



**CONSERVATION OF THE CRITICALLY ENDANGERED TOGO SLIPPERY FROG (*Conraua derooi*), IN  
EASTERN GHANA**

Submitted by

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**CONSERVATION OF THE CRITICALLY ENDANGERED TOGO SLIPPERY FROG (*Conraua derooi*), IN  
EASTERN GHANA**

**CLP project ID: 0143510**

**This project aimed at protecting the last known viable population of a Critically  
Endangered frog (the Togo slippery; *Conraua derooi*) in Eastern Ghana**

**Project duration: August 2010 – April 2011**

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## SUMMARY

This project aimed at preserving the last known viable population of a Critically Endangered frog, (the Togo slippery; *Conraua derooi*) in the Atewa Mountains, Eastern Ghana. To achieve this aim, we first assessed the presence and distribution patterns of amphibians in the study site, with emphasis on threatened amphibian species through series of repeat field surveys. Further, we determined the population size of the Critically Endangered Togo slippery frog through a mark-recapture study and concurrently instigated behavior change among local people. Also, we trained several undergraduate students aimed at enhancing their capacity to independently undertake amphibian conservation and research in the future. Our field surveys detected a total of 43 amphibian species in the Atewa Mountains including one potentially new species to science. Also, we recorded a total of 153 individuals of the Togo slippery frog and estimate about 240 to occur in the study site. The number of individuals of the Togo slippery frog recorded far exceeds our initial expectation and provides hope for the long-term persistence of this Critically Endangered frog. At least three hundred and sixty people comprising fringe community members and students were directly educated on amphibian conservation through this project and an additional 10 individuals received hands-on training to identify and conduct amphibian research. An important impact of this project is a renewed interest in the conservation of the Togo slippery frog by local people, the public, national and international NGOs; this will hopefully culminate in the creation of a sixth national park and the first Important Amphibian Area in Ghana.

## PROJECT BACKGROUND

The Togo slippery frog (*Conraua derooi*) was originally described by Hulselmans in 1971. Shortly after its description the species was never found again for a period of almost 36 years and consequently thought to have been extirpated. In 2002 search efforts for this species was even intensified following global outcry of mass amphibian declines but without any success (Rödel & Agyei 2003, Leaché *et al.* 2006) until 2007 when three small and very isolated populations were discovered in eastern Ghana and along the Ghana Togo border (Kouame *et al.* 2007, Hillers *et al.* 2009). Sadly most of these sites at which the species now occur are already surrounded by human settlements, where they face severe anthropogenic impact including conversion of its riparian habitats to farms and human consumption.

Among the known distributional range of this species, the Atewa Mountains in Ghana is likely the only site where a viable population of this frog exists (McCullough *et al.*, 2007). Even for this site, actual population size estimates is lacking, nevertheless the frog regrettably, faces an imminent extinction threat from increased human consumption (hunting for food) and habitat destruction (e.g. illegal logging and small scale mining). Hence, the long term persistence of this species is thought to be unlikely except urgent conservation actions are taken to mitigate these threats.

The Atewa Mountains (the main study site for this conservation effort) is located in south-eastern Ghana (6°12'24.7"N, 0°34'37.2"W) within the upper guinea biodiversity hotspot. It is one of only two reserves in Ghana with upland evergreen forests and characterized by a unique ecosystems with exceptional species richness and high levels of endemism. Atewa also represents about 33.5% of the remaining closed forest in Ghana's Eastern Region. It is home to many endemic and rare species, including black star plant species and several endemic butterfly species including *Neaveia lamborni* and *Sapium aubrevillei* (McCullough *et al.*, 2007). Atewa is also one of Ghana's Globally Significant Biodiversity Areas (GSBAs) based on its high botanical diversity and an Important Bird Area (IBA). Designation as a GSBA is equivalent to IUCN's Category IV designation: a protected area designated mainly for conservation through management intervention.

