

# Australia's Vanishing Frogs

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## Discovery Weekend Briefing

Team 4: September 26 – 28, 2008 (Families Welcome)

Team 1: October 17 - 19, 2008 (Families Welcome)

Dear Volunteer,

Welcome to the Vanishing Frog's Discovery Weekend. We are very pleased to welcome each of you as a participant in our summer research program for 2008 and 2009. We would like to take this opportunity to share a few aspects of our project with you.

We have been carrying out research in the forested areas of eastern Australia over the last 16 years and we never cease to be amazed by the area's biological diversity and beauty. Our field studies have involved Earthwatch teams in the past, and many of our volunteers have become our friends. I would like to thank you for contributing your time and energy to this project, and I hope in return we can provide you with a rewarding and enjoyable experience. Your contribution to this research will help us address conservation priorities for several endangered species and provide you with insights into the role of science and community in conservation management.

Our project is based in the forests of the eastern escarpment of the Great Dividing Range in eastern Australia. What we hope to achieve is to understand the cause of decline of the forest frog communities. Along the East Coast of Australia, nine species of frogs have totally disappeared in the past two decades, and scientists are at a loss to explain why, and more importantly to provide solutions. The decline and disappearance of frogs in Australia is paralleled by losses of amphibians in other parts of the world. This loss is a truly global tragedy. Our task is to monitor the health of populations of several species that are considered critically endangered and to keep a watch on others that we consider may be susceptible to sudden declines. At the same time, we will be collecting information on the cause of the decline.

Be prepared for a camping style weekend. There are several reasons that make this the most suitable arrangement. Firstly, our research sites are within a State Forest, which are distant from towns. Secondly, a considerable portion of our work occurs after dark, and we have found from experience that camping nearby study sites avoids driving when people are tired. Thirdly, because we aim to study a number of sites, a single base near to the sites is most appropriate. Lastly, camping provides closeness to the bush that cannot be matched by most built facilities.

We also have a large camp tent along with all the necessary gear to make work and leisure time comfortable. The site where we camp has toilets but not showers. There is a nearby creek for freshening up. Please keep in mind, however, that some aspects of our program are unpredictable e.g., we cannot guarantee weather (rain is possible), so bring suitable wet weather gear. The temperature should be comfortable (daily average around 22°C/72°F, ranging between 13-20°C/56-68°F), and the humidity may at times be high (greater than 90 percent).

Come prepared for working along streams in forest and rainforest habitats. The amount of walking is not strenuous, and we move at a leisurely pace because we are continually searching for frogs. We also always work in teams of at least two people so you will always be working with others.

Please let us know in advance if you have any special interests or skills that might help in the research or group process. We look forward to meeting you.

Best wishes,  
Michael Mahony, Ph.D.

## **Discovery Weekend**

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Discovery weekends are an opportunity to join Earthwatch Scientists at their field research site. Together you can explore continuing programs of research, how they function and some of the results of this work. Discovery times are brief, yet full of information and adventure. Depending on the season, moon phase and current conditions, you will have a wide range of experiences.

The following are excerpts from the Briefing of previous Vanishing Frogs projects. This information gives an idea of the scope of field activities and experience volunteers have during their weekend stay. On the Discovery Weekend you will participate in some of these activities.

We look forward to you joining us!!

# Australia's Vanishing Frogs Discovery Weekends

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## PROJECT SUMMARY

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**POSITION / TITLE:** Senior Lecturer

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**PROJECT TITLE:** Australia's Vanishing Frogs

**RESEARCH SITE:** Watagan National Park, NSW

**RENDEZVOUS SITE:** The Junction of George Downes Drive and Walkers Ridge Road

**TEAM DATES IN FIELD:** **Team 4:** September 26 – 28, 2008 (Families Welcome)  
**Team 1:** October: 17 - 19, 2008 (Families Welcome)

**TEAM SIZE:** **Minimum:** 8 **Maximum:** 20

### Abstract of Proposal

The principal aim of this project is to assess the status of a number of critically endangered frogs in the rainforests of eastern Australia. Monitoring of selected species and populations commenced several years ago, and volunteers will assist in the ongoing research to determine why the frogs are declining. Monitoring is proactive and involves the close observation of the health of individuals so those sick individuals can be sent for veterinary pathology. We also aim to determine the distribution of a fungus that has been implicated in the decline of amphibians in eastern Australia and elsewhere. Volunteers will be involved in regular systematic monitoring and be introduced to the dilemma of dealing with wild populations that are declining for reasons that are not fully understood. Methods include conducting stream transects for adults and tadpoles, collection of samples and the documentation of results.

