Galliform Surveys throughout the Cardamom Mountains, Cambodia, with particular reference to the Vulnerable Chestnut-headed Partridge (*Arborophila cambodiana*)

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SUMMARY

Cambodia is home to 14 species of Galliformes of which four are considered to be globally threatened. One of the most important areas for Galliformes within Cambodia is the Cardamom Mountain Range, which supports nine species. Between November 2005 and April 2006 we undertook a combination of ornithological, questionnaire and trapping surveys, and direct observation to record the presence of galliform species, in particular chestnut-headed partridge, and green peafowl in the Cardamom Mountain Range (including Mount Bokor) in Southwest Cambodia. We established the presence of eight Galliform species by ornithological survey and questionnaire surveys. All species occurred at low densities, with silver pheasant, scaly-breasted partridge and red junglefowl being the most numerous. By recording the chestnut-headed partridge we confirmed its presence throughout the entire Cardamom Mountain Range. We predominately recorded this species at altitudes higher than 500 metres asl. Information provided on the number of birds hunted shows that the current population estimate for the species is likely to be an under-estimate. We established that there is a small population of green peafowl occupying the lowland areas, away from the strongholds for this species, which are thought to be in the north and eastern plains of Cambodia. The main threats to all galliform species appeared to be illegal hunting, habitat degradation and disturbance, possibly making this group of birds one of the most threatened within the country. Future work needs to continue to fully assess the range and status of the chestnut-headed partridge and the green peafowl throughout the lowland forests of Cambodia. Conservation action to protect Galliformes throughout Cambodia should include increased legislation and enforcement to control hunting and logging, the education of local people about the value of wildlife conservation, the establishment of community-based conservation groups and the establishment of a market for the agricultural products of local people to generate food and income in place of hunting.

1. BACKGROUND

The Indochina region, which comprises Cambodia, Laos and Vietnam, is important for Galliformes, with 25 species occurring (Brickle *et al in prep*). Within Cambodia, 14 species of Galliformes have been recorded (Tan Setha & Pech Bunnat 2001, Davidson & Walston 2003), of which four (orange-necked partridge *Arborophila davidi*, chestnut-headed partridge *Arborophila cambodiana*, Germain's peacock pheasant *Polyplectron germani* and green peafowl *Pavo muticus*) are globally threatened (IUCN 2003) and have Conservation Action Plans (Fuller et al 2000). In addition the Siamese fireback *Lophura diardi,* which also occurs, is listed as near threatened (IUCN 2003).

Within Cambodia, one of the most important areas for Galliformes is the Cardamom Mountain Range in Southwest Cambodia, where nine species of Galliformes have been recorded (Daltry & Momberg 2000, Tan Setha & Pech Bunnat 2001). These include the near-endemic chestnut-headed partridge and the green peafowl. The Cardamom Mountain Range, which extends to over 1,435,513 ha, comprises two Wildlife Sanctuaries, two Protected Forests, one Multiple Use area and two National Parks.

Following years of conflict and political instability the infrastructure and economy of Cambodia is severely compromised. This has resulted in increasing pressure, by a variety of unsustainable patterns of consumption, on the natural habitats of the country. Forest ecosystems are particularly threatened, primarily by illegal logging operations. Vulnerable populations of many animal and plant species are threatened by illegal hunting and collecting for local consumption and the wildlife trade. Habitat loss and degradation is placed under further pressure by unplanned conversion of land for agriculture and settlements. Galliformes, owing to their desirability as food or for the wildlife trade, have suffered particularly from these threats and disturbance from local people entering the forests to collect non-timber forest products (NTFP). A recent review on the status and distribution of pheasants and partridges (Tan Setha & Pech Bunnat 2001) identified that hunting is the major problem for ground-living birds in Cambodia and they stated that research to properly understand the needs of the globally threatened pheasants and partridges is urgently needed. Additionally, because of the internal security problems in Cambodia, very little is known about the birds (and other wildlife) in the country.

The chestnut-headed partridge which is a near-endemic to Cambodia and is currently listed as Endangered on the IUCN Red List (IUCN 2003), is thought to inhabit the dense forests and plateaus of the Cardamom Mountain Range (Central Cardamom, Phnom Somkos and Aural wildlife sanctuaries), around Bokor National Park and Sampling Forest Concession in Koh Kong (Daltry & Momberg 2000, Tan Setha & Pech Bunnat 2001, Net Neath 2001, Swan & Long 2002, Seng Kim Hout et al 2003). The species is thought to have a population of between 100 – 1000 individuals (BirdLife International 2000, 2001), however, virtually nothing is known about the species with only a few observations, mainly in the 1930s, and during some recent surveys. Further information on the ecology, habitat requirements, status and distribution of the species is required so that a targeted approach to its conservation can be instigated.