The overall goal of this project has been to contribute to the long term persistence of the Critically Endangered Togo slippery frog in the Atewa mountains by providing information for

conservation planning, highlighting the conservation potential of the Atewa mountains, influencing behavior change through conservation education in local communities, and building local capacity to both study and conserve the target species and many threatened amphibian species occurring in the forest of southern Ghana.

To achieve this goal, we worked with a number of key local and international collaborators. Locally we worked with the Faculty of Renewable Natural Resources and AROCHA-Ghana students chapter all of the Kwame Nkrumah University of Science and Technology in Kumasi Ghana. We gave talks at the Faculty main auditorium and welcomed student volunteers to participate in our field survey efforts. We also engaged the head office of the Ghana wildlife division in our project execution and received a lot of guidance in raising conservation awareness and getting government support towards the creation of a National Park in the Atewa Mountains. Internationally, we worked with the Biology Department and the Burke museums both of the University of Washington, Seattle and the Museums fur Naturkunde, in Berlin, Germany. Key personnel in the University of Washington (Adam Leache) and the Museums fur Naturkunde (Mark-Oliver Rödel) participated in some of our field surveys and provided expert taxonomic advice respectively.

## **PROJECT MEMBERS**

**Caleb Ofori Boateng:** Caleb is currently completing a PhD program on wildlife management and ecology at the Kwame Nkrumah University of Science and Technology (KNUST). He is also a research fellow at Ghana's Forestry Research Institute of Ghana and the leader and founder of Herp conservation societies in three West African countries (Herp-Liberia, Herp-Ghana and Herp-Ivory Coast). Caleb was the team leader and species survey leader for this CLP funded project.

**Asha Damoah:** Asha recently completed a Master of Science program in environmental science at the University of Bristol, UK. She is currently seeking to take up a teaching position in Ghana's newly established public university of Energy and Natural Resources. Asha effectively led and directed our conservation education efforts throughout this project.

**Gilbert Adum:** Gilbert is currently completing a Master of Science program on wildlife management at the KNUST. He is also the country director and ecologist at Savethefrogs Ghana; an

amphibian conservation organization in Ghana with headquarters in California. Gilbert served as the chytrid survey leader throughout this project and currently co-authoring a 15 person collaborative manuscript on the absence of the chytrid fungus in West Africa.

**Evans Nkrumah:** Evans is pursuing a PhD program on bat ecology and conservation in West Africa at KNUST. He was in charge of the day to day administration of this project including arranging logistics.

**Sharon Nsiah;** Sharron has a Bachelor of Sciences degree with specialized interest in nature photography. Sharon was the team photographer but due to some other commitment could not stay with the team for the entire project duration. Her place was taken over by David Kwarteng Amaning who is currently completing a Master of Science degree in natural resources at the University of Greenwich, UK.

**Darlington Saykay-Tuabeng;** Darlington recently completed a masters program in conservation biology from the University of Cape Town, South Africa. He is currently the country director of Herp-Liberia and a member of staff of the Liberian Forest Development Authority (FDA). He was a member of this team.

## **AIM AND OBJECTIVES**

This project aimed at preserving the last known viable population of the Critically Endangered Togo Slippery frog (*Conraua derooi*) in Eastern Ghana, West Africa. Five main objectives were pursued:

1. Assessment of the presence and distribution of amphibians in the Atewa Mountains, with emphasis on the critically endangered Togo slippery frog.
2. Determination of the population size of the critically endangered Togo slippery frog.
3. Instigation of positive behavior change in local communities through conservation education
4. Enhancement of in-country capacity in conducting amphibian conservation and research
5. Confirmation of the presence or absence of the chytrid fungus in the Atewa Mountains

## **METHODOLOGY**

We conducted species survey in the Atewa Mountains from August 2010 to April 2011. Our methodology followed the time-constrained searches as described by Heyer *et al.*, (1994). A combination

of visual and acoustic encounter survey techniques were utilized to detect and record species. This combination gives the most reliable results both in species presence, as well as in their relative abundance (Rödel & Ernst, 2004). Estimated number of species occurring in the study site was done using the Chao 2 richness estimator in the program past (version 2.0).