# RESEARCH PLAN

## 1. THE PROJECT

### Background

Nine endemic Australian frogs are considered to have disappeared (presumed extinct) in the past 20 years. A further 20 species have declined alarmingly in distribution and abundance, and 27 species are listed as threatened by the national Action Plan for Australian Amphibians (Tyler, 1997). The most dramatic and unexplained declines occurred among stream frogs along the eastern seaboard. The proximate cause of declines and disappearances remains unknown. It is perplexing that many declines have occurred in pristine environments where habitat destruction, introduced predators or pollution have not been implicated. With declines continuing, it is necessary to conduct research relying on a multi-disciplined approach to elucidate the cause of declines and thus establish strategies to reverse or manage it.

### Significance

In the past 20 years, nine frogs—about 5% of Australian frog species—disappeared from eastern Australia and are now presumed extinct. Seven were stream dwelling or stream breeding frogs and the remaining two occupied swamps and ponds. In NSW, two species of bell frog (Southern tableland or spotted bell frog, *Litoria castanea* and the Northern tableland bell frog *L. flavipunctata*) disappeared in this period, and the remaining bell frog species (Green and golden bell frog, *Litoria aurea*) declined by an estimated 80%. Overseas, there have been reports from all over the world in recent years of frog species declining or disappearing. A number of causes for these declines and disappearances have been postulated, but few have been proven. Many of the affected species inhabited pristine habitats and were commonly located in conservation reserves. Declines occurred both gradually and precipitously; in the latter instance, monitoring has shown populations disappearing over periods as short as three months.

The declines and disappearances appear to be largely related to altitude. Species that have disappeared were found only above 300m elevation. Species that had ranges spanning the 300m altitude level, disappeared from areas above 300m but remain in areas located below this altitude.

To illustrate the process of extinction that has occurred there is no better example than that of the Gastric Brooding Frog (*Rheobatrachus silus*). *Rheobatrachus silus* was discovered by Liem (1973) in the Connondale Ranges of Queensland. The frog was well known for its peculiar breeding habits: The female swallowed its fertilized eggs, which developed into young frogs in its stomach (Tyler 1983). It turned off its digestive mechanism during this six-week period and did not eat until the offspring finally emerged through its mouth. In 1976, the species was described as abundant; but in routine monitoring surveys of the summer of 1978-1979 it could not be

detected. No specimen in the wild has been seen since. The last known captive specimen, a male, died in the Adelaide laboratory of Dr Michael Tyler in 1983, and although a small colony had been held in captivity they never bred (Tyler and Davies 1985). A second species (*Rheobatrachus vitellinus*), which also exhibited gastric breeding, was discovered in 1984 (Mahony et al., 1984). It disappeared in 1985 and has not been seen since (McDonald 1990), it was known to science for a period of less than 18 months.

These extinctions have received considerable attention because of the unique biology of these species and their story is paralleled by the story of the extinction of the Golden Toad of Monteverde. When they are considered in the light of what was to follow in the decades after they disappeared the situation takes on even greater significance. Following the loss of the gastric brooding frogs a further seven rainforest stream dependent frogs disappeared in eastern Australia in the period between 1980 and 1992. This process is continuing with other species now reaching the level of critically endangered.

Initially the focus was on the loss of some remarkable and unique species such as the gastric brooding frogs in Australia and the golden toad in Monteverde. However these extinctions have also focused attention on a potentially more serious problem for both biological conservation and ecological theory when confronted with actual ecosystems (Mahony 1999; Sakar 1999). As has been reported in both the scientific and popular press, there have been drastic declines in amphibians, particularly frogs, throughout the world. In a few cases (e.g., in the demise of populations linked to the release of mine tailings), the proximate factors can be immediately linked to the human activities responsible. But in the majority of cases, no such factor has been found. As Sakar (1999) has pointed out, one would expect that ecological theory would, at this point, step in and reveal the underlying causes of declines or, at the least, provide plausible and testable models that would spur investigation. However, conventional ecological theory has contributed little insight so far.

