

# ANTARCTIC SITE INVENTORY: 1994 – 2005

## LESSONS FOR ENVIRONMENTAL MONITORING, CONSERVATION, AND MANAGEMENT

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THE ANTARCTIC SITE INVENTORY PROJECT HAS COLLECTED BASELINE BIOLOGICAL DATA AND SITE-SPECIFIC DESCRIPTIVE INFORMATION IN THE ANTARCTIC PENINSULA SINCE NOVEMBER 1994. THE GOAL IS TO BUILD A COMPREHENSIVE DATABASE TO ASSIST IMPLEMENTATION OF THE 1991 PROTOCOL ON ENVIRONMENTAL PROTECTION TO THE ANTARCTIC TREATY.

THIS POSTER EXAMINES KEY RESULTS AND FINDINGS FROM ELEVEN SEASONS INVENTORYING THE ANTARCTIC PENINSULA, AND HOW THESE RESULTS AND FINDINGS POTENTIALLY ASSIST ENVIRONMENTAL MONITORING, CONSERVATION, AND MANAGEMENT EFFORTS BY ANTARCTIC TREATY PARTIES.

### PLAN OF WORK, LOGISTICS

THE INVENTORY INITIALLY INVESTIGATED WHETHER OPPORTUNISTIC, WELL-TIMED, CENSUS VISITS BY TRAINED RESEARCHERS, UTILIZING EXPEDITION SHIPS, ARE AN EFFECTIVE MEANS FOR CHARACTERIZING SITES AND COLLECTING ESSENTIAL BASELINE BIOLOGICAL DATA AND DESCRIPTIVE INFORMATION.

IN ELEVEN SEASONS FROM NOVEMBER 1994 THROUGH FEBRUARY 2005, THE INVENTORY HAS DEMONSTRATED CLEARLY THE UTILITY AND COST-EFFECTIVENESS OF SUCH VISITS. IN THIS TIME FRAME, INVENTORY RESEARCHERS HAVE MADE 639 VISITS TO 93 ANTARCTIC PENINSULA LOCATIONS. THERE HAVE BEEN REPETITIVE VISITS TO ALL SITES THAT ARE MOST HEAVILY VISITED BY EXPEDITION TOURISTS, AND TO ALL SITES THAT EXHIBIT THE MOST SPECIES DIVERSITY AND WHICH ARE MOST PRONE TO POTENTIAL ENVIRONMENTAL DISTURBANCE FROM VISITORS.

IN NOVEMBER 2003, WITH FUNDING FROM THE US NATIONAL SCIENCE FOUNDATION'S OFFICE OF POLAR PROGRAMS, THE INVENTORY ADDED A SECOND COMPONENT – A FIVE-YEAR, LONG-TERM ASSESSMENT AND MONITORING STUDY AT PETERMANN ISLAND (65° 10' S, 64° 10' W), A HEAVILY VISITED SITE EXHIBITING MEDIUM SPECIES DIVERSITY AND A MODERATE SENSITIVITY TO POTENTIAL DISRUPTIONS FROM HUMAN VISITORS.

### METHODOLOGY

THE INVENTORY COLLECTS THREE CATEGORIES OF DATA AND INFORMATION:

- BASIC SITE INFORMATION (DESCRIPTIONS OF KEY PHYSICAL AND TOPOGRAPHICAL CHARACTERISTICS)
- VARIABLE SITE INFORMATION AND DATA, WHICH INCLUDES WEATHER AND OTHER ENVIRONMENTAL CONDITIONS (SEA ICE EXTENT, CLOUD COVER, SNOW COVER, TEMPERATURE, WIND DIRECTION AND SPEED) AND BIOLOGICAL VARIABLES (POPULATION SIZE, BREEDING PRODUCTIVITY)
- MAPS AND PHOTODOCUMENTATION

WITH RESPECT TO KEY BIOLOGICAL VARIABLES, DATA COLLECTION FOLLOWS STANDARD METHODS ESTABLISHED BY THE SCIENTIFIC COMMITTEE OF THE COMMISSION FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES (CCAMLR) FOR THE CCAMLR ECOSYSTEM MONITORING PROGRAM (CEMP).

CRITICAL DATA SETS FOR PENGUINS ARE: STANDARD METHOD A3A (V4) TO ESTIMATE BREEDING POPULATION SIZE (NUMBER OF OCCUPIED NESTS) AND DETERMINE INTERANNUAL TRENDS IN THE SIZE OF BREEDING POPULATIONS; AND STANDARD METHOD A6 (V5), PROCEDURE A TO ESTIMATE BREEDING SUCCESS AND TO ASSESS PRODUCTIVITY BY PROVIDING AN INDEX OF RELATIVE CHANGE IN THE NUMBER OF CHICKS PRODUCED ONE YEAR TO THE NEXT.