To document and estimate the population size of the Togo slippery frog, we surveyed seven different streams occurring within the Atewa mountains at night. Population size was assessed using mark-recapture techniques in several repeated visits (6x) to each stream. Individuals were captured, measured and marked by clipping the index toe. This was done only for individuals exceeding 40mm Snout Vent Length (SVL). Clipping was done using sterilized surgical kit. All individuals captured were released at the vicinity of capture at the end of each sampling occasion. Toes clipped were preserved in 90% ethanol for future genetic analysis. Mark-recapture data was analyzed using the triple catch method; a modification of the Jolly-Seber method with 95% confidence limits obtained using equations given by Manly (1984) and the CAPTURE program.

Localized participatory efforts were used to educate local people and students on the target species, habitat preservation, climate change and amphibian declines. This method is the most effective in conducting wildlife education in rural communities. Specifically we went to several homes and engaged individual households in conservation discussions. Further, we organized public meetings at night (when local people have returned from their farms) and showed video documentaries on the special biodiversity the team have discovered in their forests. Through these documentaries and several question and answer sessions, we proved to the local people the importance of conserving amphibian biodiversity and how they can be involved in conservation efforts at the local scale.

We conducted a capacity building workshop at the Kwame Nkrumah University of Science and Technology in September 2010. Students were allowed to participate in field surveys and additional 10 of them received specialized training in species identification. Local community members also accompanied us in most of our field surveys and were trained in basic identification protocols.

A non-lethal methodology for collecting superficial swab samples from the skin of amphibians was used to investigate the possible occurrence of the chytrid fungus in our study site. We successfully

swabbed several individuals (between the toes, dorsum etc) comprising 40 species during six months of field survey.

## **OUTPUTS AND RESULTS**

We recorded 43 amphibian species, comprising 11 species that are threatened according to the IUCN red list of threatened species (appendix 1). The Chao 2 estimator predicts between 47 and 50 species to occur in the study site making the Atewa mountains one of the most species rich sites in West Africa. This study represent the first long term study of the amphibians of the Atewa mountains; previous studies have only lasted up-to three weeks (McCullough *et al.*, 2007). An important output of our field survey efforts is the production of the first comprehensive list of amphibian species occurring in the Atewa Mountains (see appendix 1), a new species to science from the genus *Phrynobatrachus* (see project photos) and the first distribution map of the Togo slippery frog (see appendix 2).

We marked and released 153 individuals and successfully recaptured 83 individuals. Preliminary analyses using the capture software estimate a closed population of 240 ( $\pm 12$ ) individuals and an opened population of up-to 490 ( $\pm 28$ ) individuals. An important output is a manuscript in preparation that provides the first population data of this Critically Endangered frog species.

At least 210 university students attended our conservation education workshop whilst a large number of local people (at least 360) benefited from our conservation education campaigns in local communities. Further, 10 university students received specialized training in various fields including field identification of amphibians, chytrid swabbing and field survey protocols.

One hundred and fifty (150) individuals comprising 40 species were successfully screened for possible infection with the chytrid fungus. An important output is a collaborative manuscript with the University of Washington recently submitted to *Herpetological Review* for publication.

## **ACHIEVEMENTS AND IMPACTS**

This project aimed at conserving the most viable population of a Critically Endangered frog (Togo slippery frog, *C. derooi*) in the Atewa Mountains in Eastern Ghana. We confirmed the presence of an important population of this frog in the Atewa mountains and provide for the first time both

distribution and population data on this species. We further show that the amphibian assemblage occurring in the project site is unique in that it harbours an unusual composition of threatened and high numbers of West African endemic frogs.