Detailed reports of the frog declines in Australia were summarised in the proceedings of a national conference held in 1996 (see papers in *Declines and Disappearance of Australian Frog*, Environment Australia 1999). The disturbing nature of the various reports is obvious, but what is apparent is the many unanswered questions;

- Are these declines permanent, and are they part of a general trend?
- Is the frog crisis any deeper than the general biodiversity crisis that has erupted during the last two decades?
- Can the activities of man be directly linked to these declines?
- Finally can the declines be considered, as many have claimed (e.g. Balustein and Wake 1995), to be an indicator or general environmental degradation (the canary in the mine scenario)?

The answers to these questions are far from obvious. Some have argued that ecological theory has failed in its response to these issues (Peters, 1991) because ecology has an historical conceptual framework rather than a predictive one. Unfortunately, the declining frog scenario is typical of situations where ecological theory is confronted with the actual problems of conservation biology. Sakar (1999) provided a critique of this area and pointed out that ecological models and exact models are almost always restricted to scales far too small to be of much relevance to the problems of conservation. At the larger scales that are relevant to conservation contexts, speculation replaces models. One approach to overcome this problem is to conduct well planned case studies that are restricted to individual contexts that are of a sufficient spatial and temporal scale.

Our study on the declining frogs of eastern Australia adopts this approach. This project involves detailed case studies of frog species that are known to be in decline. Our objective is not simply to document the process but to search for solutions to this problem and provide some level of prediction to conservation managers.

Studies first reported in 1998 (Berger et al 1998, 1999) have implicated a fungus as the causal factor in the decline of amphibians on several continents. While these findings are still somewhat controversial and not accepted by all those who have been involved in the study of declining frogs this hypotheses does provide a number of testable hypotheses which require the collection of empirical data to either confirm or refute the proposal. We have conducted investigations into the geographical distribution of the pathogen in eastern Australia and its occurrence in a range of amphibians and habitats. While these studies help in a predictive sense to identify species, populations and habitats that are at risk they do not provide a solution to the problem of declining frogs. The aim of this project is to go beyond risk assessment and to investigate whether some populations are resistant to the pathogen and to investigate the nature and extent of that resistance.

An ecological assessment of the impact of the pathogen on native frog species and populations is essential. The decline or disappearance of some species has been sudden, whereas it has been more gradual for others. Virtually no field data has been gathered on the detail of the impact and ecology of the pathogen. The current situation provides an opportunity that may not be repeated and therefore should not be missed, to gather this information which may be vital in preventing the extinction of a number of frog species. In particular, information is needed to determine:

- which species are currently being affected;
- which parts of the life cycles (e.g., eggs, tadpoles, juveniles, adults) are being affected, and relative susceptibilities;
- the rate and intensity of infection, and the proportion of each population that are being affected; and
- climatic constraints (i.e., temperature, rainfall, humidity) on the extent, rate and seasonal spread of infection.

These questions have great relevance to the frogs of eastern Australia and most likely to those in other Australian regions (Mahony, 1999). They are also of considerable significance internationally. The finding that the Chytrid fungus found on the east coast of Australia is identical to that found in Panama (Berger *et al.* 1998), where numerous species have declined in a fashion very similar to that observed in Australia, is one that sounds alarm bells for frog communities across the globe. For example, recently there have been reports that the Chytrid fungus has been detected among moribund individuals of one of the endemic New Zealand frogs.

The objectives of this project include:

- To determine if there is currently an epidemic of sick and dead frogs in northeast NSW, and if so, to identify its geographical extent and nature on a species-specific basis;
- To determine the causes of sickness and death of frogs found in these conditions;
- Alerting local communities, interest groups and individuals and the local media to the issue, and to obtain support in searching for or reporting occurrences of sick and dead frogs; and
- Identify if species or populations appear to be resistant or have recovered from exposure to the pathogen what is the nature of that resistance?

### **Methods and Techniques (Research Design)**

- Assessing Conservation Status (population monitoring), Monitoring and Ecological Studies
- Selection of threatened species
- Selection of most appropriate geographic region and areas
- Stratification of chosen area based on a range of pertinent physical and biological variables to select survey sites
- Systematic survey methods. Repeated visit design. Detailed demographic studies of selected species, populations and communities
- Developed non-intrusive methods to detect and test for the presence of the pathogen (Chytrid fungus) on wild caught animals
- Range of habitat variables measured and included in a large GIS data base

## **Public-Policy contexts**

The declining frog phenomenon as it is known has received considerable attention among the general community. Public agencies responsible for conservation and land management, wildlife management, and health authorities also have strong interests in the situation. Attention has been drawn by several commentators to the implications of an alarming decline among such a widely distributed group of vertebrates in such a short time frame and across such a variety of habitats on the globe. The concept that amphibians may be regarded as analogous to the “canaries in the mine” providing a warning that there are subtle changes occurring in the environment which have disastrous effects. These provide timely warnings to humanity of the close interaction of all life and that we too rely on the same environments to survive.