Historically, green peafowl (*Pavo muticus*) was once a relatively common and widespread species throughout much of south-east Asia. Over the last few decades uncontrolled hunting and habitat clearance has expatriated the species throughout parts of its former range and in areas where is does still occur threats to its conservation status still exist. Accordingly IUCN have listed the species as Globally Threatened and it has the status of Vulnerable. Within its current range, which mainly falls within Indochina, the species is found predominately within dry deciduous forest. The areas of west-central Vietnam and northern and eastern Cambodia are thought to hold the largest remaining population in the world, although the status of the species in Myanmar (Burma) is unknown. Additional records outside the main area come from the Cardamom Mountains in Cambodia, southern Laos and central Vietnam.

The exact status and distribution of these and many other galliform species is unknown. There is a genuine desire within the country, among both governmental and non-governmental sectors, to undertake wildlife conservation and protect habitats, but years of conflict have set this back and limited our knowledge of the status of wildlife. In spring 2004, a preliminary study funded by a Rufford Small Grant was undertaken in part of the Cardamom Mountain Range to start developing the methods to increase our knowledge, and at the same time provide more information on the status of the chestnut-headed partridge and other galliform species, and the threats they face. Although this work was preparatory in nature, a range of important information emerged. In addition, it provided clear direction for the development of a research programme designed to underpin the conservation of the country's Galliformes.

To supplement this preliminary information, this project was established to contribute towards a national programme that will help achieve the targets of the threatened species' IUCN/WPA Conservation Action Plans and will collect information on the status, distribution and threats faced by all galliform species. It is hoped that this information will be used to develop species conservation actions plans, lobby Government and other stakeholders to improve wildlife protection legislation and enforcement, and develop an educational programme to improve public awareness about galliform conservation. This work is likely to take a number of years to complete and will be undertaken in a modular format. The national programme, known as the **Cambodian Galliformes Conservation Programme (CGCP)**, has the objective of providing sound scientific information on threats and their mitigation, and enhancing the field skills of a cadre of motivated Cambodian biologists. It is hoped that the work will develop an education programme and produce educational material about galliform conservation and legislation for circulation within rural communities and undertake visits to schools. Ultimately it will develop a recovery plan with local people, partner organisations and the Cambodian government for all galliform species that will have the aim of removing those that are threatened from the IUCN Red List.

2. METHODS & STUDY SITE

This study was undertaken between November 2005 and April 2006 in Koh Kong, Pursat and Kampot Provinces within the Cardamom Mountain Range, southwest Cambodia. The area consists of relatively high (up to 1717 m) steep-sided mountains covered with dense forests interspersed with numerous valleys containing villages and human settlements. Around the settlements, areas of rice paddy fields, grazed grass fields and open deciduous forest occur. The study area is interspersed with numerous rivers and streams, all of which are vary in size and presence seasonally. Travel within the study area is severely hampered by a lack of infrastructure, paved roads are almost non-existent and ox carts or motorcycles along dirt tracks are the usual means of transport.

Densely forested slopes of the Cardamom Mountains

Cultivated fields in the lowland valleys.

2.1 Ornithological surveys

A combinations of transect surveys and point-count surveys (Bibby et al 2000) were used to record Galliformes. Point-count surveys, adapted by Brickle (2002), were used primarily to survey green peafowl, although other galliform species that were present were also recorded. Based on the principal that the wailing call of a green peafowl can be heard over a distance of 1km, point-count locations were situated at least 2 km apart along forest trails. The point count locations were selected at random, but ultimately their location was dictated by available access, although attempts were made to loosely stratify their location based on habitats in the surrounding area. Each point count location was surveyed once, with the counting period lasting for two hours and was undertaken immediately after sunrise (05:30 to 07:30) or before sunset (16:30 to 18:30). During the two hour recording period the direction and estimated distance of the calling bird from the observer was recorded. The location of each point count location was recorded by a Geographical Positioning System (GPS). Point counts were used only in the lowland areas where green peafowl were most likely to be encountered.