## PROJECT PICTURES



Team leader demonstrating field techniques in frog handling



A section of team members examining morphological patterns of the Togo slippery frog



A new *Phrynobatrachus* species discovered in the Atewa Mountains



Typical habitat (overgrown perennial primary forest pond) of the newly discovered species



*Kassina arboricola*, one of the many threatened frog species recorded from the Atewa mountains



Project campsite at the Atewa mountains



**Video show at Sagyimase village**



**Video show in a local community**



**Participants at capacity building workshop at the Kwame Nkrumah University of Science & Technology**



**Team members executing a house to house conservation education**



**Some beneficiaries of the capacity building component of the project**



**Morph metric measurements on *C. derooi***

Nonetheless, several non-forest species were recorded in all the sites investigated to indicate that the loss of habitat and degradation of this forest is severe. These results in general highlight the biodiversity value of the Atewa Mountains and the urgent need to protect it. Previous amphibian studies in West Africa have also documented high diversity and endemism in localities like south-western Cote d'Ivoire and Nimba Mountains in Cameroun (Bangoura & Rödel 2006). Useful inference can be made from these observed distribution patterns of high diversity and endemism in these forest sites; they coincide with areas postulated to be rainforest refugia during the Pleistocene period of the earth history (Falk *et al.* 2003). These rainforest refugia are presumed to have survived and preserved biodiversity during unfavourable climatic conditions in the past and expected to play similar roles in the future. Hence, conservation of these forest refugia sites seems critical in the light of current global climate change and cannot be overly emphasized.

In collaboration with stakeholders at Global Wildlife, AROCHA-Ghana, Herp-Ghana, the information generated from this study and other related information on the biodiversity value of the Atewa Mountains will be uploaded onto a single online portal to aid efforts at gazetting the site as Ghana's seventh National Park. Further, population data on this critically endangered frog has been submitted to the Amphibian Specialist Group and will play a critical role in enlisting the project site as an Alliance for Zero Extinction (AZE) site; a status that will preclude all anthropogenic activities from the site and attract funding for conservation work. Locally, population data is being utilized by Herp-Ghana and the Ghana Wildlife Division to develop an urgent conservation action plan to save this Critically Endangered frog from extinction.

Our conservation education efforts, has already made some impact on the local and national scale. Local watch dog committees have been established in local communities to protect amphibian habitat in response to our education campaigns. Also media reportage of illegalities in and around the study site has increased dramatically nationally in the past four months (e.g. TV3-News). This has led to joint police and military force operations aimed at curbing illegal habitat destruction that has characterized the study site and its environs. Internationally we have attracted several international collaborators including personnel from Global Wildlife, Conservation International and the US Fish and Wildlife aimed at supporting efforts at creating a national park in Ghana that will protect the target species.

## **CONCLUSION**

This project has laid a very solid foundation that will guarantee the long term persistence of this Critically Endangered frog (the Togo slippery). In many ways our conservation efforts have highlighted the plight of this species both locally and internationally and consequently increased efforts aimed at conserving it. In particular the Atewa Mountains has gained international and national exposure as a result of this project; this will definitely increase conservation efforts at this site and consequently guarantee the persistence of this evolutionary distinct frog.

Also, this project has provided essential baseline information for effective management of this species. Specifically, population data emanated from this study serves as baseline for monitoring future conservation efforts. Further, this data is being utilize to guide the development of conservation actions for the protection of this species.

Last but not least, this project has enhanced local capacity to conserve the target species. This include large numbers of graduate students and local communities who are now well equipped with both information and skill to contribute effectively to the management of this Critically Endangered and Evolutionally Distinct frog species.

## **PROBLEMS ENCOUNTERED**

This CLP project was developed on the premise that the causes of decline to the Togo slippery frog are mainly human consumption and habitat destruction through illegal logging. However, after six months of fieldwork it became apparent that the species also faces severe threat from commercial gold and bauxite exploitation. Hence, we refocused our educational campaign efforts to target government officials, the national forest and wildlife authorities as well as other international conservation bodies and personnel. This has so far worked well and the study site has played host to a lot of top management officers of Ghana's Forestry Commission including the chief executive officer and the Eastern Regional Minister/Governor all within this project period. Important lesson learnt is to constantly monitor and evaluate the objectives and activities of your project to ensure that they are still relevant in addressing the main conservation issue. This of course comes with an additional budgetary obligations; fortunately in our case an additional generous support from the Mohammed Bin Zayed (MBZ) species conservation fund made it possible to address this challenge.

