

Echidnas and Goannas of Kangaroo Island

EXPEDITION BRIEFING

- Team I: January 20 - February 2, 2007
- Team II: February 10 - February 23, 2007
- Team III: July 28 - August 10, 2007
- Team IV: September 22 - October 5, 2007
- Team V: October 20 - November 2, 2007
- Team VI: January 19 - February 1, 2008



PELICAN LAGOON RESEARCH & WILDLIFE CENTRE

Dear Earthwatch Volunteer,

Welcome to the *Echidnas and Goannas of Kangaroo Island* expedition! These fascinating creatures represent groups of animals that have survived hundreds of thousands of millennia. You will be joining me and my staff on Kangaroo Island to investigate, document, and explore the secrets of these ancient survivors' ecology, and how they interact with their ecosystems.

Sometimes erroneously referred to as the "spiny anteater," the echidna is not related to any of the anteaters, the hedgehog or the porcupine. Echidnas form a special group of mammals called monotremes – the only egg-laying mammals in the world. Their ancestors roamed the planet with the dinosaurs! Similarly, the goanna, a monitor or varanid lizard, has been on the planet for a very long time. Rosenberg's goanna on Kangaroo Island is special because it lives further away from the equator than any other varanid lizard. This means it has had to adapt to survive.

Echidnas were discovered and described by Europeans over 200 years ago. One would imagine that the biology and ecology of this unusual creature is well understood and documented. Quite the contrary! A major problem with echidna field research is the animal's shy nature, sporadic activity, and reclusive habits. With the aid of Earthwatch volunteers and intense field observations, we have documented breeding behaviour, discovered age of sexual maturity, and are starting to learn more about recruitment and survival of young. We are now quantifying and analysing the role of the echidna as cultivators and bio-indicators in their environments.

You, the volunteer, are an invaluable asset to new discoveries within the realm of echidna and goanna ecology. We need you to help find, track, observe, map, and monitor activities of echidnas, goannas, and the microclimates within their ecosystems. Your detective work helps to unlock the secrets of these species' survival strategies and supply guidelines for species conservation strategies.

My staff and I look forward to greeting you on Kangaroo Island. Both echidnas and goannas continue to bring lots of surprises into this long-term project. Your contribution of time and energy are greatly appreciated, and we believe you will find your experiences and work in Nature's laboratory rewarding.

Cheers,

Dr. Peggy Rismiller

Echidnas and Goannas of Kangaroo Island

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GENERAL INFORMATION

PRINCIPAL INVESTIGATOR: **Dr. Peggy Rismiller**

POSITION / TITLE: Visiting Research Fellow/Senior Researcher

AFFILIATIONS: 1) Department of Anatomical Sciences,
University of Adelaide
2) Pelican Lagoon Research and Wildlife Centre,
Kangaroo Island

PROJECT TITLE: **Echidnas and Goannas of Kangaroo Island**

RESEARCH SITE: Kangaroo Island, South Australia

TEAM DATES IN FIELD: Team I: January 20 – February 2, 2007
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Team V: October 20 – November 2, 2007
Team VI: January 19 – February 1, 2008

TEAM LENGTH: 14 days

TEAM SIZE: Minimum: 5 Maximum: 7

MINIMUM AGE OF PARTICIPATION: 18 years of age *

* Volunteers under 18 years of age may be able to participate if accompanied by a parent or guardian. Contact Earthwatch for more information and see Section 9 'Before You Leave' for traveling advice for minors.

BRIEFING VERSION 1

THE EXPEDITION

1. PROJECT OVERVIEW

"It was everything I expected and more – the place, the people and the work. For me one of the most positive experiences was tracking and finding an echidna or goanna."

~ Mary Murdock, Teams II and III, June and July 2004

The Project

The short-beaked echidna is an Australian icon whose ancestry dates back to the time of the dinosaurs. It is highly adaptable and was once found throughout the continent. Rosenberg's goanna is a large varanid lizard that has adapted to living in a cooler climate. It is a significant terrestrial predator on Kangaroo Island, but has disappeared from much of its mainland range. Both echidnas and goannas are indicators of healthy habitats and intact ecosystems, but both species are declining. The key aims of this project are to document the biology and dynamic interactions of echidnas and goannas in intact and altered habitats. Quantifying how these species help maintain an ecological balance in the environments they inhabit will provide new directions for habitat restoration, land management and biodiversity conservation at local and national levels. Habitat restoration is fundamental to the future of echidna and goanna conservation.

On Kangaroo Island researchers have the rare opportunity to conduct long-term studies on individuals in undisturbed populations and intact ecosystems. Human impacted and newly re-vegetated areas provide arenas for comparison of microclimates and wildlife usage. Earthwatch volunteers provide the vital human resources necessary to survey, search, monitor, document, compile, and help turn biological data into educational and management tools to aid community projects and conservation management of these vulnerable species.

One of the main challenges of this work is actually finding the echidnas and goannas before field research can begin. While radio-telemetry is a terrific tool for tracking animals, it is first necessary to locate an animal in order to attach the transmitter and begin fieldwork. Neither echidnas nor goannas can be trapped because they are not attracted to baits or calls. Participants in this research project spend up to 300 hours searching on foot for first encounters with an echidna. So while spending time in a beautiful, vibrant environment learning to look, then see and observe these elusive, secretive and fascinating research subjects will be a rewarding experience, volunteers must be aware that it is also a challenging one. There are many exciting components of this research, but the work also demands a good deal of patience. The researchers of the *Echidnas and Goannas of Kangaroo Island* project invite you to take the challenge!

Team Development

The catalyst for team spirit is the enthusiasm brought by each participating volunteer. One immediate reward of this project is the chance to explore a new, natural setting involving sustainable research and lifestyle with others who have a common interest. Staff and volunteers remain together throughout the project and share daily research and household tasks. As the bush becomes familiar, team members may see themselves as detectives, trackers, or behaviorists. Jointly, each team gathers new, original data and makes new contributions to the understanding

of long-standing echidna and goanna questions. Joint interpretation of data and imagination in the development of scientific field equipment are a positive part of the team atmosphere.

On one day, team members will travel together and visit people and areas of interest on the island. There will be an opportunity to tour a eucalyptus distillery, walk among native wildlife, and search the trees for koalas. Weather permitting, the team may choose an evening to have dinner on a local beach and watch the sun set. Such activities, along with slide shows, brainstorming, and star gazing, are sure to encourage further team development.

2. RESEARCH AREA

Kangaroo Island is the third largest island in Australia. Located off the south coast of South Australia, the island is approximately 150 by 50 kilometers large, with a population of about 4,000 people. The largest population concentration is in the township of Kingscote, approximately 50 kilometers by road from the research area. The research site is located on the north shore of Pelican Lagoon, an aquatic reserve, and is near the east end of Kangaroo Island. Expanses of intact habitat including natural mallee woodlands, shrubland, ephemeral fresh water, and intertidal swamps are found on this island. The highest point on the island is approximately 900 feet (300 meters) above sea level, though work will mainly be conducted between sea level and 200 feet (60 meters).

Flora and Fauna

The Pelican Lagoon Research and Wildlife Centre is privately operated and totally self-sufficient, with solar power and natural rainwater collection for all cooking, domestic and sanitary needs. Pelican Lagoon Conservation Park borders two sides of the research center with the aquatic reserve bounding the southern shoreline. The center and most of the adjacent study area are vehicle-free spaces and restrict the number of people working in the area at any one time; thus, ecosystems have remained intact. The island, and Pelican Lagoon in particular, is known for its ecosystems and wildlife. Although there are no animal species on Kangaroo Island that cannot be found elsewhere in Australia, wildlife behave differently on the island due to the lack of rabbits and foxes allowing for a large amount of intact habitat. Kangaroo Island has been referred to as a biological window to the past. Here you can observe plants and animals much as they were 200 years ago, before European settlement.

At the primary study area, over 130 species of birds can be observed during the year. The majority of the island's native mammals, including the restricted-range tammar wallaby and the shy pygmy possum, are also in the area. There are few conspicuous amphibians and reptiles, with the exception of the large varanid lizard, Rosenberg's goanna, and some diminutive geckos and skinks. Recent work by a local field botanist has increased the recorded number of the island's vascular plants from 790 species to over 1,000. Included in this increase were several species new to taxonomic science. For nine to ten months of the year, some of the island's 60 known orchid species are in bloom. Many of these orchids occur in and around the primary study area.

Volunteers will have the opportunity to observe western grey kangaroos and tammar wallabies close up during the expedition. Team trips to other parts of the island may allow participants to see native species such as little penguins and maybe even glossy black cockatoos, as well as introduced species like the Cape Barren goose and the koala. You'll be able to view some of the beautiful, rugged coastline and walk one of many secluded beaches punctuating the landscape. Rays, wild dolphins and the occasional sea lion can be sighted feeding in the lagoon, as osprey,

white-belly sea eagles, and wedge tails fly overhead. The infamous great white shark, which has been declared a vulnerable species, can also be seen at certain times of the year around the island.

Luckily, there is no need to be too concerned about human intruders while staying on Kangaroo Island; instead, the team will need to keep animals like kangaroos and possums out of the living space. There are wild animals around the research center that are considered neighbors – NOT pets. If these animals are treated with respect, they pose no real danger. On the contrary, volunteers may spend quality time observing the natural behavior of fascinating birds, mammals and reptiles.

Climate

The climate on the island is considered Mediterranean, but conditions can change very quickly. During the summer (January-March) air temperatures are likely to range between 40° and 15°C (100-58°F). Some nights are warm and pleasant enough for sleeping outside if you enjoy watching the southern constellations! June through August is the winter season and night temperatures can be cool (5°C/40°F), however daytime temperatures are often a pleasant 15-20°C (58-69°F). Spring (September-November) is mild and variable from hot to cool and wet to dry. Humidity throughout the year ranges from 40 to 100%, drier in the summer and wetter in the winter. Pelican Lagoon has an annual average rainfall of 20-22 inches (500-580 millimeters). The heaviest rainfalls are generally experienced between June and September, with a general pattern of alternating rain and fine days. Because of the island conditions, there is almost always a nightly dew, which leaves the shrubland bespangled in dew drops early in the day.