Transect surveys varied in length from 2 to 10 km and were at a range of different altitudes (100 to ~1000 metres asl). Due to the impenetrable nature of the forest and the disturbance caused whilst attempting to walk through it, transects were established only forest tracks, usually made by Ox-carts, loggers and NTFP collectors. The transect surveys were undertaken from immediately before sunrise and sunset for approximately two hours (05:30 to 07:30 and 16:30 to 18:30), when Galliformes were most active. When seen or heard calling, the species, numbers present, location (recorded by GPS), direction and distance from observer were recorded.

2.2 Questionnaire survey of local people and hunters

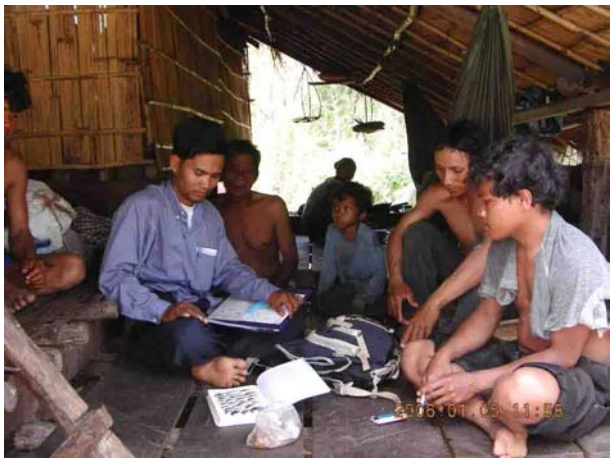
A questionnaire survey of local communities was also undertaken to collect information on their perceived status of Galliformes, their distribution and to ascertain their threats. The village elders and senior hunters specifically and more generally other village people and hunters were shown pictures of Galliformes in the Guide to Birds of Southeast Asia, and the Guide to Birds of Cambodia and asked the following questions:

Which species of Galliformes occur?
How many individuals of each species are present?
How many individuals of each species are hunted?
How many hunters are there?
How many hunters come from outside the area?
What hunting methods are used?
How many traps do they set?
Where did they sell the caught birds?
When was hunting undertaken?
How often did they hunt?
Would they hunt if alternative food was provided?
What alternative food would they like?
Do you think it is important to protect the wildlife around their village?

2.3 Trapping surveys

When the opportunity arose and if the habitat and topography was suitable a trapping survey using lines of leg-hold snares was undertaken. The traps were set near water and checked regularly.

Undertaking line transect surveys.



Undertaking questionnaire surveys.

2.4 Direct Observation

When the opportunity arose direct observation surveys were undertaken by using motorbikes to travel at slow speed along available roads. Surveys were undertaken along both sides of roads and could cover at least 10 km. Additionally, any direct observations of Galliformes whilst travelling within the study site were recorded.

3. RESULTS

The results collected by this study are still very preliminary in nature and do not justify a detailed analysis at this stage. However, a summary of all the data collected thus far is presented, together with a slightly more detailed assessment of the findings within the conservation action plans for the threatened species. It is hoped that the information presented here will be combined with data collected by other studies in Cambodia, as part of the CGCP, to allow the preparation of two scientific publications.

3.1 Ornithological surveys

The results from the ornithological and questionnaire surveys are summarised in Table 1. Seven species of Galliformes were heard calling at 246 locations. Of particular importance were the records of two vulnerable species, the green peafowl, which was heard calling from 29 locations, and the Chestnut-headed partridge which was heard callings from 34 locations. Of additional interest were records of Siamese fireback (heard at two locations), silver pheasant (heard at 17 locations), Scaly-breasted partridge (heard at 41 locations), Red junglefowl (heard at 81 locations) and Chinese francolin (heard at 58 locations).

3.2 Questionnaire surveys

The information collected from the questionnaires revealed a range of information about what people from the local communities knew about Galliformes and how they regarded them (see Table 2). Although notoriously difficult to interoperate, as it's never known if the respondents are giving true answers or the answers they think they should provide, there does appear to be a degree of correlation between the questionnaire data and that collected by the bird surveys. The information that the locals gave about the preferred habitats and locations of the different galliform species was very similar to what the surveys found. Additionally, how they perceived the abundance of each species is generally in agreement with the survey results. This gave us confidence that the information supplied on levels of hunting was probably correct.

On average the respondents thought that about 43 (range 1-100) people hunted for Galliformes within their village, on 80 (range 10-360) days per year, using 80 (range 2-300)

traps per hunter. All respondents hunted for food to be consumed locally, including 20% who also hunted to sale the excess. All respondents used traps, although one said that he also used dogs and a gun to hunt for Galliformes. All respondents, except one, said that if given food they would no longer hunt.