## **FUTURE PLANNED ACTIVITIES**

We have formally registered a charity organization (Herp-Ghana) that will be committed to the conservation of threatened amphibian and reptile species in West Africa. Our most urgent conservation priority will be the small isolated populations occurring along the Ghana Togo border as preliminary morphological and genetic data suggest this population may constitute a subspecies or even an entirely new species. In this regard, more field sampling and genetic analysis will be needed. If confirmed, the new species will certainly be among some of the top Evolutionary Distinct and Critically Endangered species in the world. In these localities, alternative livelihood options such as rearing of rodents to substitute for frog meat consumption will have to be urgently deployed.

In the Atewa project site, we will further seek to establish a permanent conservation presence by establishing a resource centre in one of the villages to aid conservation education efforts, population monitoring and implementation of conservation action plans. We will further work actively with all stakeholders both locally and internationally aimed at getting the legal support from the government of Ghana to upgrade the protection status of the Atewa Mountains from a forest reserve to a national park.

## APPENDICES

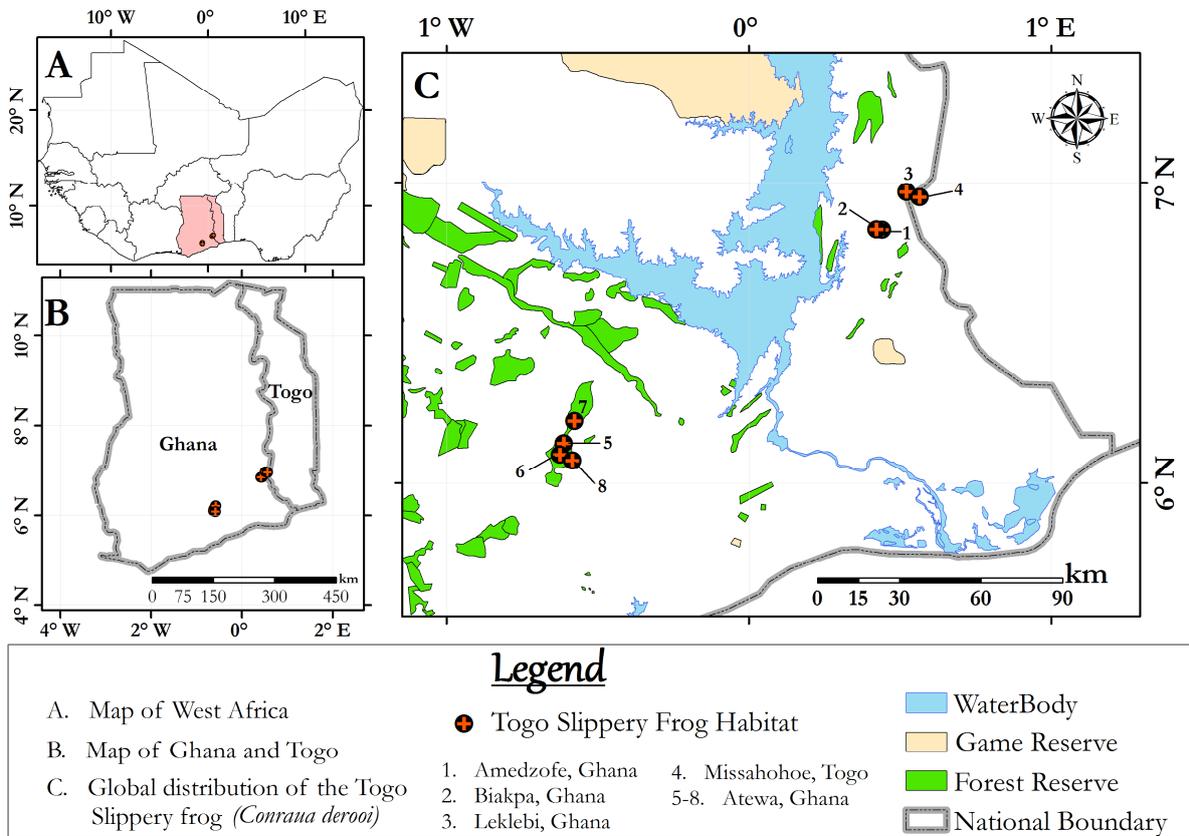
### Appendix 1. Amphibian species recorded in the Atewa Mountains of Eastern Ghana, general habitat preference and IUCN Red List category for threatened species (IUCN 2009).