Cultural, Social, and Political Environment

Australia is a melting pot of cultures. If you spend time in any of the large cities you can find restaurants and stores featuring specialties from many parts of the world and different cultures. Australia is also a relatively safe place. As in all countries of the world, the larger cities have more instances of crime than in small country towns or in the bush. You should have no problems getting around and enjoying yourself. Kangaroo Island itself is a quiet place, and its rich Aboriginal and European history will be explored and discussed during your stay.

3. PROJECT STAFF

Peggy Rismiller will be present throughout each Earthwatch expedition. Other staff members listed below will be present as available.

Principal Investigator

Peggy Rismiller has more than 20 years of experience as an environmental physiologist and wildlife biologist. She is an experienced Earthwatch Principal Investigator (PI) and has worked with Earthwatch volunteers on Kangaroo Island since 1988. Peggy completed her Ph.D. in biology/environmental physiology at the Philipps University in Marburg, Germany and was the first woman to receive the university's Science Dissertation Award. A post-doctoral position at the University of Adelaide brought her to Australia in 1988 to work with tiger snakes (a live-bearing reptile) and echidnas (an egg-laying mammal). After a short research interlude back to Germany in 1990, she returned to Australia to stay. Since 1991, she has been a Visiting Research Fellow in the Department of Anatomical Sciences at the University of Adelaide and Senior Research Scientist at Pelican Lagoon Research and Wildlife Centre.

Peggy's professional studies center on whole animal physiology, ecology, and how animals interact and help shape their environment. Of special interest is how photoperiod and climate affect biological processes and species survival. Her other interests include puppetry, magic, aboriginal history, native bush tucker, and herbal medicine. Peggy is responsible for research methodologies, logistics, and organization of the echidna/goanna Earthwatch project as well as analysis of all data collected. She instructs volunteers on the use of tracking equipment, behavioral observations, and physiological measurements, and provides encouragement in the kitchen while meals are prepared. She resides full time at the Pelican Lagoon Research and Wildlife Centre on Kangaroo Island and will be with team members throughout the duration of each expedition.

Site Manager and Field Team Leader

Michael McKelvey, manager and full time resident at the Pelican Lagoon Research and Wildlife Centre, has lived on Kangaroo Island for over 30 years. Originally from California, he completed a B.Sc. in biology in the USA. This was followed by an apprenticeship in large format photography and a position as a magazine editor. He has traveled the world and worked as a ship's cook, museum preparator, photographer, and jackaroo (to name a few) before establishing Pelican Lagoon Research and Wildlife Centre in 1982. Mike is responsible for all the solar equipment and maintenance that keeps the research facility running. He shares insights about sustainable power and water conservation with volunteers. In addition, he instructs them in the use of a compass, interpretation of aerial photographs, drafting, field mapping, and maintenance of field equipment. Mike also familiarizes volunteers with signs of echidnas and other native animals, and shares his vast knowledge of Kangaroo Island's history, bird life, and colorful characters. Mike will be present throughout the duration of all teams.

Field Assistant

John McNeil was born in South Australia and is an experienced field botanist and permaculturalist. John has many years of experience working in the field with echidnas and goannas. He helps teach volunteers valuable field techniques. As an Aussie, John shares colorful stories and 'Stralianisms with volunteers.

Visiting Scientists

Dr. Brian Green is an expert in Australian varanid lizards and started his work on Kangaroo Island in 1966. Brian frequently visits the research center where he is collaborating with Peggy Rismiller on a study of Rosenberg's goanna. His past research also includes energetic studies on the echidna. He is an enthusiastic field researcher with projects around the world.

Dr. Topa Petit is a senior lecturer in the School of Environmental Recreation Management at the University of South Australia, Adelaide. Her main topics are wildlife ecology, conservation biology and research methods. Since 2000 her research has focused on the ecology and conservation of South Australian spider orchids. As a result of her research, she became interested in the role of echidnas as diggers and cultivators.

DAILY LIFE IN THE FIELD

4. TEAM ITINERARY

- Day 1:** Volunteers will be met at the Kingscote Airport and driven to the research center. There will be an introductory talk followed by lunch. Training commences after lunch with an orientation walk and compass work. Evening tea (the evening meal in South Australia) may be followed by a slide lecture on volunteer involvement in the research. This depends on how volunteers are feeling and if they need an early night.
- Day 2:** Demonstrations and practical hands on training will be given in the use of field monitoring equipment such as data loggers, digital thermometers, hygrometers, scales, aspirators (for insect sampling) and radio-tracking gear. During orientation walks volunteers will become familiar with habitat types, plant names and tracks/digs of native animals. Depending on animal activity, mini weather stations may be placed in the field or traps set for monitoring feral animals. An evening slide lecture on echidna and goanna ecology will follow the meal.
- Day 3:** Volunteers will be familiarized with forms for various field activities. Field sampling kits will be passed out and reviewed. Use of monitoring and telemetry equipment will be reviewed and practiced. Fieldwork will commence in the afternoon with onsite instructions on collecting observational data, sample collection, monitoring environmental parameters, etc. Depending on the daily activity cycle of the echidnas and goannas during any specific expedition, some fieldwork will be required after dark as well as at dawn.
- Days 4-6:** The team will visit different habitat sites and conduct wildlife/plant surveys. Environmental data will be collected with hand equipment and data loggers, and soil/invertebrate samples will be taken for various tests and analyzed at base camp. Echidnas and goannas will be searched, radio-tracked, and monitored daily on a rostered basis. Volunteer slide/photo presentations will be given in the evenings.
- Day 7:** This day will be free for volunteers to travel and sightsee, stay in and rest, do laundry, etc. Possible activities will be discussed with the group, but could include beach combing, visiting the Kangaroo Island Eucalyptus distillery, sitting with the Australian pelicans (the largest in the world), searching for koalas or viewing the talents of Kangaroo Island artists. Entrance fees will be covered, but please bring Australian money for any souvenirs. You will be able to find locally produced items ranging in price from a few to hundreds of dollars.
- Days 8-11:** Echidna, goanna, and microclimate searching/monitoring will continue. One day will involve a foraging or termite mound survey, while another will involve insect collection and soil recordings. If necessary, a re-vegetation area will be revisited to complete a plant survey and reset weather monitoring equipment.
- Day 12:** Fieldwork and data entry will be conducted in the morning. During the afternoon there will be a tour of island's east end or free time at the research center.
- Day 13:** Fieldwork and data entry will be completed in the morning, if necessary. During the afternoon the team will clean up and pack.
- Day 14:** Volunteers will fly back to Adelaide in the morning.

5. DAILY SCHEDULE AND TASKS

Please be aware that this project works on “echidna time” and daily schedules fluctuate according to weather and animal activity. A day’s schedule can instantly change if someone discovers a train of echidnas (one or more males following a single female during courtship) or sees a goanna digging on a termite mound. Your cooperation, understanding, and flexibility in such circumstances are appreciated.

Team members generally rise shortly after dawn (earlier in the spring and later in the winter) and enjoy morning coffee/tea and breakfast before beginning the day’s activities. After breakfast, the day’s goals are discussed and tasks are assigned. Some field activities are timed around those of the echidnas and goannas. How early and how active they are depends on the season and the weather. Most tasks can be completed during the morning; however some activities are conducted in shifts with a rotating schedule for all volunteers.

Volunteers usually return to the center for lunch, but while conducting some surveys or monitoring animal activities at certain times of the year, lunch is taken in the field. During the summer afternoon heat, volunteers take turns with lab work such as data entry, while others are in the field documenting breeding behavior of goannas. After lunch at other times of the year work parties either return to the bush for monitoring and survey work or remain at base camp to help with sound recordings, data entry or other lab work. The evening meal is typically at about 7:00 pm. After dinner the team usually relaxes, but on some nights it may be necessary to move data loggers or check trap lines.

Some evening dinners are followed by debriefing and discussion. There will be a couple of evening slide lectures by the Principal Investigator (PI) and other occasional programs by volunteers (please bring a small selection of slide material, prints, or digital photos on CD from home to share some of your interests and home town with everyone). There will be time to write postcards and enjoy the stars. Some previous team members have used evenings to repair, refine, and even modify or design new field equipment used in this study. Brainstorming and inventive genius are welcome. Most people gladly retire by about 10:00 pm.

On occasion, some field activities must be conducted at odd times of the day, involving arising before sunrise or observing animals and setting data loggers at night.

6. VOLUNTEER FIELD TRAINING AND ASSIGNMENTS

Training

Slide and PowerPoint lectures about goanna and echidna biology are presented during the first few days of the project. These presentations introduce volunteers to field methodologies and different aspects of the past and ongoing research. Other presentations provide information about Kangaroo Island biodiversity, geology, wildlife communities, edible flora, and topics related to echidna and goanna ecology research. Frequent debriefings on current findings and informal round-table discussions about daily events keep everyone informed about happenings throughout the duration of the project.

Each team receives up to three full days of training with the PI and onsite staff before being assigned field tasks. The first goal of training is to ensure that all volunteers are familiar with the research site. Volunteers are trained to use a compass and maps and are taught to recognize key

plants and landmarks. Both contour and aerial photographs are incorporated in the orienteering process. Volunteers then learn radio-telemetry techniques for tracking different types of transmitters used for locating and/or measuring body temperatures of animals. Tracking is practiced on stationary objects to ensure accurate and correct use of equipment before volunteers tackle moving animals in the field. Volunteers are familiarized with digital thermometers, weighing equipment and insect sampling kits that become part of the field pack.