All of the respondents thought that it was important to protect the wildlife around their village. A number of reasons for this were given, including:

"lost so much wildlife already", "don't want wildlife to disappear", "they never destroy our crops", "its nice to look a wildlife", "important to save for future generations", "if they were more common then they would provide more food", "wildlife is the property of the whole country"

3.3 Trapping surveys

A chestnut-headed partridge and a silver pheasant were caught using traditional leg-hold snares.

Juvenile male silver pheasant caught during trapping survey.

Adult male chestnut-headed partridge caught during trapping survey.

3.4 Direct observation

Three individuals of chestnut-headed partridge, seven individuals of green peafowl, one Siamese fireback, one silver pheasant, one Scaly-breasted partridge, eight red junglefowl and many individual Japanese quail were observed directly at the point-counts, along the transects and the old roads in the study areas.

4. DISCUSSION

Previous surveys and records have confirmed the presence of chestnut-headed partridges in the central and western areas of the Cardamom Mountain Range (Daltry & Momberg 2000), in Kiriron NP to the south of the range (Poole 1999, Tan Setha & Pech Bunnat 2001) and at Bokor NP in the extreme east (Net Neath 2001) and this study recorded the species in the extreme north east of the range, which confirms that it is present throughout the entire Cardamom Mountain Range. Additionally, we recorded birds present in a region below the previously reported altitudinal range of the species, at approximately 200 m amsl. Information supplied to us by local hunters implied that they had regularly caught this species at these lower altitudes, but only during the dry season. A bird was also heard calling in Kirirom NP at an altitude of 140 m amsl during February 2000 (Tan Setha & Pech Bunnet 2001). It is therefore possible that limited water availability high up the mountain in the dry season between February and April forces chestnut-headed partridges to move to lower elevations to find water. This may provide evidence that the altitudinal range of the species at certain times of year is actually larger than previously reported. The information provided on the number of birds hunted, if correct, clearly shows that the current population estimate

for the species of 100-10000 individuals is likely to be an under-estimate. Given that this species occurs within a larger range, both in terms of area and possibly altitude, and is likely to have a larger population size than previously estimated, there is clearly a pressing need to continue to fully assess its current population status and distribution by undertaking surveys that allow an accurate population estimate to be calculated.

Although we recorded the sightings of silver pheasant, evidence of a predated silver pheasant and anecdotal evidence from local villagers on this species and Siamese fireback it would appear that both species are relatively uncommon in the areas that we surveyed. Hunting data would suggest that Siamese fireback is less numerous than silver pheasant. If the information regarding the Siamese fireback is correct, this constitutes some of the first evidence of this species occurring in the forests of southwest Cambodia (Tan Setha & Pech Bunnet 2001). However, more scientifically rigorous evidence, either camera traps, observations during surveys or birds caught and photographed by licensed bird ringers, is required to confirm this.

Our survey information and that provided by the local villagers confirms that there is a small population of green peafowl occupying the lowland areas of the Cardamom Mountains. The strongholds for this species are thought to be those in the north and eastern plains of Cambodia, although there have been a small number of sightings of this species in the northeast of the country (Tan Setha & Pech Bunnet 2001).

The information we collected on the numbers of Galliformes hunted in the study areas clearly show that illegal trapping is a major threat to the status and conservation of many species. Trapping is undertaken by NTFP collectors, who catch wildlife to supplement their diet whilst they live in the forest. Additionally, some people enter the forest specifically to catch wildlife to provide food, to sell at the local market, or occasionally (especially in the case of green peafowl) for the pet trade. Wildlife trapping usually involves a hunter setting as many as 2000 traps along old trails and near water to opportunistically trap any ground dwelling animals or birds, although usually the number of traps used is much lower. Not all species are equally affected by hunting, with those that are easy to catch (chestnut-headed partridge, Scaly-breasted partridge and red junglefowl), or are desirable for meat, eggs and feathers (green peafowl) being especially targeted by hunters.

In addition to hunting, habitat degradation caused by illegal logging for timber and forest clearance to provide areas for cultivation are major threats to Galliformes. Possibly of more concern is that not only does clearing destroy habitats, but it also opens up access to the forest, causes disturbance and cultivators also hunt Galliformes for food and start cooking fires and burn the felled trees, which may spread and cause further forest damage.

Chestnut-headed Partridge caught and prepared for local consumption.

Green peafowl chicks caught and reared for resale to wildlife traders.

Illegal logging activities to produce wood for local construction.