In the context of eastern Australia several government agencies are actively involved in dealing with the problem. In particular, New South Wales National Parks and Wildlife Service as the lead agency responsible for wildlife conservation is involved in regular discussion of research findings and directions. The principal investigator has in the past five years worked directly with the Threatened Species Unit of the service in the preparation of Recovery Plans for five endangered frogs, and has conducted targeted surveys dealing with the sick and dying frog syndrome. At the national level the Commonwealth government agency responsible for wildlife conservation is Environment Australia. In the past four years the PI was commissioned to provide research phase information to the agency for the purpose of preparing documentation for the prioritising and listing species under the national Endangered Species Act. There has been a direct link between the field research conducted and the policy foundations to investigate the problem and to bring this information to politicians and the public.

Future public policy and directions will be guided by the results of field research. A clear and well-established link exists between the on-ground field monitoring and research, and the development and modification of policy. In the past, development of clear policy has had significant impact on a range of activities. For example forestry operations now operate under a range of prescriptions and protocols designed to reduce environmental impacts developed by understanding of the ecology and habitat requirements of endangered species. In the comprehensive regional assessment of forestry resources in eastern Australia, the field work that we have conducted over the period of a decade resulted in significant reservation of certain habitats in National Parks.

## 2. RESEARCH OBJECTIVES

### **Goals**

To understand the cause(s) and seek solutions to the phenomenon of amphibian declines. This will be achieved by investigating the following objectives:

- assess conservation status of frog communities,
- monitor selected identified threatened species,
- investigate the ecology of selected threatened species,
- identify threatening processes,
- seek solutions to the threatening processes.

### **Specific questions to be addressed in this season**

- Has there been any change in the population demography of three species of critically endangered rainforest stream frogs?

Studies in the past have established the population structure of selected populations. Age class structure, population size, age structure, age specific mortality, fecundity and recruitment rates have been determined. Using mark-recapture techniques paired populations are monitored and any significant changes in demographic features are detected.

- Is there any sign of illness or disease in the stream frog communities monitored?

These questions are necessary to achieve the long-term objectives of determining whether declines are occurring and how they effect populations of susceptible species. From a management perspective if declines in frog populations are found, various means can be taken to prevent the loss of the population and species. These may involve removal of individuals to other site programs. From the theoretical scientific perspective, these studies may also enable the cause of declines to be closely investigated.

### 3. METHODS

The methods used are relatively straight-forward, but they are labour intensive and it is for this reason that the role of volunteers is vital.

#### **Field methods**

The frogs that are being studied occur in the riparian zone (the zone along the stream side, usually an area with moist microhabitats which may extend up to 30 metres either side of the stream) of rainforest streams. The streams vary from very small riffles less than one metre wide and with small pools to more substantial streams up to five metres wide and with larger pools. The animals are terrestrial not aquatic and in most instances they can be detected sitting on the forest floor. They are relatively large frogs up to 12 cm (5 inches) in the largest species.

Transects have been marked along the streams where the study will occur.

#### **Nocturnal (Night) Transects**

Walked by teams of three to four workers commencing shortly after dusk and normally taking up to five hours (an average transect takes four hours, the time taken depends on the number of animals found active and that need to be processed). Head torches and spotlights are used to detect animals. Call playback (use of a pre-recorded call of the male frog played over a portable loud speaker) is also used to detect animals. The methods have been standardized and the assistants will be trained in these methods and the reason for adherence to set protocols will be explained and discussed.

Animals will be collected by hand (these frogs are essentially harmless, they do not bite, are not poisonous and there is little chance of injury or distress to the animal once the assistants have been trained. It is worth noting that we operate under strict animal ethics guidelines and approval processes). Immediately after an animal is collected it is placed into a clean plastic bag and a removable numbered tag is placed at the point of capture and the number written onto the bag with a texta.