Volunteers learn other skills in the field, including habitat and native plant identification, mapping, survey and observational techniques. Mike, John and Peggy train volunteers to identify tracks, scats, and other traces of native and feral wildlife. These skills are used when teams assist with routine survey work of termite mounds, goanna burrows, echidna foraging sites, microclimates, plant surveys, etc. Global Positioning System (GPS) skills are taught and used for placing, collecting and downloading data loggers at echidna or goanna burrows in the field and for mapping animal locations. Each team enters their collected information and observations into a computer database.

All team members learn about and become involved in the day to day maintenance and practicalities of sustainable living at the research center. This includes everything from how solar power works to composting, recycling and building fires for winter warmth.

Quality of data collected is assured by using standardized forms for all fieldwork (e.g. daily tracking, body temperature data, shelter site descriptions, etc). The efficacy of this process is assessed as trained staff assist volunteers with forms, mapping, equipment setup and data entry, and volunteers help each other with all tasks and enter data from themselves and other team members. All relevant data are entered while volunteers are in the field, ensuring that any questions can be clarified immediately by the person who collected the data. Hands-on data collection followed by input of data helps volunteers better understand the methods of data collection and the necessity of accurate field recordings.

Most importantly, **this project requires patience**; all the other necessary skills can be taught.

Assignments

Field time accounts for approximately 75% of the work schedule. The remaining time is used for data processing and lab work, including general maintenance of field and analysis equipment. Some activities are carried out as a team or in pairs; other jobs will be done individually.

The amount of time spent on various tasks depends on the animals' activities, the weather, and the season. All teams throughout the year will monitor and collect macro- and microclimate data from areas of intact native habitat, cleared areas and re-vegetation areas. Surveys for presence of wildlife will also be conducted at all times of the year. Each team will be trained in use of tracking equipment and mapping/recording locations. All volunteers assist with set-up, launch and download field data loggers used in monitoring environmental parameters (temperature, humidity, etc.).

The summer (January-March) teams will spend a large portion of the time with goannas during the day, as echidnas avoid the heat and their many food sources only come near the surface in the cool of the night. These teams may be lucky enough to observe goanna mating rituals and see the female dig into a termite mound to lay her eggs. When this occurs, volunteers may be assisting with 24-hour body temperature monitoring of the goannas. This is also the time of year that female echidnas are weaning their young. There is a possibility of discovering a youngster as it explores the area.

Later teams (July-August) will spend much of their time observing pre- and post echidna breeding behavior, searching for tracks, and looking for new animals or those who have shed their tracking transmitters during the summer months of new spine growth. There is the chance to find a rare “echidna train” and maybe even see an egg in the pouch. Goannas should be sleeping. Their winter burrows will be located and loggers set up to measure environmental and body temperatures.

The spring (September-October) teams will continue monitoring the daily activity cycles of males, non-breeding and lactating female echidnas. Of special interest will be the activity patterns of lactating females. Volunteers may get to see a puggle (baby echidna) before the female puts it in a burrow. Females with young will be closely monitored in hopes of discovering the nursery burrow. This is also the time of year when young goannas dig out of their termite incubation mounds. The team will be monitoring mounds to document the time of emergence and capturing some of the young for measurements and tagging.

Below is a list of the various tasks in which volunteers may participate during the expedition:

- Wildlife surveys for tracks, scats and traces of echidnas, goannas, other native species and feral animals in different ecosystem sites
- Plant surveys
- Collecting climate data (e.g. air and ground temperature, rainfall, humidity, wind speed, etc.) using handheld instruments and data loggers in native habitats and in re-vegetating areas
- Recording ‘soundscapes’ of activity in the soil and invertebrates in native habitats and re-vegetation areas
- Surveys and measurements of echidna and goanna foraging activity
- Searching the research area for new echidnas and goannas or animals that have shed their transmitters
- Radio-tracking animals to record location, habitat, vegetation types, microclimate and activities
- Mapping animal locations and entering data into computer database
- Monitoring termite mounds for goanna reproductive activity (January-March) or egg hatching (September-October)
- Monitoring feral cat traps (primarily during winter months)
- Helping with household and cooking duties

7. ACCOMMODATIONS

Volunteers and staff will live and work at the Pelican Lagoon Research and Wildlife Centre, 40 kilometers (50 minutes’ drive) from the airport. Most fieldwork is conducted on foot departing from the center. This small private facility has grown over the years through the efforts of the researchers who use it. Here, emphasis is placed on sustainable research, living, and the natural environment.

Volunteers will sleep in tents large enough to stand up in with off-the-ground beds, or in a small cabin. Pillows will be provided, but you will need to bring your own sleeping bag and pillowcase. Sleeping areas are shared with other volunteers – generally two people per tent and three to four in the cabin. If you are a light sleeper it may be wise to bring earplugs. Males and females bunk separately. Separate provisions for couples can be made, but prior notice is necessary to arrange a private tent.

The large, comfortable dining/work area is furnished with a wood stove for heating, gas cooking facilities, and solar-powered 12-volt DC electricity (**there is no 240 or 110 volt AC**). Camera batteries can be recharged using 12-volt DC car adaptors. Please bring your own specific charger with car adaptor. There is a solar powered computer onsite and you will have the opportunity to send and receive email on several occasions during your stay, using the facilities at the research centre. Broadband internet is not available, so please **DO NOT plan on downloading large files while in the field.**

The shower house is simple but functional with gas-heated water during the winter months. During the summer fire ban season, solar heated shower bags will be used or you may choose to take a quick dip in the lagoon or a fresh shower from the rainwater storage tanks. There are conventional flush/septic toilets, plus a composting toilet. Because all of the water used at the center is collected (and treasured) rainwater, it will not be possible to do laundry. During the day trip there will be an opportunity to visit a laundromat.

Note: Due to the bush setting and fire regulations of the area, there is NO SMOKING at the research center.

8. FOOD

On Days 1-3, during team training, a cook will prepare all meals. After that, household and cooking duties will be shared by team members on a rotating basis. As the island lacks large grocery stores, food shopping is done in bulk on the Australian mainland, which involves a sea trip and hours of driving. Whenever possible, locally grown fresh vegetables, eggs, and fresh milk and cream are used. Below are examples of what you might expect during the expedition. Please bear in mind that variety depends on availability, and it is very important that volunteers be flexible.

- Breakfast:** Self-serve with fruit juices, cereals, muesli, toast, coffee (decaf and regular), tea, fresh fruits, milk, and island yoghurt
- Lunch:** May be hot or cold depending on the time of year and creativity of the cook
- Dinner:** Red or white meat, fresh vegetables of the season and canned goods to complement main courses, and fruit or some other dessert
- Snacks:** Kangaroo Island sheep yogurt may be sampled and bush tucker (native foods such as berries or fungus) may be gathered when in season; if you have a favorite treat, you will have to supply this yourself
- Beverages:** Pure Kangaroo Island rainwater is available for drinking (it is even available bottled in shops!) and volunteers are advised to fill up bottles every day; in addition, a selection of juices, cordials (fruit drinks), and a taste of Australian wine will be provided with evening meals

Special Dietary Requirements

People with special diets (e.g. diabetic, lactose intolerant, etc.), vegetarians, or those with specific food allergies should indicate this in advance both on their application forms and when talking to their Expedition Coordinator, so that appropriate arrangements can be made. **Non-meat diets can be provided only if prior notice is given.** Vegetarians should indicate what type of vegetarians they are, including "flexible." Note that accommodating special diets is not guaranteed and can be very difficult due to availability, location and local conditions.

TRAVEL PLANNING

9. BEFORE YOU LEAVE

For a listing of useful websites for passport and visa requirements see Section 15 'Helpful Resources.'

Passport Information

Most volunteers traveling from outside the host country will require a passport, valid for at least six months beyond the dates of travel.

Visa Information

Citizens of the United States, Canada, Japan, the United Kingdom, and many other countries will require an Electronic Travel Authority (ETA) for entry into Australia. The ETA replaces the standard tourist visa for visitors staying up to three months in Australia. **Please apply as a tourist; if you say you are working on a research project it may complicate matters for you** (see *Reminder* below). An ETA can be obtained through your travel agent and does not require any application form. Citizens of other countries should check with their travel agent or a visa agency for specific visa and entry requirements. If you do need a visa, the information below should be useful.

Essential Information for Volunteers Requiring Visas

Type of Visa	You must get a TOURIST VISA .
Where to Get a Visa	Contact the nearest embassy or consulate of the country to which you are traveling to find out how to apply for your visa. Please note that this process can take weeks or more. If you have less than six weeks or wish to save yourself trouble, we strongly recommend using a visa agency , which can both expedite and simplify the process. See below for a list of visa agencies.
Required Information	You will need to send your passport (valid for at least six months beyond your stay), a Visa Application and Immigration Form , 2-4 passport-size photos plus payment to the embassy or visa agency (if applicable). Please be sure that your passport is valid for at least six months beyond your stay.
Cost of a Visa	Generally between US\$40-100, but varies from country to country and can potentially cost up to US\$180 . A visa agency will charge an additional fee (depending on the amount of time it takes to process the application), which you can inquire about directly.

Reminder: The purpose of your visit is for vacation, holiday or travel. Foreign immigration officials do not always understand the concept of a "working vacation" or even "volunteering." Words such as "working"/"volunteering," "research" or a "scientific expedition" can raise questions concerning the country's foreign labor laws and/or prompt questions about official scientific research permits and credentials, etc., to which volunteers on their own will not be equipped to respond. All required research permits for the project are in place and have been approved by the proper authorities.

Visa Agencies

IN THE UNITED STATES	IN EUROPE	IN AUSTRALIA
PassportVisaExpress.com 1911 North Fort Myer Drive, Suite 503 Arlington, VA 22209 Tel: +1 888 596-6028, +1 703 351-0992 Fax: +1 703 351-0995 Email: info@passportvisaexpress.com Web: www.passportvisaexpress.com	The Visaservice Tel: +44 (0) 8708 900 185 Fax: +44 (0) 20 7278 8464 Web: www.visaservice.co.uk Thames Consular Services Ltd Tel: +44 (0)20 8995 2492 Fax: +44 (0)20 8742 1285 Web: www.visapassport.com	Ask your travel agency if they can send your visa application on your behalf.