FOLLOWING THESE METHODS ENSURES THE COMPARABILITY OF INVENTORY DATA WITHIN THE ANTARCTIC RESEARCH COMMUNITY, AND TO ASSIST DETERMINATIONS WHETHER ANY DETECTED CHANGES ARE SITE-SPECIFIC ABERRATIONS OR PENINSULA-WIDE (PERHAPS, CONTINENT-WIDE) TRENDS.

### PUBLIC AVAILABILITY OF DATA, INFORMATION

ANTARCTIC SITE INVENTORY DATA AND INFORMATION ARE PUBLISHED AND MADE AVAILABLE IN PEER-REVIEWED SCIENTIFIC PAPERS AND GOVERNMENT REPORTS, AND REPORTED ANNUALLY AT ANTARCTIC TREATY CONSULTATIVE MEETINGS.

MUCH OF THE INVENTORY DATABASE AND COMPILED, SITE-DESCRIPTIVE INFORMATION MAY BE FOUND IN THE COMPENDIUM OF ANTARCTIC PENINSULA VISITOR SITES (2D EDITION, 2003, PUBLISHED BY THE US ENVIRONMENTAL PROTECTION AGENCY).

DISSEMINATING THESE DATA AND INFORMATION IS INTENDED TO ASSIST PARTIES, EXPEDITION TOUR OPERATORS, AND VISITORS IN MINIMIZING AND AVOIDING POTENTIAL DISRUPTIONS TO PENINSULA FAUNA AND FLORA.

### GEOGRAPHICAL COVERAGE

THE INVENTORY DIVIDES THE ANTARCTIC PENINSULA INTO SIX SUBAREAS:

- ELEPHANT ISLAND AND NEARBY ISLANDS (EI);
- SOUTH ORKNEY ISLANDS, INCLUDING LAURIE, CORONATION, AND SIGNY ISLANDS (SO);
- NORTHEAST ANTARCTIC PENINSULA/NORTHWESTERN WEDDELL SEA (NE), FROM CAPE DUBOUZET (63° 16' S 64° 00' W) TO JAMES ROSS ISLAND;
- SOUTH SHETLAND ISLANDS, INCLUDING DECEPTION, LOW, AND SMITH ISLANDS (SH);
- NORTHWEST ANTARCTIC PENINSULA (NW), FROM CAPE DUBOUZET (63° 16' S 64° 00' W) TO THE NORTHERN END OF LEMAIRE CHANNEL;
- SOUTHWEST ANTARCTIC PENINSULA (SW), FROM THE NORTHERN END OF THE LEMAIRE CHANNEL TO THE NORTHERN PART OF MARGUERITE BAY (68° 18' S 67° 11' W)

SOUTHERN GIANT PETRELS (*MACRONECTES GIGANTEUS*) SATISFY IUCN CRITICALLY ENDANGERED CRITERIA, AND THEIR LISTING AS A SPECIALLY PROTECTED SPECIES UNDER THE ANTARCTIC ENVIRONMENTAL PROTOCOL WILL BE CONSIDERED AT THE 2006 ANTARCTIC TREATY CONSULTATIVE MEETING.

SOUTHERN GIANT PETRELS BREED AT FOUR SOUTH SHETLAND ISLANDS VISITOR SITES THAT ARE REGULARLY CENSUSED BY THE ANTARCTIC SITE INVENTORY – HANNAH POINT, AITCHO ISLANDS, PENGUIN ISLAND, TURRET POINT



### SOUTH SHETLAND ISLANDS (SH) SUBAREA

### NORTHEAST (NE) SUBAREA

### NORTHWEST (NW) SUBAREA

### SOUTHWEST (SW) SUBAREA

ANTARCTIC CIRCLE  
66° 30' S.



30 NAUTICAL MILES  
35 STATUTE MILES



### POPULATION TRENDS

THE INVENTORY IDENTIFIED A SIGNIFICANT DECLINE IN POPULATIONS OF BLUE-EYED SHAGS (*PHALACROCORAX ATRICEPS*) THROUGHOUT THE PENINSULA, IRRESPECTIVE OF THE AMOUNT OF TOURISM AT CENSUS SITES. THE DECLINES MAY BE INDICATIVE OF SOME UNDERLYING ENVIRONMENTAL CHANGE AFFECTING SHAG BREEDING SUCCESS. POPULATIONS NOW APPEAR TO HAVE STABILIZED OR SLIGHTLY INCREASED, AND THE INVENTORY WILL CONTINUE TO MONITOR THESE SITES.