Processing of the animal occurs immediately after they are caught and the animal is released to the exact point of capture. This step takes about 5 minutes. Animals are weighed and sex is determined. Measurement of various body dimensions are taken and reference is made to a number of constructed growth curves to determine approximate age. A passive transponder reader is used to determine if the animal has been previously caught and carries a Passive Integrated Transponder (PIT). If this is found to be the case the animal's number is recorded onto the field card of the animal. If not previously caught a transponder is injected into the dorsal lymph sac following specific methods (Christy, 1996). Notes on the condition of the animal (health, injuries, parasites) are recorded. It is our experience that recapture rates of some of the populations that are studied are up to 70% and we have some individual animals that have been re-caught numerous times over five years.

These techniques enable us to study the life expectancy, habitat use, migration and emigration of individuals, territoriality and habitat use of the two sexes and of juveniles compared to adults.

### **Diurnal (Day) Transects**

The stream transects are walked by day to assess a number of features. Tadpole numbers and habitat use are determined by specific methods (netting and the setting of small perspex funnel fish traps). Searches are made for egg masses in the various microhabitats used (egg masses are placed under stream banks or in rudimentary nest constructed in riffle banks).

Measurements of physical features of the stream are made (flow rate, turbidity, dissolved oxygen content, organic load).

Diurnal and nocturnal transect are repeated at the monitoring sites on consecutive nights to provide robust data for population estimates from mark-recapture estimation.

### **Sick and moribund animals**

If animals are found that reveal any of the symptoms associated with the declining frog syndrome in eastern Australia, samples of tissues are taken for pathology.

Set protocols are followed (see attached protocols for handling, sterilization of gear and transport) in the handling of any animals with symptoms of the syndrome. We aim to develop techniques that enable us to detect whether a fungus is present in the skin of individuals by using small epidermal skin scrapes. Smears would be made in the field and perhaps even staining and preliminary examination. Spray tish (cytological fixative and sealant) may be used to fix slides until they can be examined.

If animals are moribund (dead) they are collected and dispatched to the Australian Animal Health Laboratory for detailed pathological testing.

## **4. FIELD TRAINING AND VOLUNTEER ASSIGNMENTS**

Field training will be given to volunteers over the weekend. This will include:

- Introductory talk on the issue. Why are we doing it? How do we do it? Who uses the results?
- Guided introduction to the field situation: Familiarization during daylight hours. Safety issues. Team work principles (always be with someone).
- Talk and skills session on methods: catching and handling frogs (weighing, measuring, determining sex, etc). All of these skills will be repeated many times and there will be ample opportunity for volunteers to practice with assistance. The PI or assistant will be part of all field teams on transects.

- First transect: Introduction to the methods, actually collecting data.
- Recording and analysing the data: A feature of field work that is often neglected is the time spent filling in record cards, double checking and then conducting some preliminary analysis of the situation, even if it a simple comparison with the results obtained the last time the transect was conducted.
- General discussions. These will be conducted as and when the situation is suitable. It may be that an unusual finding or some particular observation provides the opportunity of question/answer and discussion sessions.

### Supervisory Structure:

The PI will be responsible for most decisions on the scientific aspects of the project. Logistics (food, transport, accommodation) will be the primary responsibility of the first assistant. Because our approach is to camp at sites where we have access to bush kitchens (undercover sheds with an open fire place and benches) duties in the preparation of food and cooking will be shared in rostered teams. Depending on team numbers any graduate assistants will share duties of scientific direction and logistics.

The volunteers would provide vital support in tasks that are labour intensive. Animals need to be located (a skill which can be learned) and collected. Once collected, animals are processed (measured, weighed, health checked, non-obtrusive collection of tissues, and marked) and released as rapidly as possible to the point of capture. Data is then recorded. In demographic studies of one endangered species, we routinely take six hours with four workers (one processing, one data recording, two collecting) to complete a 1000 metre transect. Transects are surveyed twice within a day, diurnally and nocturnally.

In the case of family teams, children will be placed in a team with at least one of their parents. The aim here is to help with monitoring the needs of children. Children will be integrated into all the aspects of the program, our experience is that they have good skills at spotting frogs and especially enjoy this aspect. On the other hand they may not like to sit and listen to long winded scientific explanations of why frogs are endangered. Our team includes members who have been involved with children and alternative activities such as a bush walk or a game can be arranged at these times depending on need.

