<th># Sightings</th>
<th>Counts</th>
<th>% Freq. of Occurrence</th>
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</thead>
<tbody>
<tr>
<td>Diomedeidae</td>
<td>8</td>
<td>165</td>
<td>222</td>
<td>3.11</td>
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<tr>
<td>Hydrobatidae</td>
<td>3</td>
<td>28</td>
<td>38</td>
<td>0.53</td>
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<tr>
<td>Laridae</td>
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<td>11</td>
<td>47</td>
<td>0.66</td>
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<td>Pelecanoididae</td>
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<td>6</td>
<td>7</td>
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<td>Procellariidae</td>
<td>27</td>
<td>1115</td>
<td>6320</td>
<td>88.6</td>
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<tr>
<td>Spheniscidae</td>
<td>4</td>
<td>88</td>
<td>456</td>
<td>6.39</td>
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<tr>
<td>Stercorariidae</td>
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<td>11</td>
<td>11</td>
<td>0.15</td>
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<tr>
<td>Sulidae</td>
<td>1</td>
<td>9</td>
<td>32</td>
<td>0.45</td>
</tr>
</tbody>
</table>
RESULTS – Voyage Surveys contd.

Legend
- □ Seabird locations
- ▪ Voyage Direction
- □ World Map
- □ Study Area
- High Chlorophyll Concentration
- Low (mg/cu. m)
Average Body Weight (Kg)

<table>
<thead>
<tr>
<th>Latitude Class</th>
<th>Body Weight Range</th>
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</thead>
<tbody>
<tr>
<td>35-37</td>
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<td>38-40</td>
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<td>41-43</td>
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<td>59-61</td>
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<td>62-64</td>
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<td>65-67</td>
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<td>68-70</td>
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</tr>
</tbody>
</table>

3 degrees Latitude class
Latitudinal Gradient of Species Richness during Austral Summer 2013-14
RESULTS – Voyage Surveys contd.

Latitudinal Gradient of Species Richness during two Austral Summers
RESULTS – Voyage Surveys contd.

Latitudinal Gradient of bird counts during two Austral Summers

Bird Count

Latitude

Latitudinal Gradient of bird counts during two Austral Summers
RESULTS – Voyage Surveys contd.

Latitudinal Gradient of bird counts during Austral Summer

Latitudinal Gradient of bird counts during Austral Summer
Latitudinal gradient in bird counts – within season
RESULTS – Voyage Surveys contd.

LATE SUMMERS (Feb-Mar)

Latitudinal gradient in bird counts - within season
RESULTS – Voyage Surveys contd.

BIRD COUNT DISTRIBUTION ACROSS STUDY AREA (2013-14)
RESULTS – Voyage Surveys cont.

Latitudinal gradient in bird counts based on food type in 2013-14

- Cephalopods
- Fish
- Mixed
- Plankton
Latitudinal gradient in bird counts based on food type in 2009-10
• Marine Mammals

- 15 species of marine mammals seen during the two voyages
- Sightings dominated by Humpback whale (> 50%) and Sperm whale
- Two species of dolphins: Killer whale and Long-finned Pilot Whales
RESULTS – Aerial surveys contd..

Seal and Penguin Distribution

Legend
- Station
- Survey Line
- Continent Boundary
- Leopard Seal
- Crabeater
- Weddell
- Unid Seal
- Ross Seal
- Emperor
- Adelie
RESULTS – Aerial surveys contd.

Species count

<table>
<thead>
<tr>
<th>Species</th>
<th>India Bay</th>
<th>Larsemann Hills</th>
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</thead>
<tbody>
<tr>
<td>Adelie Penguin</td>
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<tr>
<td>Crabeater Seal</td>
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<tr>
<td>Emperor Penguin</td>
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<tr>
<td>Leopard Seal</td>
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</tr>
<tr>
<td>Ross Seal</td>
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<td></td>
</tr>
<tr>
<td>Weddell Seal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unidentified</td>
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<td></td>
</tr>
</tbody>
</table>

Species

Weddell Seal

Adelie Penguin
RESULTS

• Island Surveys
  o 13 islands at Larsemann Hills surveyed
  o Five species of birds found nesting in 12 islands

Wilson’s Storm Petrel

Snow Petrel

Emperor Penguin

South Polar Skua

Adelie Penguin
ACKNOWLEDGEMENTS

- National Centre for Antarctic and Ocean Research
- Director and Dean, Wildlife Institute of India
- Faculty and Staff, WII

ONE-THIRD OF ALL SEABIRDS ARE GLOBALLY THREATENED
Thank You