Forest clearance to prepare land for agriculture.

Camps made by illegal loggers and NTFP collectors were frequency encountered.

Trapping with leg-hold snares is widespread throughout the Cardamom Mountains.

5. SPECIES' CAMBODIAN CONSERVATION ACTION PLANS

A. Green peafowl *Pavo muticus*

Status

Green peafowl was once common and widespread throughout much of South East Asia, but today it is expatriated from Malaysia and Peninsular Thailand, probably expatriated from India and Bangladesh and only occurs in small isolated pockets in China, Laos and Northern Thailand. The species' remaining strongholds are Indonesia, Southern Vietnam, Cambodia and Myanmar, although the exact status in the last two countries is unknown. The species is currently listed as Vulnerable and is estimated as having a global population of 5,000-10,000 individuals. Cambodia is thought to support a large proportion of the global population of this species

Ecology

The species occurs in a wide range of habitats, but in Cambodia favours the lowland deciduous forests and riparian evergreen forests in the North and East of the country and the lowland forests in the valleys of the Cardamom Mountains in the South. It uses the wooded habitats for roosting and during the heat of the day and feeds in the early morning and late afternoon on adjacent grassland or cultivated fields, which brings it into close contact with humans. It seems as though the presence of water is important in dictating the presence of this species. In Cambodia the breeding season probably extends from December to April. One male can have a harem of up to five females, which nest on the ground producing between three to six eggs. It is primarily granivous, although the chicks are likely to feed on insects for at least the first two weeks of life.

Threats

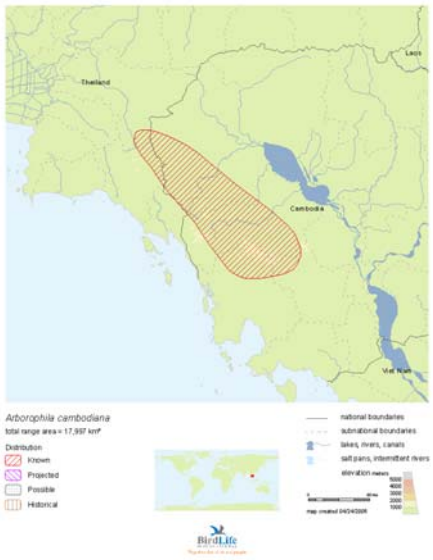
The primary threat to the status of green peafowl in Cambodia is the illegal hunting and capture for local consumption or sale. Adults are hunted to provide meat, for their train feathers, which are sold for decoration and for the pet trade. Eggs are collected to be either eaten, sold or hatched under chickens so that the young can be sold. Occasionally, young peafowl are also collected directly from the wild. Birds destined for the pet trade are usually sold to dealers from Laos or Thailand. Green peafowl are also threatened by habitat destruction and fragmentation by logging activities and clearance for agricultural purposes. These activities also result in increased disturbance which has been shown to negatively influence green peafowl.

Conservation action in Cambodia

i) Carry out surveys in the previously unsurveyed areas of North West Cambodia to gain more information on the species' distribution and abundance.
ii) Conduct further research into the ecological requirements of the species.
iii) Initiate a conservation awareness campaign throughout the country.
iv) Promote strict enforcement to prevent illegal logging and hunting in the protected areas containing green peafowl.
(v) Promote community conservation projects to increase local stakeholder involvement in the protection of the species.
(vi) Establish a total ban, with appropriate enforcement, on the trade of live birds and their derivatives.

B. Chestnut-headed partridge *Arborophila cambodiana*

Status



Chestnut-headed partridge is endemic to the mountains of south-east Thailand and south west Cambodia. The species was first described in the 1930s from a specimen caught on Mount Bokor and recorded again in the mid-1990s at Kirirom National Park. Based on these sparse observations the species was thought to number less than 1000 individuals. However, more recent surveys have established that the species is present in suitable habitats throughout the entire Cardamom Mountain range. The species is currently listed as Vulnerable and is estimated as having a global population of 2,500-10,000 individuals.

Ecology

The species occurs predominantly in dense evergreen forests at high elevations (400 – 1,400 m). During the dry season when water availability is limited it is thought to move down to lower elevations as low as 200 m, where it has been observed feeding on cultivated fields. Little is known about the ecology of the species, but it has been reported as forming flocks of between 5 and 30 individuals.

Threats

The primary threat to the status of chestnut-headed partridge in Cambodia is illegal logging and clearance for agricultural purposes resulting in habitat destruction and fragmentation as well as increased disturbance. Illegal hunting to provide food for local consumption and occasionally sale is an added serious problem.