Volunteers Under 18 Years of Age

Entry to Foreign Countries

In an effort to prevent international child abduction many governments have initiated procedures at entry/exit points. Many countries require all persons under the age of 18 to have a notarized letter from all legal guardians stipulating that the person under 18 can travel unaccompanied or in the presence of only one guardian. This letter must give an explanation for why only one parent or someone other than a parent is signing the letter. For example, if one parent is deceased, only one parent has legal guardianship, or someone other than the parents are legal guardians, the letter should state that.

In addition, airlines may also have documentation requirements for unaccompanied minors. Parents of minors are responsible for checking with each airline that their child will be flying to ensure that sufficient documentation is provided. This could include a copy of a birth certificate or a notarized letter stating that the minor has his or her parent's permission to travel alone.

Note: Requirements by specific countries and airlines vary and change frequently. You MUST keep informed of the requirements on your own to avoid problems at immigration. If a letter is not available, the volunteer under 18 can be refused entry into the country. There is nothing Earthwatch Institute can do to help in this circumstance.

Travel Medical Insurance

Travel medical and evacuation insurance is mandatory for Earthwatch volunteers while on an Earthwatch expedition anywhere in the world. The insurance covers volunteer travel medical risk, including medical expenses and medical evacuation, while traveling with Earthwatch overseas or on an expedition within your home country. Without insurance, the costs of such measures can range from US\$20,000 to \$50,000.

The emergency medical and evacuation assistance provider for Earthwatch is OnCall International. OnCall is a 24-hour international operation which provides medical assistance and evacuation, a 24-hour nurse help line and other travel assistance services such as lost baggage and lost document assistance.

Basic coverage is valid in the country of your Earthwatch expedition and during international travel to and from your expedition. If the expedition takes place in your home country, coverage begins when your group forms for the expedition and ends when the group disbands, and is incremental to your existing health insurance. Options are available for volunteers who would like to extend the period of coverage, increase insurance amounts or purchase additional cancellation or baggage insurance.

A detailed description of the Volunteer Medical and Evacuation Insurance Program policy, including the optional coverage increases, will be sent with this briefing. **Please note that policies are specific to each Earthwatch office.**

To contact OnCall International in the event of an emergency, dial:

- 1-866-509-7715 from within the US
- +1-603-898-9159 from outside the US

State that you are on an Earthwatch expedition. The Earthwatch policy number is #US008020.

Cancellation Insurance

Trip cancellation insurance, which will help cover your airfare if you are unable to travel, is highly recommended to Earthwatch volunteers. Earthwatch does not reimburse airfare or costs associated with cancelled flights. Check with your travel agent to find out how to obtain trip cancellation insurance.

Earthwatch Europe volunteers can purchase Additional Cancellation Cover for £10 as a supplement to the main premium that covers non-refundable travel expenses should your team be cancelled.

Travel Agencies

Contact your local travel agent or use the web to find the lowest rates to make your travel arrangements. A list of suggested travel agents can be found in Section 15 'Helpful Resources.' Be sure to give your rendezvous details to your travel agent as soon as possible.

Other Advice / Information

- *Local currency:* Australian dollar
- *International dialing code:* +61
- *Electricity:* The research center produces all of its own power from solar energy, using **only 12-volt DC**. Please bring appropriate adaptors (usually car adaptors) for charging camera batteries, etc. There is no 240 or 110-volt available.
- *Time zone:* GMT/UTC +9:30
- *Personal funds:* It is recommended that you bring about AU\$140/US\$100 for incidentals, snacks, etc. More may be advisable to allow for day off activities. You should exchange money at the international airport upon arrival in Sydney or Melbourne as money exchange may not be available at the Adelaide airport. There are no banking facilities close to the project site, so you should have some cash with you. Some places (e.g. galleries and retail stores) take major credit cards, but traveler's checks are more difficult to use.
- *Tipping:* Tipping is not customary in Australia, except when exceptional service is provided.
- *Luggage:* Please note that if you are checking your luggage for an international flight with one or more connections, it will be necessary to collect your bags at the airport and have them rechecked after proceeding through Customs. Leave extra baggage at your Adelaide accommodation. **Regional Express Airlines have a 15-kilogram (33-pound) weight limit on your flight to Kangaroo Island.**

10. PROJECT CONDITIONS

Please show this section to your physician when s/he is completing your health statement. Be sure to discuss inoculation requirements with your physician well in advance of your departure date. See Section 11 'Health Information' for inoculation information.

To the examining physician:

Your patient has volunteered to join a field research team that has specific physical demands of which you and your patient should be aware. **We need your accurate evaluation of your patient's ability to meet the conditions detailed below in order to safeguard his/her health and safety, and ensure that s/he can participate fully and effectively.**

General Conditions of the Research Site

Kangaroo Island can be cool and damp during the winter (June-August). There is seldom frost, but the southerly winds can bite. A few rainy days are usually followed by a few dry and sunny ones. Summer can be fairly hot and dry with cool evenings, but it can also rain, so come prepared. During summer expeditions (January-March) the temperatures may reach 40°C (104°F). September-October is usually pleasant, but can be cool at night. Much of the terrain you will be walking over is rocky, and because vegetation has not been thinned by rabbits, it can be very dense.

Humidity	40%	to	100%
Altitude	Sea level	to	200 ft/60 m

Time of Year	Daytime Temp. Range	Nighttime Temp. Range	Rainfall
January-March	70-98°F/21-37°C	55-65°F/13-18°C	05 cm/0-2 in
June-July	50-68°F/10-20°C	41-50°F/5-10°C	5-13 cm/2-5 in
August	50-68°F/10-20°C	40-50°F/4-10°C	2.5-7.5 cm/1-3 in
September	58-75°F/14-24°C	45-55°F/7-13°C	2.5-7.5 cm/1-3 in
October-November	60-78°F/16-26°C	48-58°F/9-14°C	0-5 cm/0-2 in

Physical Demands

Volunteers must be able to walk (not run) for several kilometers (10-15 on average) a day over rolling, loose, rocky terrain. Finding goannas and echidnas in the bush can be demanding at some locations, but once one is located, all fatigue is forgotten! All participants should be able to comfortably carry light loads (tracking receivers, notebooks, echidna bag, etc.) in a daypack and be able to work in a kneeling position for short periods of time.

Below are the expected demands of the project, however, please keep in mind that conditions may change and the project could potentially be more or less strenuous than the chart indicates.

Activity	Workload/Intensity
Sitting	2 hours per day during mapping, sorting samples, and data entry
Bending	2 hours per day during plant and wildlife surveys
Hiking	2 hours per day while setting out equipment
Walking	3-9 mi/5-15 km over 6-7 hours per day while searching/radio-tracking
Carrying	5-7 kg/10-15 lbs (field kit) over 6-7 hours per day

Potential Hazards

Hazard Type	Associated Risks and Precautions
Vehicles	Transport of volunteers on Kangaroo Island will be in a Toyota van equipped with a First Aid kit and safety belts. There is little traffic on the island roads.
Terrain	The terrain in the area is uneven with loose rocks, and vegetation can be dense. Wear reasonable footwear and clothing and pay attention to where feet are placed.
Getting lost	A home base transmitter, PET (Personal Emergency Transmitter), and maps are provided and carried by each volunteer, and you should bring your own compass. Your senses may feel challenged if you go out in the bush without a compass, but there are few hazards and no one has ever been lost for any serious length of time.
Animals	Tiger snakes inhabit the island, but are generally shy and rarely seen. Insect bites (mosquitoes and ants) are possible; the greatest risk lies in accidentally standing on an ant nest. There are several species of ants that have an additional surprise to the normal nip of their pincers – these species also sting! However, the insects are more annoying than anything unless the victim has a severe allergy to bee or ant stings. If you do have such an allergy, please be sure to carry your own medication (if you require an epi-pen, please bring TWO) and inform the project staff of your allergies. Learn to recognize ant nests, and use insect repellent if allergic to mosquito bites. Additionally, having personal belongings such as airline tickets or passports eaten by a kangaroo or possum is a risk if left in the open. All volunteers are advised to leave personal papers in their accommodation and not to leave backpacks outside.
Plants	There are prickly plants such as <i>Acacia paradoxa</i> that volunteers will quickly learn to identify and avoid. Wear reasonable clothing and there will be few problems; many volunteers find gaiters useful for protecting legs.
Climate/ Weather	Dehydration during the hot months and hyperthermia after rain are possible when people go out unprepared for the weather conditions. Always carry a water bottle, hat and coat, and learn to recognize signs such as headaches, sweating, and dizziness. Wear sunscreen and appropriate clothing to protect against the sun.
Water	The team will work close to Pelican Lagoon, an aquatic reserve. No volunteer is to enter the water alone or without previous consent from the PI.
Project equipment	There is a risk of poking another volunteer with a tracking antenna, but they are never brought indoors and you will be taught how to safely use them with a partner.

Medical Conditions of Special Concern

Condition	Concerns and Precautions
Asthma or allergies	Anyone suffering allergic reactions to bee or ant stings and/or insect bites should list this on their Earthwatch Health Form and, if necessary, bring appropriate medication. Kangaroo Island also has flowering plants throughout the year, especially during winter, that produce huge amounts of pollen. Even people not typically prone to hay fever can experience stuffy heads. Please come prepared with medications to help breathing and clear congestion.
Obesity and/or limited mobility (e.g. back, knee or feet issues)	This project involves extensive walking over rocky terrain in all types of weather. Obesity may hinder walking and can also increase risk of hyper- and hypothermia. If you cannot comfortably kneel on the ground, get up easily and walk with a backpack for several hours, please consider another project.
Conditions that may require immediate care	The nearest medical assistance is in Kingscote, approximately one hour away by vehicle. Volunteers may sometimes be in the bush alone. Anyone with conditions requiring immediate care should consider participation carefully.
Bad hearing or vision	Reasonable eyesight, with or without corrective lenses, and hearing are necessary for using the radio-tracking equipment and for searching in the field.