Species	Red list category	Habitat Preference
<b>Hyperoliidae</b>		
<i>Acanthixalus sonjae</i>	LC	F
<i>Afrixalus dorsalis</i>	LC	FB
<i>Afrixalus nigeriensis</i>	NT	F
<i>Afrixalus vibekensis</i>	LC	F
<i>Hyperolius baumanni</i>	LC	F
<i>Hyperolius bobirensis</i>	EN	F
<i>Hyperolius concolor</i>	LC	FB
<i>Hyperolius fusciventris</i>	LC	FB
<i>Hyperolius guttulatus</i>	LC	FB
<i>Hyperolius picturatus</i>	LC	FB
<i>Hyperolius sylvaticus</i>	LC	FB
<i>Hyperolius torrentis</i>	EN	F
<i>Kassina arboricola</i>	NT	F
<b>Rhacophoridae</b>		
<i>Chiromantis rufescens</i>	LC	F
<b>Bufoidea</b>		
<b>Bufoidea</b>		
<i>Amietophrynus latifrons</i>	LC	S
<i>Amietophrynus maculatus</i>	LC	FB
<i>A. togoensis</i>	NT	F
<i>Leptopelis occidentalis</i>	NT	F
<i>Leptopelis spiritusnoctis</i>	LC	F
<i>Phlyctimantis Boulengeri</i>	LC	F
<b>Arthroleptidae</b>		
<i>Arthroleptis spp.</i>	LC	F/FB
<b>Astylosternidae</b>		
<i>Astylosternus sp. nov.</i>	Undescribed	F
<b>Caeciliidae</b>		
<i>Geotrypetes seraphini</i>	LC	F
<b>Petrophryniidae</b>		
<i>Phrynobatrachus sp. nov.</i>	New species	F
<i>Phrynobatrachus calcaratus</i>	LC	F/FB
<i>Phrynobatrachus accraensis</i>	LC	S
<i>Phrynobatrachus alleni</i>	NT	F

<i>Phrynobatrachus annulatus</i>	EN	F
<i>Phrynobatrachus francisci</i>	LC	S
<i>Phrynobatrachus ghanensis</i>	EN	F
<i>Phrynobatrachus gutturosus</i>	LC	F/FB
<i>Phrynobatrachus liberiensis</i>	NT	F
<i>Phrynobatrachus natalensis</i>	LC	S
<i>Phrynobatrachus plicatus</i>	LC	F/FB
<i>Phrynobatrachus tokba</i>	LC	F/FB
<b>Ranidae</b>		
<i>Amnirana albolabris</i>	LC	F
<i>Amnirana occidentalis</i>	NT	F
<i>Aubria subsigillata</i>	LC	F
<i>Conraua derooi</i>	CR	F
<i>Ptychadena aequiplicata</i>	LC	F
<i>Ptychadena bibroni</i>	LC	F/FB
<i>Ptychadena longirostris</i>	LC	F/FB
<b>Pipidae</b>		
<i>Silurana tropicalis</i>	LC	F/FB

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**Appendix 2. Global distribution map of the Togo slippery frog (*Conraua derooi*).**



**Appendix 3. Population data of the Critically Endangered Togo slippery frog. Data was collected over 6-month period in the Atewa Mountains in Eastern Ghana. PlotID: R=River, S=sample**

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<b>Plot ID</b>	<b>Sample</b>	<b>Fresh Captures</b>	<b>Re-captures</b>
R1S1	2	16	0
R1S2	3	10	8
R1S3	4	9	9
R1S4	1	8	2
R1S5	5	8	5
R2S1	1	7	0
R2S2	4	7	4
R2S3	3	6	4
R2S4	5	5	6
R2S5	2	4	2
R2S6	6	4	7
R3S1	1	25	0
R3S2	2	20	10
R3S3	3	15	12
R3S4	5	6	8
R3S5	4	3	9
R5S1	1	3	0
<b>Total</b>		<b>153</b>	<b>83</b>