Conservation action in Cambodia

i) Carry out surveys in the previously unsurveyed areas of the Cardamom Mountains and Kirirom National Park to gain more information on the species' distribution and abundance.
ii) Undertake further surveys throughout the Cardamom Mountains to allow accurate estimates of abundance and density to be calculated.
iii) Conduct further research into the ecological requirements of the species.
iv) Initiate a conservation awareness campaign throughout the country.
v) Promote strict enforcement to prevent illegal logging and hunting in the protected areas containing chestnut-headed partridge.
vi) Promote community conservation projects to increase local stakeholder involvement in the protection of the species.

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Table 1 Summary information from the ornithological surveys undertaken in Koh Kong, Kampot and Pursat provinces within the Cardamom Mountain Range, southwest Cambodia during November 2005 to April 2006

Species	Number of times recorded	Habitat	Elevation
Chinese francolin *Francolinus pintadeanus*	58 locations, only recorded at certain sites	Secondary woodland, near cultivations	Lowest elevations 100-200 m
Chestnut-headed partridge *Arborophila cambodiana*	34 locations, only recorded at certain sites	Dense primary forest, Swamp forest at higher elevation and Bamboo forest at lower elevations	Highest elevations 200 - 1813 m
Scaly-breasted partridge *Arborophila chloropus*	41 locations	Dense primary forest, Swamp forest at lower elevation and Bamboo forest	Mid-elevations, usually below 400 m
Red junglefowl *Gallus gallus*	81 locations, recorded daily	Primary, secondary and bamboo forest, most common near cultivations	Low to mid-elevations 100 - 400 m
Silver pheasant *Lophura nycthemera*	17 locations	Dense primary forest at lower elevation	Low to mid elevations 100 - 400 m
Siamese fireback *Lophura diardi*	2 locations	Dense primary forest at higher elevation	
Green peafowl *Pavo muticus*	29 locations, only recorded at certain sites	Secondary forest, deciduous forest near cultivations and old ricefields	Lowest elevations 100 - 320 m

Table 2 Estimated number (mean ± s.e.) of individuals thought to be present and hunted in around villages within the areas surveyed in the Cardamom Mountains.

	Estimated abundance		Estimated number hunted	
Species	**Mean**	**s.e.**	**Mean**	**s.e.**
Chinese francolin	3598	1889	11	7
Scaly-breasted partridge	3773	1851	150	107
Chestnut-headed partridge	4377	1867	110	31
Red junglefowl	11841	5792	246	113
Silver pheasant	1418	718	29	14
Siamese fireback	1273	902	6	4
Germain's peacock-pheasant	821	724	21	12
Green peafowl	135	57	1	1
Rain quail	3276	2710	33	33
Japanese quail	418	240	0	0

Budget and Expenditure

Item	Budgeted	Expenditure	Difference
Staff costs			
Programme Leader	$2,400.00	$2,580.00	-$180.00
Programme Assistant	$1,800.00	$1,750.00	$50.00
Local Guide	$360.00	$360.00	$0.00
Subtotal	**$4,560.00**	**$4,690.00**	**-$130.00**
Field Surveys			
Travel	$1,000.00	$1,235.89	-$235.89
Accommodation	$550.00	$220.00	$330.00
Food & water (3 persons)	$950.00	$821.31	$128.69
Insurance	$420.00	$410.00	$10.00
Subtotal	**$2,920.00**	**$2,697.20**	**$222.80**
Advisor visits			
Air fare	$1,273.00	$1,273.00	$0.00
Accommodation	$150.00	$145.00	$5.00
Food	$50.00	$50.00	$0.00
Subtotal	**$1,473.00**	**$1,468.00**	**$5.00**
Field Equipment			
Binocular	$760.00	$822.00	-$62.00
Cooker	$30.00	$25.00	$5.00
Cooking equipment	$30.00	$11.20	$18.80
Subtotal	**$820.00**	**$858.20**	**-$38.20**
Contingency & Administration			
Communications	$244.32	$140.00	$104.32
Medicines	$244.32	$222.88	$21.44
Administration	$244.33	$340.00	-$95.67
Miscellaneous	$244.33	$455.00	-$210.67
Subtotal	**$977.30**	**$1,157.88**	**-$180.58**
Personal contribution	**$1,273.00**		**$121.00**
Total	**$9,477.30**	**$9,598.28**	