11. HEALTH INFORMATION

Basic First Aid kits are available at the research center. All volunteers should make sure to have the following up-to-date immunizations: DPT (diphtheria, pertussis, tetanus), polio, MMR (measles, mumps, rubella) and varicella (if you have not already had chicken pox). **Because we are working in the field, an updated tetanus inoculation is highly recommended.** Other standard immunizations common in some countries may include HIB (haemophilus influenza), pneumococcal, meningococcal, influenza and hepatitis B.

A yellow fever vaccination certificate is required if, during the six days before arriving in Australia, you will have visited a country declared by the World Health Organization (WHO) to be infected with yellow fever.

Additionally, the World Health Organization (WHO) also estimates that one-third of the world's population is infected with the bacterium (*M.tuberculosis*) that causes tuberculosis (TB). Incidence of tuberculosis is higher in developing countries, particularly in Asia, Africa, the Caribbean and Latin America. In general, approximately 10% of persons infected with *M. tuberculosis* are at risk for developing active TB during their lifetimes. TB is considered highly treatable with medications that are of relatively low toxicity and cost. Volunteers returning from developing countries are encouraged to have a (PPD)-tuberculin skin-test to screen for potential infection.

Medical decisions are the responsibility of each volunteer. Note that health conditions around the world are constantly changing, so keep informed and consult your physician, a local travel health clinic, the US Center for Disease Control (www.cdc.gov), the World Health Organization (www.who.int) or the resources in Section 15 '*Helpful Resources*' for the latest health information for travelers. Please consult your physician for guidance on inoculations if you intend to travel to other parts of the country.

12. PACKING CONSIDERATIONS

PLEASE SEE THE PACKING CHECKLIST AT THE BACK OF THIS BRIEFING AND REMEMBER TO TAKE YOUR BRIEFING WITH YOU ON YOUR EXPEDITION.

General Considerations

Do not bring more luggage than you can carry and handle on your own. You will fly from Adelaide to Kangaroo Island in a smaller than international size aircraft. **Luggage restrictions are currently 15 kilograms per person.** Large excesses of baggage may have to go on a later flight at additional expense to the owner. It is often better to bring two small, preferably soft bags rather than one large bag. It is recommended that you pack a carry-on bag with an extra set of field clothing and personal essentials in the event that your luggage is lost and/or takes several days to catch up with you. If you have been traveling prior to your expedition or plan to travel afterwards, leave extra bags in hotel storage.

Weather Considerations

Please take into consideration the weather conditions during your team when packing for your expedition. Climate information can be found in Section 10 '*Project Conditions*.' Fieldwork will be carried out in all weather (that means rain), working under the motto, "There is no such thing as

bad weather, just wrong clothing.” You will receive an update letter from your PI shortly before your expedition. Weather conditions for your expedition and any last minute instructions will be covered. Remember, the seasons are opposite in the northern and southern hemispheres! Durable clothing and lightweight, flat-soled, footwear (tennis shoes are adequate) are recommended at all times. Volunteers work in natural scrubland that has not seen the impact or thinning effect of the introduced rabbit. This really makes a difference to lightweight rain trousers and spray jackets; Gore-Tex, though stylish, often does not fare well in these conditions. Old-fashioned, heavy duty waterproofs (oil skins or rubber) are very good in wet weather, but may be too heavy for volunteers to keep under the baggage weight limit. Some staff members choose to wear gaiters to keep dry from the knees down.

Essential Items

Make sure to bring your Earthwatch Expedition Briefing with you! It includes important information to which you may need to refer during your expedition, as well as during your journey to and from the project site. As stated above, it is essential that you bring clothing and gear for all types of weather. Long shirts and trousers are necessary in the bush at all times of the year because of biting ants and prickly plants. Comfortable shoes and a cozy sleeping bag are also very important to keep you happy, and though the stars and moon are often bright, don't forget to bring a flashlight or headlamp.

Please see the Expedition Packing Checklist for a complete list of what you will need to take with you. We recommend going through the list with a pen or pencil and marking off each required item right before you leave for your expedition. This list conveniently tears out from the briefing, so you can take it with you when shopping and preparing for your expedition. Make sure to bring the list with you on your expedition so you can check it again before you return home!

13. RECOMMENDED READING

The research center library contains numerous books and journals with scientific as well as popular articles about echidnas and goannas. There is also a large selection of field guides covering plants, insects, fishes, reptiles, birds and mammals. However, if you wish to read more about the study subjects before joining your expedition, the following reading materials are recommended:

- Rismiller P. 1999. *The Echidna, Australia's Enigma*. Hugh Lauter Levin Associates, Connecticut. ISBN 0-88363-788-X (a result of 10 years of research with Earthwatch volunteers, including lots of pictures and factual information written for the general public).
- Green B. and King D. 1993. *Goanna, The biology of varanid lizards*. New South Wales University Press. Kensington, NSW.

Project Field Report

Each Earthwatch Institute-supported project submits a report on the past year's research and results to Earthwatch, generally on an annual basis. The most recent field report for this project may be available online through www.earthwatch.org. Note that reports are not available for all projects.

14. EMERGENCIES IN THE FIELD

All staff members are trained in First Aid and minor injuries will be treated in the field. Those more seriously injured will be taken by project vehicle or First Response Unit ambulance to the hospital in Kingscote. The nearest First Response Unit is in the township of Penneshaw (20 kilometers and 30 minutes away), and there are additional ambulance services in the townships of American River and Kingscote. For life-threatening situations, the island has an air ambulance unit (costs for this would be covered by volunteer travel medical insurance).

In case of a personal emergency requiring a volunteer to leave the expedition early, Earthwatch must be advised and airline bookings must be confirmed before departure. The volunteer will be driven to the airport by project vehicle.

Proximity to Medical Care

Staff certified in safety training	Peggy Rismiller, Mike McKelvey and John McNiel all have St. John's First Aid training certificates
Nearest hospital	Kangaroo Island Hospital The Esplanade, Kingscote, South Australia 5223 Tel: +61 8 8552 34200
Distance to hospital	50 km/35 mi (1 hour)

15. HELPFUL RESOURCES

Pelican Lagoon Research Centre

- Includes sections on local wildlife and some information about the center:
<http://www.echidna.edu.au>

Useful Visa Information

- General: <http://www.embassyworld.com>
- For Japanese citizens: http://www.rainbowt.jp/travel/visa_top.html
- For Australian citizens: <http://www.travel.com.au>
- Passport Visa Express (for US citizens): <http://www.passportvisaexpress.com>
- The Visaservice: <http://www.visaservice.co.uk>
- Thames Consular Services Ltd: <http://www.visapassport.com>

Travel Guidebooks and Booksellers

- Lonely Planet travel guidebooks and online travel site: <http://www.lonelyplanet.com>.
- The Rough Guide travel guidebooks and online travel site:
<http://travel.roughguides.com/>
- Amazon: <http://www.amazon.com>
- Barnes and Noble: <http://www.bn.com>

Travel and Airline Resources

- TravelNotes.org: <http://www.1800-fly.com>
- World Travel Guide: <http://www.worldtravelguide.com>
- Cheap Flights (worldwide): <http://www.travelix.com/> or
<http://www.discountair.com/>
- Airport Codes Worldwide: <http://www.logisticsworld.com/airports.asp>

- Third World Traveler – offers many links for useful travel information:
http://www.thirdworldtraveler.com/Travel/Travel_Links.html
- STA Travel (US): <http://www.statravel.com>
Tel: +1 800 781-4040
- STA Travel (UK): <http://www.statravel.co.uk>
Tel: +44 (0) 1865 792800
Fax: +44 (0) 1865 792911
Email: manager.oxford@statravel.co.uk
Quote code: EWE01/02
- Wexas International (Europe): <http://www.wexas.com>
Tel: +44 (0) 20 7581 8761
Fax: +44 (0) 20 7581 7679
Email: southern@wexas.com
Quote code: EWE01/02
- UK Foreign Office travel advice: <http://www.fco.gov.uk/travel>
- Travel website for Australia: <http://www.smartraveler.gov.au>

Country Information

- Country Reports - country information from around the world:
<http://www.countryreports.org>
- National Geographic Map Machine:
<http://plasma.nationalgeographic.com/mapmachine>
- U.S. State Department: <http://www.state.gov/>
- World Time Server: <http://www.worldtimeserver.com/> (time worldwide with GMT/UTC) or <http://worldbuddy.com>
- Currency Converter: <http://www.xe.com/ucc/>
- Electrical Current Converter:
http://www.converterstore.com/voltage_chart.htm
<http://kropla.com/electric2.htm>
- Telephone dialing from and to anywhere: <http://kropla.com/dialcode.htm>
- Online Unit Conversions: <http://www.onlineconversion.com>
- Worldwide Weather: <http://www.worldweather.com>,
<http://www.wunderground.com> or <http://www.tutempo.net/en/>
- ATM Locator:
<http://visa.via.infonow.net/locator/global/jsp/SearchPage.jsp>
<http://www.mastercard.com/atmlocator/index.jsp>
- Heat Index (temperature, dewpoint and relative humidity):
<http://www.weatherimages.org/data/heatindex.html>
- Exhaustive List of Weather Resources:
<http://cirrus.sprl.umich.edu/wxnet/servers.html>

Health Information

- US Travel Clinic Directory: <http://www.astmh.org/scripts/clinindex.asp>
- Travel Health website: <http://www.mdtravelhealth.com>
- Center for Disease Control: <http://www.cdc.gov>
Tel: +1 800 311-3435 or +1 888 232-3228
- World Health Organization: <http://www.who.int>
- The Travel Doctor (Australia): <http://www.tmvc.com.au>
Tel: +1 300 658-844 (within AU)
- Disease Outbreaks: <http://www.who.int/csr/don/en/>

- Hospital for Tropical Diseases Healthline (UK)
Tel: 0906 1 337733 (within UK)
(calls are charged at 50p per minute)
- MASTA Travelers' Healthline (UK)
Tel: 0906 8 224100 (within UK)

THE RESEARCH

16. BACKGROUND, OBJECTIVES AND METHODS

Short-beaked Echidnas

Short-beaked echidnas are one of three egg-laying mammals. The other two are the platypus, whose amphibious lifestyle restricts its natural distribution to waterways in eastern Australia and Tasmania, and the long-beaked echidna, now found only in Papua New Guinea. These mammals, known collectively as monotremes, represent the oldest surviving mammals on the planet. Their relatives date back to the time of the dinosaurs and may have been around when Australia separated from the super-continent of Gondwana 140 million years ago.