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#### Appendix 4. Project account (income & expenditure)

Itemized expenses	Total CLP requested (GHC)	Total CLP requested (\$)	Total CLP used (\$)
<b>PHASE I - PROJECT PREPARATION</b>	<b>1,124.00</b>		<b>3,579.67</b>
<b>Administration</b>			<b>461.33</b>
Communications (telephone/internet)	60	40	40
Books and printing of journal articles/materials	150	100	100
Permits (Ghana wildlife and forest services divisions research permits)	300	200	200
Team training (Please detail: Cost of printing & photocopying of training materials and field manuals )	120	80	80
Medical supplies: (first aid and anti-malaria drugs)	62	41.33	41.33
<b>Reconnaissance</b>			<b>538.33</b>
Car rentals, fuel, food and field assistance (additional labour)	807.5	538.33	538.33
<b>Equipment</b>			<b>2580</b>
Scientific/field equipment and supplies (Cost of 24 headlamps)	780	520	520
Photographic equipment (Please detail: Digital camera and AA-batteries)	565	376.67	376.67
Camping equipment (Please detail main items: cost of 6 tents )	2,250.00	1,500.00	1,500.00
Field guides (Cost of colour photocopying and binding of 6-unpublished field guides	275	183.33	183.33
Other (Please detail: )		0	0
<b>PHASE II - IMPLEMENTATION EXPENSES</b>			<b>4,351.67</b>
<b>Conservation Education (video shows and house-to-house visits)</b>		<b>0</b>	<b>3,113.33</b>
Accommodation for 6 team members during education outreach programmes @ \$10/per. for 30-days	2,880.00	1,920.00	1,920.00
Hiring of projector @ \$11/day for 30-days,	495	330	330
45 mins air time@ evolution FM @ \$46.7/day for 2-days,	140	93.33	93.33
Printing of 100 project T-shirts@\$2.8/T-shirt,	420	280	280
Construction of billboards @ project site @ \$490	735	490	490
<b>Field Surveys</b>		<b>0</b>	<b>3,148.00</b>
Transportation: fuel	612	408	408
Transportation: vehicle hiring (Cost of renting a vehicle @ \$16.6/day for 30 days)	750	500	500
Food for team members and local guides ( Food in field ;\$280 per week for 6 people * 8 weeks)	3,360.00	2,240.00	2,240.00
<b>Workshops (Capacity Building)</b>			<b>1,206.67</b>
Cost of printing & photocopying of training materials and field manuals @ \$10/person for selected students (20-students)	110	73.33	73.33
Cost of light refreshment for training participants (125-students)	1,250.00	833.33	833.33
Cost of transport (2-mimibus) for field training @ \$150 per day for 1-day	450	300	300
Other (Please detail: cost of 1000 tree seedlings )		0	0
<b>PHASE III - POST-PROJECT EXPENSES</b>			<b>1,453.00</b>
<b>Administration</b>		<b>0</b>	<b>1,453.00</b>
Report production and results dissemination	2,250.00	1,453.00	1,453.00
Other (Please detail: )		0	0
<b>Total</b>	<b>18,821.50</b>	<b>12,500.67</b>	<b>12,500.67</b>

## **Appendix 5. Manuscripts in preparation**

**Ofori-Boateng, C., A. Damoah, G.B. Adum, S. Nsiah, E. Nkrumah and D. Saykay-Tuabeng (in prep.).** Population size and distribution of the Critically Endangered Togo slippery frog (*C. deroo*).Oryx???

McElroy, M., **C. Ofori-Boateng**, D. Portik, D. Reid, & A. Leaché (*in rev.*). *Batrachochytrium dendrobatidis* not detected in frog populations from Ghana. *Herpetological Review*.

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