# FIELD LOGISTICS

## 5. RESEARCH AREA

The climate of the areas where we will be working varies from subtropical to warm temperate. At the time of the expedition (Spring and Summer in the southern hemisphere) daily temperatures average about 26°C and the evening temperatures average about 20°C. Humidity can be high at times (up to 90%). It is best to be prepared for rain over the weekend, however the conditions are not difficult if it does rain.

The rainforests of the Eastern escarpment World Heritage Area occur on the Great Escarpment of the Great Dividing Range. This range runs roughly parallel to the east coast of Australia and is separated from the coast by a narrow coastal plain. The plain is a rich agricultural zone that is extensively cleared. The escarpment however is forested and provides the environment for a rich and varied flora and fauna. These forests contain flora that has its origins and evolution in the ancient supercontinent of Gondwana, and the flowering trees are ancestors to the flowering trees of the world. By international standards the mountains are not high, raising to a maximum of 1200 metres. However in the ancient landscapes of Australia, the Great Dividing Range is perhaps the most significant landscape feature of the eastern seaboard.

There are a small number of possible irritants and natural hazards. Mosquitoes and leeches occur in the forest and these can be dealt with by taking appropriate precautions (suitable clothing, sprays, creams etc). The only dangerous animals in this part of Australia are snakes. Once again suitable precautions such as appropriate clothing and care means they should not be a concern.



Examples of typical streams that are examined © M. Mahony

## 7. INSURANCE

We recommend that all volunteers have current travel, medical and evacuation insurance appropriate to the location of their project. Please check your current level of cover and ensure there is evacuation coverage. Insurance details need to be provided on the Earthwatch Liability Release.

## 8. DAILY SCHEDULE

### **Friday Evening**

1730 – 1800	Introduction and setting up camp
1830 - 1930	Evening Meal
2000 - 2200	Introduction to Frogs and their habitats
2200 – 2230	Supper, sitting around the fire, those whose are tied and wish to stay at camp and/or go to bed may do so, others will have the opportunity to look at some more frogs in other habitats (2230 – 2400).

### **Saturday**

0900 – 1000	Breakfast (this will be available when people wish get up)
1000 – 1100	Discussion time. Background introduction to the declining frog problem. Aims and Objectives of the study.
1100 – 1200	Morning tea.
1500 - 1700	Free time (time for a short bush walk or to sit next to the creek)
1700 –1800	Preparation for nocturnal transect. Discussion time.
1800 – 2030	Evening meal
2030 – 2430	Nocturnal transect (supper in the middle)

### **Sunday**

0900 – 1000	Breakfast (this will be available when people wish get up)
1000 – 1100	Discussion time. Data collation, reporting and analysis.
1100 – 1200	Morning tea.
1230 – 1330	Lunch
1300 – 1400	Packing up and depart.

## 9. ACCOMMODATION

This will be essentially a bush camping expedition. The camping sites have group cooking facilities. Sleeping will be in two- or three-person tents and you will be provided with your own tent so there is ample room for yourself and your bags. You are welcome to bring your own tent if you wish. A marquee (8-person tent) will be set up as the general laboratory/gear area. We will arrange to have suitable tents and sleeping mats for all volunteers. It will be necessary for volunteers to have their own sleeping bag and pillow. The camping site has toilets, **but not heated showers.**



A typical Campsite © M. Mahony



Campsite at the Gloucester River, showing the marquee used for cooking and storage © M. Mahony

## 10. FOOD

Volunteers will assist in meal all preparation. I look forward to learning a range of new and exciting recipes. We can accommodate special diets. Most meals will be cooked on a gas cooker that enables anything that can be fried, grilled or boiled. Generally the evening meal will be the main meal of the day.

Special Dietary Requirements can be accommodated **with advance notice**.

## 11. PHYSICAL CONDITIONS

### **Overview**

The fieldwork does not require any major physical demands beyond walking in bush along streams for distances.

From our experience, a great deal of the fieldwork proposed is most effectively conducted by small groups of between 4 and 6 individuals. Two experienced leaders with a support team of volunteers can effectively survey a stream transect in a prescribed systematic manner. It should therefore be possible to divide the volunteers into two groups each with a scientist and assistant and complete two transects per day.

The volunteers would provide vital support in tasks that are labour intensive. Animals need to be located (a skill which can be taught) and collected. Once collected animals need to be processed (measured, weighed, health checked, non-obtrusive collection of tissues, and marked) and released as rapidly as possible to the point of capture. Data needs to be recorded. In demographic studies of one endangered species we routinely take six hours with four workers (one processing, one data recording, two collecting) to complete a 1000 metre transect. Transects are surveyed twice within a day diurnally and nocturnally.