Short-beaked echidnas (usually referred to simply as echidnas) are aptly described by their Latin name, *Tachyglossus* (swift or rapid tongue) *aculeatus* (with points). Their outward features are whimsical. The back is covered with spines that are modified hairs, the legs and belly are soft and furry, and the hind feet point backward. Echidnas have no teeth. The tiny mouth, located at the end of its bird-like beak, only opens the width of the tongue, which can extend up to 17 centimeters! Echidnas are phenomenally adaptable and can be found throughout Australia from the desert regions to alpine areas above the snow line, in the rain forests, and along the coasts. There is no other native Australian vertebrate species that occupies a greater diversity of ecosystems. Despite their wide distribution, little is known about population numbers, except that they are on the decline.

Due to the echidna's cryptic lifestyle, studying this species and documenting its biology has not been easy. Echidnas were discovered and described by Europeans in 1792. It wasn't until 92 years later (1884) that their unique mode of reproduction – egg-laying – was discovered. The echidna's mastery of camouflage and its tenacious and secretive nature continued to challenge researchers over the next 100 years.

Much of the monotreme research carried out between 1792 and 1989 was compiled by the recently deceased monotreme authority, Dr. Mervyn Griffiths. His own contributions were numerous and covered a broad range of biological disciplines. In the 1960s Griffiths determined that an echidna egg incubates in the female's pouch for 10.5 days before hatching. He also discovered that the composition of milk in lactating females changes during growth of the young (Griffiths *et al.* 1969). Despite numerous studies, there was still little known about echidna reproduction and life in the wild.

Enter Earthwatch. More than 100 years after the discovery of egg-laying in echidnas, Earthwatch volunteers came to Kangaroo Island to assist in field studies on these elusive creatures. In their first two seasons (1988, 1989) they helped answer one of a series of questions posed by Richard Owen in 1834: how echidnas mate in the wild (Rismiller and Seymour 1991). In 1991 a long-term study with Earthwatch volunteers was initiated at the Pelican Lagoon Research Centre. Since then Earthwatch volunteers have been instrumental in filling large gaps in knowledge about echidna behavior, ecology and population dynamics. Unraveling the biological secrets of echidnas has taken tens of thousands of field hours.

With volunteers as tenacious as echidnas it has been possible to follow individual animals and make major discoveries about their life cycle, such as:

- Females in a population breed and produce a single young once every three to five years (Rismiller and McKelvey 2000). This took eight years of fieldwork and there is now new material to expand this.
- Females must be a minimum of five years old and sometime up to 12 years old before they are sexually mature and reproduce for the first time (Rismiller and McKelvey 2003). These findings required 14 years of fieldwork, and it is still unclear when males become successful breeders.
- Young echidnas leave their natal areas and travel at least three kilometers and up to 40 kilometers before establishing a home range area (Rismiller 1999, Rismiller and McKelvey 2000). More work is necessary in this area as first finding and then keeping transmitters on young animals is very difficult.

Findings have been published on other aspects of echidna biology such as breeding behavior (Rismiller 1992), home range sizes (Rismiller and McKelvey 1994), and body temperature (Rismiller and McKelvey 1996). Numerous additional investigations are being continued, the results of which are not yet ready to be published. These include the fate of the young, echidna "fingerprinting," detection of soil invertebrates (i.e. communication and hearing), and most recently the role of echidnas as cultivators, recyclers, and indicators for assessing habitat restoration progress.

Rosenberg's Goannas

Echidnas and goannas on Kangaroo Island share much of the same habitat and some of the same food sources. As the only natural predator of young echidnas, Rosenberg's goanna, *Varanus rosenbergi*, was a logical candidate to include in this long-term study.

Goanna is the common name in Australia for a lizard belonging to the family Varanidae. It is believed to be a corruption of the name "iguana." Rosenberg's goanna is actually a relative of the largest varanid, the Komodo dragon. Varanids or monitor lizards are usually associated with warm climates. Rosenberg's is of special ecological interest because it is one of the largest varanid species living furthest south of the equator. This means they have adapted to living in a cooler climate and adopted different strategies to cope. This project is investigating some of the strange relationships between goannas and their environment that allow them to live successfully here.

Documenting Rosenberg's goanna biology and ecology in the wild is also important to the conservation of this species. Rosenberg's was once widespread throughout many parts of southern Australia. In recent years, Rosenberg's goanna numbers have declined in both their mainland ranges and on Kangaroo Island due to pressures on habitat, increased road traffic, and increased predation by feral cats. Rosenberg's goannas have never been successfully bred in captivity, nor has artificial incubation of eggs taken from the wild been successful.

Although some aspects of Rosenberg's goanna biology have been extensively studied (Christian and Weavers 1994, Green 1972, Green *et al.* 1991, King and Green 1979), there are still many unanswered questions concerning its reproduction, seasonal movements, and body temperature regulation. Little comprehensive field data have been collected due to difficulties with keeping radio-tracking transmitters on the animals for continuous monitoring in the wild. This project has overcome this problem in adult animals by using implantable transmitters whose pulsed rate is used to measure temperature and detect location.

Early research found that goanna home ranges were relatively small but variable (Green and King 1978, 1993). Using more direct techniques and following animals on a daily basis over the

past three years, the project found that Rosenberg's goanna is highly mobile from October through April. Their home range may be as large as 78 hectares (~170 acres) and an individual may use up to 30 different burrows during this time of year (personal observations, unpublished data).

Courtship, breeding, and egg deposition in Rosenberg's occurs between December and February. It was once believed that these solitary living goannas were monogamous during the breeding season. Observations collected with Earthwatch volunteers have proven differently. Some males in the study population have been observed to court and breed with two or more different females. With the assistance of this project, a Ph.D. student is currently investigating successful parenting in this species through DNA analysis.

Rosenberg's goannas lay their eggs in termite mounds where they incubate for approximately seven months before hatching (King and Green 1979, Green and King 1993, Rismiller, personal observations). Artificial egg incubation experiments for species conservation purposes have not been successful. Therefore, the daily and seasonal fluctuations of temperature and humidity in termite mounds are currently being investigated in hopes of discovering the secrets of goanna egg incubation in the wild. Some initial trials were fraught with difficulties (termites tend to eat anything placed in their mounds but goanna eggs), but progress is being made with these investigations.

In autumn (April-May in Australia), goannas on Kangaroo Island go into a winter burrow. It is known that on sunny winter days some individuals emerge wholly or partially to bask in the sun (Christian and Weavers 1994, Rismiller personal observations). Earthwatch volunteers recently assisted a Master's student investigating oxygen consumption and body temperatures in goannas during the winter (Biebach 2003). It was discovered that some animals use more than one winter burrow, moving when the environmental conditions seem inhospitable for a reptile. Investigation will continue into the biology and activities of Rosenberg's goanna and how the microclimates they frequent affect their reproductive status.

Additional/New Work in the Upcoming Field Seasons

In recent years, one of the questions most frequently asked at the research center is how to attract echidnas and goannas back onto the land. The simple answer would appear to be providing habitat, as every species needs food and shelter to survive. Even on Kangaroo Island, an area free of rabbits and foxes, there has been a decrease in the number of both goannas and echidnas from the 1970s to the 1990s. This decrease followed the greatest land clearance on Kangaroo Island, which occurred between 1950 and 1970. With land clearance came climate change. The relationship between habitat clearance and altered climate/microclimate has been documented in many parts of Australia. Habitat restoration and understanding fire regeneration is essential for the future of echidna and goanna conservation. Echidnas have home ranges of up to 200 hectares, may live for 50 years, are slow to reach sexual maturity, and are not frequent breeders. Because young disperse from their natal areas, it is necessary to ensure that suitable habitats are available within their range. Without adequate habitat on Kangaroo Island and mainland Australia, there will be aging populations of echidnas in isolated pockets with no recruitment. The result is a slow but certain demise of this species and a breakdown in functioning ecosystems.

Although not yet studied as extensively, Rosenberg's goanna is also a highly mobile, long-lived species that has a specialized reproduction requirement and low recruitment. It is still unknown when they reach sexual maturity. Their near demise on the mainland has been due to loss or fragmentation of habitat as well as feral predation.

Re-vegetation and natural regeneration at fire sites can positively influence wildlife conservation and microclimate. Creating microhabitats improves microclimate, provides shelter for native wildlife, and leads to increased soil biota that provides food. In the long term, establishing microclimates with rich biodiversity yields positive results for the macroclimate of the entire area. Restoring habitats and documenting fire regeneration sites benefits not only the conservation of wildlife and flora, it supports global initiatives to recreate hospitable climates for humans.