### LONG-TERM MONITORING STUDY AT PETERMANN ISLAND, 2003-08

JEAN-BAPTISTE CHARCOT AND THE SECOND FRENCH ANTARCTIC EXPEDITION WERE BASED AT PETERMANN ISLAND FROM DECEMBER 1908 TO NOVEMBER 1909. DURING THE WINTER, CHARCOT'S VESSEL – *POURQUOI PAS?* – WAS TIED SAFELY INTO CIRCUMCISION BAY, AND PROTECTED FROM PENOLA STRAIT ICE BY HAWBERS STRUNG ACROSS THE ENTRANCE TO THE BAY. FROM PETERMANN, CHARCOT EXPLORED MORE THAN 2,000 KILOMETERS OF PREVIOUSLY UNKNOWN COASTLINE.

CHARCOT'S DATA, COMPARED TO THOSE COMPILED BY THE INVENTORY, PROVIDE SOME INDICATION OF CHANGES OVER THE LAST CENTURY. THE ADÉLIE PENGUIN POPULATION HAS DECLINED BY 50%, WHILE THE GENTOO POPULATION HAS SHOWN A 40-FOLD INCREASE. STILL UNDETERMINED IS HOW THESE TRENDS RELATE TO CLIMATOLOGICAL, OCEANOGRAPHIC, PHYSICAL, CHEMICAL OR OTHER BIOLOGICAL VARIABLES. INDEED, CLIMATE MAY BE A CRITICAL FACTOR. DURING CHARCOT'S YEAR AT PETERMANN, DECEMBER 1908 TO NOVEMBER 1909, HIS TEAM RECORDED A MEAN SURFACE TEMPERATURE OF -3.0° C. FOR COMPARISON, TEMPERATURE DATA FROM NEARBY VERNADSKY STATION (FORMERLY THE UK FARADAY STATION), LOCATED SIX MILES SOUTH OF PETERMANN ISLAND, HAVE BEEN RECORDED CONTINUOUSLY SINCE 1951. MEAN ANNUAL SURFACE TEMPERATURES HAVE RANGED FROM -9.3° C. (1959) TO -1.3° C. (1989); AND, OVER FIVE DECADES, THESE DATA INDICATE THE LARGEST, STATISTICALLY SIGNIFICANT WARMING TRENDS IN ANTARCTICA: +0.56° C. PER DECADE.



"FARSIDE" ADÉLIE PENGUIN COLONY  
1909-10

**PETERMANN ISLAND**  
Nov 1909  
CHARCOT'S SECOND EXPEDITION

ADÉLIE PENGUIN – 2,000 INDIVIDUALS (~1,000 NESTS)  
GENTOO PENGUIN – 112 INDIVIDUALS (~56 NESTS)  
BLUE-EYED SHAG – 1 NEST

**PETERMANN ISLAND**  
Dec 2004 - Jan 2005  
ANTARCTIC SITE INVENTORY

ADÉLIE PENGUIN – 502 NESTS  
GENTOO PENGUIN – 2,232 NESTS  
BLUE-EYED SHAG – 24 NESTS

### ENVIRONMENTAL MONITORING

ENVIRONMENTAL MONITORING AND ASSESSMENT ARE THE LYNCHPINS OF CONSERVATION, EVERYWHERE.

IN 2004, ANTARCTIC TREATY PARTIES BEGAN TO DISCUSS A CONTINENT-WIDE, ENVIRONMENTAL ASSESSMENT AND MONITORING PROGRAM. ESTABLISHED AUTHORITIES EMPHASIZE THAT THESE REGIMES SHOULD BE ABLE TO IDENTIFY CHANGES TO THE BASELINE REFERENCE STATE AT PARTICULAR LOCATIONS.

IT IS ALSO RECOGNIZED THAT ANY DETECTED CHANGES MAY BE NATURALLY OCCURRING, PRODUCED PERHAPS BY HUMAN ACTIVITIES, OR MAY RESULT FROM OTHER DIRECT, CONSEQUENTIAL, SYNERGISTIC, AND CUMULATIVE EFFECTS. POTENTIAL IMPACTS MAY BE SHORT-TERM OR LONG-TERM, IMMEDIATE OR CUMULATIVE. IN THE CASE OF BIOLOGICAL POPULATIONS, THE FOCUS SHOULD BE DETECTING AND UNDERSTANDING CHANGES THAT MAY OCCUR TO THESE POPULATIONS AS A WHOLE.

FURTHER, IT IS IMPORTANT TO: IDENTIFY THE TYPES OF HUMAN ACTIVITIES THAT COULD POSSIBLY HAVE UNACCEPTABLE EFFECTS; DETERMINE THOSE COMPONENTS OF ANTARCTIC ECOSYSTEMS MOST LIKELY TO BE AFFECTED BY THESE ACTIVITIES; SELECT POSSIBLE INDICATOR VARIABLES AND AREAS TO MONITOR; AND ENSURE THAT ACTIVITIES CAUSE NO UNACCEPTABLE DETERIORATION OF VALUES OR RESOURCES.