A group of volunteers, rotating duties, would enable a larger number of transects to be completed and surveys extended to include extra species and communities.

## Physical Demands

	<b>Workload/Intensity</b>	<b>Time (hours per day)/ #of days per team</b>
Sitting		2-4 hours
Bending		1-4 hours
Hiking	About 1-2 km per day	2-4 hours over sometimes slippery rocks/uneven ground
Walking	About 1-2 km per day	2-4 hours
Climbing	Minimum, some clambering over rocks and fallen timber along creeks	

## Medical Conditions of Special Concern

Allergy to insect bites or extreme sensitivity to heat/sun could cause a problem. Volunteers should have reasonably good eyesight and mobility/agility.

## Potential Hazards

Much of the work will involve walking along the banks of creeks and at times within the creek or stream. We will not be walking at a fast pace, however, the surfaces are uneven and often slippery. So you need to be aware that the level of fitness is greater than that required for walking on flat ground. Bear in mind that a considerable amount of the work is conducted in the bush at night, and once again while we are not moving fast we will be clambering over various obstacles such as fallen trees, boulders/rocks and vines. We may also be wading through fast flowing streams. While they don't pose any serious health risk, leeches, and biting insects are irritants.

The PI and one of the field assistants have First Aid training including CPR. The PI also has Water Safety training (Australian Lifesaving Association Bronze Medallion).

## 13. EMERGENCIES IN THE FIELD

In the event of a medical emergency an ambulance would be called to the study site. The study sites are close to road access.

Medical evacuation teams using helicopters are also present on the east coast of Australia should there be a major emergency. **Please ensure that your medical insurance has relevant ambulance cover.**

A vehicle will always be available should there be a minor accident. Each vehicle carries a first aid kit sufficient to deal with minor injuries.

You can contact Earthwatch during office hours on (03) 9682 6828, or in emergencies only on **03 9625 0822**.

## 14. COMMUNICATIONS IN THE FIELD

We will carry a mobile phone in the field (0409 452 538) and will often be near a public telephone.

## 15. WHAT TO BRING

### **General Considerations**

The climate may vary considerably over the time of the trip, so be prepared for a range of temperatures from the low teens° C/high 50s°F-low 60s°F to the mid 30s°C/mid 90s°F. Also be sure to have some wet weather gear (raincoat), and a hat for sun protection.

### Clothing/Footwear for Fieldwork

- Light weight, quick drying, long-sleeved shirts
- Long pants/trousers (jeans or khakis) for outdoors work
- Cotton T-shirts
- Enclosed footwear (either boots or runners/socks); we suggest at least two pairs because they will get wet nightly (Not rubber boots- you will get blisters!)
- A rainproof jacket is desirable and long rainproof trousers are also useful but not necessary
- A hat that provides protection from the sun is necessary for the day, something with a reasonable brim on the front and back is strongly recommended

### Clothing/Footwear for Leisure

- Clothes for relaxation: shorts and T-shirts would be most commonly worn.
- Gaiters, useful for protecting against leeches but not required

### Field Supplies

- Small daypack/rucksack is useful for carrying gear when away from the camp.
- Insect repellent
- Water bottle(s) – total volume of at least 1.5 litres
- Binoculars optional

### Bedding and Bathing

- Warm sleeping bag (night temperatures can drop below 16°C/60°F)
- Pillow
- Towels
- Sleeping pad (optional – they will be provided, but some volunteers prefer their own).

### Personal Supplies

- Personal toiletries ( we recommend biodegradable soaps/shampoos)
- Antibacterial wipes or lotion (good for “washing” hands while in the field)
- Personal first aid kit
- Sunscreen lotion with SPF 30 or higher

**NOTE: We will supply each volunteer with a head torch so there is no need to bring one.**

## 16. HELPFUL RESOURCES

- Dr. Mahony’s web site at University of Newcastle:  
[http://www.newcastle.edu.au/discipline/biology/staff/profile/mm\\_prof.html](http://www.newcastle.edu.au/discipline/biology/staff/profile/mm_prof.html)
- Australian Museum online:  
[http://wildlife.faunanet.gov.au/group.cfm?Group\\_ID=36](http://wildlife.faunanet.gov.au/group.cfm?Group_ID=36) (contains great pictures of frogs of New South Wales)