At a local level, the Kangaroo Island community is concerned with the health, future, and conservation of native flora and fauna, particularly because such species are key to the local environmental and economic resource base. Local people have experienced the effects of land clearance on wildlife ecosystems and are currently striving to preserve species diversity. There are no quick and easy methods for re-vegetation and land restoration. Land care projects that start with great enthusiasm often wane with time simply because there is no gauge of progress. Interest in re-vegetation projects is maintained only when participants see measurable results.

A pilot project made possible through the AVIVA Climate Change Award (received in 2002) has demonstrated that documentation of microclimates and acoustic monitoring in soil are measurable parameters that reflect shelter and food requirements of echidnas and goannas in intact ecosystems. Implementation of these methods has begun on community re-vegetation projects, providing comparisons and measures for progress of habitat restoration. It is an exciting long-term commitment with a high educational component that involves Earthwatch volunteers with local schools and community.

Research Objectives

The long-term goals of the project embrace the concept that the health and survival of a species depends on understanding the biology of wild/free-ranging populations, realizing their active role in dynamic biodiversity, and identifying their environmental needs for a sustainable future.

Key objectives in the next field seasons are to:

- Continue studies on population dynamics of echidnas and goannas living in intact native ecosystems
- Quantify echidna and goanna activities as cultivators and recyclers
- Monitor microclimates and habitats in human altered and natural environments
- Measure habitat restoration progress through wildlife and vegetation surveys
- Monitor natural regeneration progress in a fire site

Specifically, project staff and Earthwatch volunteers will:

- Radio-track individuals in a population to monitor population numbers of both adults and juvenile recruitment (Rismiller 1992, 1993), determine movements and home ranges (Rismiller and McKelvey 1994), document activities and special behavior (Rismiller 1999; Rismiller and McKelvey 2000, 2003), and monitor feral predation
- Continue the search for the echidna “fingerprint”
- Determine habitat usage by native and introduced species in intact, denuded, and re-vegetating areas
- Document microclimates at animal burrow sites, in areas of digging activity as well as areas where no animals or activity is found
- Monitor soil/insect acoustics to assess soil biodiversity and learn more about how echidnas find their food sources
- Work with the community on monitoring re-vegetation projects, documenting changes in soil parameters and providing comparative microclimate data to community groups
- Survey and document vegetation and wildlife changes at a site that burned in February 2005

There are still numerous unanswered questions about goanna life history. In the past four years considerable insight has been gained into home range sizes, breeding behavior, duration of egg incubation, and body temperatures. However, some of the basic biological facts relevant to conservation are still unanswered. What are recruitment numbers? How fast do young grow? At what age are Rosenberg's goannas sexually mature? From over 300 hatchlings marked in the past three years, only four have been recovered so far. Continued long-term monitoring of known individuals and marking and recaptures of young will provide the answers.

Data collected over a 14-year period provided evidence for an early project observation that echidnas must be a minimum of five years old (and up to 12) before reaching sexual maturity, unlike their platypus cousins who breed at one to two years of age. This project's new research activities evolved based on long-term field observations. One recurring question from volunteers and others who have observed echidnas is how they find their food sources. A related and most intriguing follow-up question is how these animals avoid each other in their overlapping home ranges. These questions started project staff on the track of investigating insect/ground acoustics, how echidnas hear, and possible echidna communication. Finding and testing appropriate field equipment for this task has been a challenge. However, with the continued support of enthusiastic students from the Department of Mechanical Engineering, progress is being made and these investigations will continue.

During recent years of monitoring it has become clear that echidnas and goannas play an active role in shaping the habitats and microclimates in which they live. They are diggers, cultivators, and aerators. Utilizing acoustic recordings and micro weather stations provided through the AVIVA funding, it is becoming apparent that behavioral modifications of habitats by echidnas and goannas influence microclimates in the areas of activity. Pilot studies indicate that these species' activities support soil biodiversity (i.e. invertebrate food sources and dispersal or germination of native plants). With continued and expanded research in these areas this project intends to develop tools for monitoring ecosystem health and assess progress in habitat restoration programs.

Methods

Animal life histories will continue to be documented using the following well-established methods:

- Searching on foot
- Marking with transponders
- Attaching transmitters
- Locating animals using radio-telemetry

Finding, Retrieving, Marking, and Tracking Echidnas and Goannas

Echidnas are a challenge to study because they do not use home dens or regular trails, cannot be trapped using baits, and are not attracted by recordings. To make initial contact, it is necessary to search on foot (up to 300 hours per animal). After finding an echidna, timing and decisive movements are key in picking up the animal. This will be demonstrated in the field.

The procedure for finding goannas is the same: searching the research area on foot. In months when animals are active, goannas are much more easily spotted than echidnas. Their freshly dug burrows are also easy to identify. Volunteers encountering new goannas on routine searches mark the burrow with survey flagging and report the location. Adult goannas are retrieved by the Principal Investigator or other trained staff who noose the animal or catch it by hand.

When an echidna or goanna is caught, sex, weight, reproductive condition, body measurements, and any distinguishing features are documented. Upon first encounter, new individuals have small electronic transponders inserted under their skin. This provides a lifetime positive identification. Because it is necessary to handle individuals to read the 15-digit code with a scanner, echidnas are visually identified with colored tubing (Rismiller 1992) and goannas with dots of correction fluid applied at the base of the tail.

The tracking transmitter is attached between clipped spines on the lower back of the echidna with a two component epoxy (Rismiller and McKelvey 1994). Individuals are kept overnight and released the next day at the site of capture. Tail transmitters on small goannas are glued to the base of the tail with the same type of epoxy. They are generally released within hours of capture. Body temperature/tracking transmitters for adult goannas are calibrated in a water bath before being surgically placed in the peritoneal (body) cavity. This procedure is performed under sterile conditions while the animal is safely anaesthetized (Rismiller and Heldmaier 1987, 1988, Rismiller and McKelvey 2000). The pulse rate of the signal is dependent on temperature, beating slower at low temperatures and faster at higher temperatures. While animals are active, volunteers radio-track and use a stopwatch to count the interval corresponding to seconds per 50 body temperature beats. These data are entered into the computer for conversion to body temperature. When goannas are inactive, data from pulsed temperature transmitters can be monitored with an automatic recording device. This monitoring equipment has been developed and field tested with the assistance of previous Earthwatch teams, and is now successfully implemented in other studies (Rismiller and McKelvey 1996).

All animals are radio-tracked on foot with a handheld receiver and three-element antennas. Through long-term experience, methods of unobtrusive location and observation have been devised to accurately document behavior. Volunteers are trained to use wind, terrain, light, and sound conditions to optimize tracking efficiency. Each time an animal is tracked, field data collection forms are used to record its location, environmental conditions, animal activity (e.g. foraging, moving, or resting), shelter site, habitat, and body weight or food source when applicable. On return to base camp, the location of the animal is marked on a contour map and data are entered into the computer. Using a GPS, daily movements and burrow sites are transferred to aerial photographs. All field and lab equipment operate on sustainable DC solar power.

Fingerprinting

To date no one has found an individualistic trait/characteristic for an echidna that can be used as a "fingerprint." The palate of the echidna may be the key. Each palate consists of a number of rows of small keratinous spines. When road-killed echidnas are brought to the research center, biological data is collected and the plate removed. Volunteers assist by counting the number of spines per row and document this on a sketch of the palate. Information is entered into a database. When enough samples are available (number of road kills are sporadic), a pattern recognition program will be developed to analyze the palate designs.

Surveys

There are four established sites where surveys will be conducted throughout the year:

- 1) Native woodland in an intact ecosystem
- 2) Native shrubland in an intact ecosystem
- 3) Native grassland in an intact ecosystem
- 4) Previously cleared land with re-vegetation

Additionally, surveys will be conducted at a new site where a fire occurred in February 2005.

In natural, intact ecosystems, volunteers will learn to recognize tracks, digs, burrows, scats, and traces of echidnas, goannas, kangaroos, bandicoots, and feral species. They will also be made familiar with the most common native and introduced plant species. Habitat usage in intact ecosystems will be determined by surveying transects of 50 by 50 meters and recording all animal sign. When possible, similar sized areas will be surveyed in the other two sites. Vegetation density and diversity will be recorded along permanent transect lines at all sites.

At selected sites, soil “sound profiles” (i.e. insect acoustics) will be recorded using geophones and other sensitive low frequency microphones attached to DAT or digital video equipment. In some instances, insects will be collected and recordings made in isolated situations.

Microclimate Monitoring

Long-term microclimate monitoring will be conducted using micro weather stations set in permanent positions at each of the survey sites. The weather stations record air temperature, humidity, ground temperature, solar radiation, and wind speed. Teams will use handheld anemometers to determine wind speed at different elevations and locations (to assess effects of vegetation) within the survey sites. Temperature and humidity data loggers will be placed in the field for a week at a time in sheltered and exposed parts of the habitat to determine the role of vegetation and to compare different areas. Hobo® data loggers (temperature and humidity) will be placed outside the entrance of goanna burrows and the smaller iButton® data loggers will be placed inside to monitor temperature. Loggers will also be used to monitor microclimates at any echidna nursery burrows found. Data will be entered into a database to establish and compare microclimate profiles for different areas and seasons.

Impact and Management of Invasive Species

At all survey sites, presence of feral animals will be identified by tracks, scats, and other traces (e.g. dead wildlife). Echidna nursery burrows and goanna egg mounds in all habitats will be closely monitored for disturbance by predators. Cat scats will be collected and their content analyzed. Depending on frequency and freshness of scats, live traps will be set to assess and monitor numbers within the survey areas.

During all surveys, invasive plant species will be identified. Teams may assist with the removal of feral plant species without the use of herbicides or pesticides.