THE INVENTORY SHOULD BE ABLE TO ASSIST THESE EFFORTS. IT HAS SUCCESSFULLY CENSUSED THE PENINSULA SINCE 1994, IDENTIFIED WHICH FAUNA AND FLORA MAY BE POTENTIAL INDICATORS OF ENVIRONMENTAL CHANGE (PENGUINS, BLUE-EYED SHAG, SOUTHERN GIANT PETREL, KELP GULL, AND SKUAS); AND, IN TERMS OF SELECTING APPROPRIATE SITES TO MONITOR, IDENTIFIED WHICH SITES ARE MOST DIVERSE IN SPECIES COMPOSITION AND WHICH ARE MOST PRONE TO POTENTIAL ENVIRONMENTAL DISRUPTIONS.

### ASSISTING CONSERVATION AND MANAGEMENT BY ANTARCTIC TREATY PARTIES

FROM ITS INCEPTION, THE INVENTORY HAS COLLECTED DATA REGARDING THE PRESENCE OR ABSENCE OF NESTING SPECIES OF PENGUINS AND FLYING BIRDS, WALLOWS OF SOUTHERN ELEPHANT SEALS, AND LARGE PATCHES OR BEDS OF LICHENS AND MOSSES AT ALL SITES VISITED. INVENTORY RESEARCHERS ALSO RECORD WHETHER NESTS, WALLOWS, AND LARGE FLORAL PATCHES/BEDS MAY BE READILY/EASILY ACCESSED AND/OR TRAMPLED.

FROM THESE DATA, THE INVENTORY HAS DETERMINED WHICH PENINSULA SITES ARE MOST DIVERSE IN SPECIES COMPOSITION, AND WHICH ARE MOST PRONE TO POTENTIAL DISRUPTION FROM VISITORS.

THE INVENTORY HAS IDENTIFIED FIVE SITES WITH HIGH SPECIES DIVERSITY:

- HANNAH POINT (SH), PENGUIN ISLAND (SH), AITCHO ISLANDS (SH), FORT POINT (SH)
- CUVERVILLE ISLAND (NW)

AND EIGHTEEN SITES WITH MEDIUM SPECIES DIVERSITY:

- POINT LOOKOUT (EI),
- ARCTOWSKI STATION (SH), BAILY HEAD (SH), HALF MOON ISLAND (SH), MITCHELL COVE (SH), ROBERT ISLAND (SH), TURRET POINT (SH), WHALER'S BAY (SH), YANKEE HARBOR (SH)
- ASTROLABE ISLAND (NW), JOUGLA POINT (NW), ORNE ISLAND (NW)
- BROWN BLUFF (NE), FALSE HEAD (ISLAND) POINT (NE), HEROÍNA ISLAND (NE), PAULET ISLAND (NE)
- PETERMANN ISLAND (SW), PLÉNEAU ISLAND (SW)

THE INVENTORY HAS IDENTIFIED FOUR SITES THAT ARE HIGHLY SENSITIVE TO POTENTIAL DISRUPTIONS:

- HANNAH POINT (SH), PENGUIN ISLAND (SH), AITCHO ISLANDS (SH), TURRET POINT (SH)

AND TWELVE SITES THAT ARE MODERATELY SENSITIVE TO POTENTIAL DISRUPTIONS:

- FORT POINT (SH)
- GEORGES POINT, RONGÉ ISLAND (NW), GOURDIN ISLAND (NW), NEKO HARBOR (NW), ORNE ISLAND (NW), WATERBOAT POINT (NW)
- BROWN BLUFF (NE), PAULET ISLAND (NE)
- BOOTH ISLAND, PORT CHARCOT (SW), DETAILLE ISLAND (SW), PETERMANN ISLAND (SW), PLÉNEAU ISLAND (SW)

AT THE 2005 ANTARCTIC TREATY CONSULTATIVE MEETING, PARTIES ADOPTED THE CONCEPT OF SITE-SPECIFIC GUIDELINES TO MANAGE SITES EXHIBITING A COMBINATION OF HIGH VISITATION AND HIGH/MEDIUM SPECIES DIVERSITY OR HIGH/MODERATE SENSITIVITY TO POTENTIAL DISRUPTIONS, RELYING ON SITE DESCRIPTIONS AND ORIENTATION MAPS IN THE INVENTORY DATABASE.

TO KEEP GUIDELINES CURRENT, PARTIES ADOPTED A REVIEW PROCESS OVERSEEN BY THE TREATY'S COMMITTEE ON ENVIRONMENTAL PROTECTION. THE SITES INITIALLY COVERED BY GUIDELINES ARE:

- PENGUIN ISLAND (SH), AITCHO ISLANDS (SH)
- CUVERVILLE ISLAND (NW), JOUGLA POINT (NW)