17. RESULTS AND OPPORTUNITIES

Recent Research Results

Recent exciting and significant results of the project include:

- Finding two new sub-adult echidnas in the study site
- Locating and marking 19 new goannas (nine females, five males, five sub-adults)
- Relocating three sub-adult goannas of known age
- Observing and documenting courtship behavior in six pairs of goannas
- Locating, measuring and mapping 17 different egg incubation termite mounds
- Placing long-term temperature data loggers in and on 12 mounds
- Discovering a known female echidna with two eggs in the pouch
- Analyzing palates from 16 road-killed echidnas

Benefits and Contributions of the Project

This project's long-term documentation of echidna life history has led to reviews and changes in State and Federal Government policy about permanent removal of any native species from the wild that do not breed readily in captivity. In the past four years, numerous local councils in South Australia and other parts of the country have erected echidna road-crossing or wildlife warning signs on motorways that communities have designated as hazardous to echidnas based on the number of road kills. The projects findings are also being consulted for local and regional formation of new policies on feral cat management and policy for regulating the height of the lowest live wire on an electric fence.

Due to findings of the project, government and community animal rescue/care groups are establishing policies of non-interference with echidnas found in suburban areas. Community education provided through these groups, especially with regard to the relocation of echidnas, has probably saved the lives of many animals. Documentation of echidna activities and habitat use is having a direct positive result on policies concerning captive husbandry. The project provides echidna natural history facts to a number of international zoos that have echidnas. Through habitat enrichment, zoos have increased echidna visibility, hence increasing the educational potential for the greater public. In addition, decreasing noise and/or changing diet have increased breeding behavior in some captive animals. There is to date no successful echidna breeding program in the world (no progeny of captive bred animals have yet reproduced).

Biological findings of this project resulted in the IUCN (International Union for the Conservation of Nature) changing the status of all short-beaked echidnas from "Common" to "Near threatened" in the lower risk category. This lead was not followed by the ANCA (Australian Nature Conservation Agency), which only listed the Kangaroo Island echidna as "Near threatened." Project staff are currently being asked to provide input for a *Review of the Status of Threatened Species in SA* for the reassessment and reclassification of the short-beaked echidna at a national level.

News of this project and what has been learned about the short-beaked echidna inspired a Papua New Guinea (PNG) student to apply these field methods to research the world-endangered long-beaked echidna. Project staff joined this student in the field in 2003 and are currently consulting with PNG conservation groups and wildlife authorities about establishing long-term research and a policy for protection of the long-beaked echidna at the local level.

Many volunteers participating in this project have taken educational components back to their jobs, communities, and/or homes. Skills such as radio-tracking, mapping, survey, and other

hands-on field methodologies learned on this project are now being implemented in local conservation projects across the globe. Teachers from around the world have integrated the echidna and goanna icons into math, geography, art, and literature, as well as ecology, environmental studies, and conservation curriculum. Because of the echidnas' and goannas' links with the land, they have provided international communities with working models about the role of wildlife in sustainable land husbandry and biodiversity. Economics students have even based coursework on this project, examining the value of wildlife as a natural resource on the cash flow into communities.

Sustainable research and living examples gleaned from this project have been adopted by volunteers in their community groups, businesses, and homes. Simple, effective, and practical applications of solar power and water management show how research and daily living can be conducted with minimal expenditure of costly environmental resources.

Within the local business community, especially in the area of tourism, the echidna is viewed as an incentive species which generates repeat business. Locally and nationally, echidnas have had positive and measurable benefits on regional tourism. During the course of this project, specific transmitters and data loggers have been developed that are being used by other colleagues, thereby supporting small Australian businesses. Field methods developed with the assistance of Earthwatch teams have led to portable and practical energy systems for operating field labs and facilities.

The national socio-economic value of the echidna has risen because of the media and public awareness generated by this project. Echidna likeness on clothing, household articles, cards, coins, stamps, and in form of paintings, glass, ceramics, jewelry, sculptures, and toys has increased exponentially since inception of this project because of documentaries such as *Echidna the Survivor* and other publicity. Echidna status has risen to the point that it is used to advertise high profile vehicles such as Mercedes and promote mineral exploration companies.

Data collected on this project have formed a sound biological/ecological foundation on which to base further studies. These include not only direct field studies, but also the involvement of other disciplines that rely on field samples for laboratory work. Much has been learned and documented about echidna biology, but there are still numerous areas that need further investigation. These include communication, hearing, social structure, and fate of the young. For Rosenberg's goanna, there are still many basic biology questions (growth rates, age of sexual maturity, longevity, effect of termite mounds on eggs) that have not been answered. Continued life history documentation of known individual echidnas and goannas is the only way to answer questions relevant to the conservation and sustainability of these species.

Based on accumulated knowledge, new research activities will expand the echidna and goanna research to encompass habitat restoration for conservation. This will promote more understanding of species (including human) interaction with the environment, encourage responsible land management, and engage people in sustainable practices. People are keen to re-vegetate and encourage echidnas and goannas back on to their land. Investigating the dynamics between echidnas, goannas, and their environment will provide new tools for scientists and the community to assess re-vegetation, habitat restoration, and soil biodiversity at local, state, and national levels. In addition, a better understanding will be gained about the ecological balance between microclimates and survival of native species as well as how humans can positively alter microclimate for species survival.

Dissemination of the Research Results

Information resulting from the research has been published in scientific journals as well as popular science magazines, newsletters, newspaper articles, and online. Numerous radio interviews covering all aspects of the research have been reported on local, national, and international stations throughout the years. There has been participation in national or international film or video media nearly every year.

At a local level, project staff personally share results and information with conservation, educational, and government groups through workshops, slide lectures, and onsite information days. Pelican Lagoon Research and Wildlife Centre is actively involved with education at the three local Kangaroo Island community schools. Each year, programs about the ongoing research are given during Environment, Volunteer, Math and Careers Week. A number of local students are directly involved through work experience programs or participation in special workshops on biodiversity and environment. The research center also participates in community forums, providing facts and background information on issues from road kills to re-vegetation.

Internationally, data from this project reaches thousands of people a year through the educational website <http://www.echidna.edu.au>. The book *The Echidna, Australia's Enigma*, which resulted from Earthwatch assistance, has been the basis for innumerable school projects from the primary school to the university levels, and is used as part of the biology/wildlife management curriculum at some universities. The same can be said of the documentary film *Echidna the Survivor*. Through email, factual, up-to-date information and photos are provided to students, schools, and educational institutions around the world, as well as material through the media and online classrooms. This project provides students from various disciplines and universities opportunities for projects at Honors, Master's, Ph.D., and postdoctoral levels.

Based on established connections, project staff will continue to make considerable efforts to ensure results are communicated to broad and varied audiences via scientific and popular seminars, presentations, and newsletters as well as media and electronic means. Results from the upcoming research seasons will be published in an array of scientific journals, including *Conservation Biology*, *Ecology*, *Journal of Comparative Physiology*, and *Copia*, and popular journals such as *Nature Australia*, *Geo*, *BBC Wildlife* and *Wildlife International*.

18. LITERATURE CITED

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EXPEDITION PACKING CHECKLIST

Essential Items

- This Expedition Briefing
- Photocopies of your passport, flight itinerary and credit cards in case the originals are lost or stolen; the copies should be packed separately from the original documents
- Passport and/or visa (if necessary)
- Certification of inoculation (if necessary)

Required Items

Clothing/Footwear for Fieldwork

- Lightweight, quick drying, long-sleeved shirts and pants/trousers (long sleeves and pants are necessary for protection from vegetation, insects and sun)
- Two sets of warmer clothing for winter and spring teams (see Section 10 'Project Conditions')
- Two pairs of relatively flat-soled walking/tennis shoes (NOT hiking shoes/boots with heavy treads, which damage the soil surface)
- Rainwear (poncho or jacket, pants/trousers, gaiters), especially needed in winter
- Extra socks (having warm dry feet in the evening is wonderful!)
- Wide-brimmed hat for protection from sun and rain
- Sunglasses
- Warm gloves in winter

Clothing/Footwear for Leisure

- One nicer set of clothing for evening in town or to keep clean for end of expedition
- Extra socks or light slippers for inside research center

Field Supplies

- Small daypack strong enough to comfortably carry five kilos (11 pounds) of personal gear, echidna field gear, snacks, etc.
- Drybag or plastic sealable baggies (e.g. Ziploc) for protecting equipment such as camera from dust, humidity, and water
- Water bottle(s) able to hold at least one liter
- Duct tape for field repairs (bring a small roll or just wrap some around your water bottle)
- Flashlight/Torch or headlamp and extra batteries and bulb (red or orange filter is recommended for nighttime observations)
- Compass (note that very flat compasses do not function well in Australia; thicker compasses that have more room for the needle to float work better)
- Field notebook and pencils/pens
- A waterproof felt tip pen for writing on plastic flagging

Bedding and Bathing

Note: Pillows will be provided by the project, and some blankets may also be available.

- Towels
- Warm sleeping bag (it may get down to 5°C/40°F in the winter)
- Sleeping sheet and pillowcase

Personal Supplies

- Personal toiletries (biodegradable soaps and shampoos are recommended)
- Antibacterial wipes or lotion (good for “washing” hands while in the field)
- Personal First Aid kit (e.g. anti-diarrhea pills, antibiotics, antiseptic, itch-relief, pain reliever, bandages, blister covers, etc.) and personal medications
- Sunscreen lotion with SPF 30 or higher
- Insect repellent spray

Miscellaneous

- Spending money for travel day (see *Other Advice/Information* in Section 9 ‘*Before You Leave*’)
- Camera, film/memory card(s) (film is expensive in Australia and supplies are limited in Kingscote, so plan ahead), extra camera battery
- 12-volt DC charger for your camera or other personal equipment

Optional Items

- Gore-Tex booties for wet weather (these keep feet dry in all types of shoes)
- Earplugs
- Blank CD or DVD for sharing digital photographs at the end of the expedition
- Binoculars
- Pocket knife (pack in checked luggage)
- Books, journal, games, etc.
- Favorite snack foods
- 10-20 slides or photos (hard copy or digital) of your home town, hobbies or occupation to share with team members