CEPF SMALL GRANT FINAL PROJECT COMPLETION REPORT

I. BASIC DATA

Organization Legal Name: Caspar Schöning

Project Title (as stated in the grant agreement): Army Ants in the Fragmented Forests of Taita Hills and Lower Tana River

Implementation Partners for This Project:

Project Dates (as stated in the grant agreement): November 1, 2005 - December 31, 2005

Date of Report (month/year): 28 February 2006

II. OPENING REMARKS

Provide any opening remarks that may assist in the review of this report.

In this document I only summarize the study's most important findings and their management implications. A detailed data analysis and a comprehensive discussion will be presented in the manuscript that we intend to submit to the Journal of East African Natural History as a contribution to the next special thematic issue on the Coastal Forests and Eastern Arc Mountains Hotspot.

III. NARRATIVE QUESTIONS

1. What was the initial objective of this project?

A plethora of both invertebrate species (the so-called "myrmecophiles") and vertebrate species ("ant birds" such the Taita thrush *Turdus helleri* and to a lesser extent insectivorous mammals) depends on army ants. Army ant swarm raids probably have a significant impact on the populations of prey species. Army ants are thought to regulate invertebrate diversity by creating a mosaic of patches in different stages of recovery from raid events. They have therefore been considered keystone species in afrotropical forest ecosystems.

Their low density and low dispersal capacity could make army ants very vulnerable to local extinction in small forest patches and such extinctions would obviously also have negative effects for the associated species.

The forests along the Lower Tana River and up in the Taita Hills have been reduced dramatically in size and have also been partly isolated due to overexploitation by the

increasing human population. In this constellation, fragmentation effects could lead to local extinctions of army ants.

The objective of this study was to examine the presence of the army ant *Dorylus* (*Anomma*) *molestus* in the highly fragmented and threatened forests of the Taita Hills and the Lower Tana River in relation to forest patch size and time since isolation in order to determine the minimum patch size still supporting a viable population. On the basis of these results, management planning recommendations were to be given as connectivity interventions might have been necessary to preserve the presence of army ants in small and remote fragments surrounded by unsuitable habitat.

2. Did the objectives of your project change during implementation? If so, please explain why and how.

Along the Lower Tana River we searched for army ants in 22 nominal forest patches and found them in almost all these forests. There was no significant relationship between forest size and army ant presence. Moreover, we found 18 colonies in the matrix habitat between the forests. It was really astonishing to find colonies in this very dry scrubland (please see Fig. 1 at the bottom of this document), where ground vegetation (and subsequently invertebrate prey density) is comparatively sparse. In the beginning I believed these colonies were simply slowly dwindling towards oblivion after having left the forest. But judging by the nest sizes and the sizes of the swarm raids and trails we observed, they seemed rather strong and healthy. Together with the large number of colonies and the considerable distance of some of these colonies from the nearest forest patch (> 1 km), our observations suggest that colonies can survive well outside forests, at least long enough to reach a neighbouring forest patch. In an earlier study the presence of *Dorylus nigricans* had been reported from a grassland habitat at Lamto (Ivory Coast) but that site receives almost twice as much rainfall as the Tana River forest area (1100 vs. 580 mm per year) and grassland should harbour much more potential invertebrate prey than the almost bare ground outside forests along the Tana River. Otherwise there is only a picture in Hölldobler & Wilson's book "Journey to the Ants. A story of scientific exploration." (Belknap Press of Harvard University Press. Cambridge, Massachusetts. London, England. p. 109.) which points to the presence of *D*. (*Anomma*) in very dry habitats. In the dry savannah the colonies only forage at night so that colony growth (and thus reproduction rate) should thus be lower than in forests.

But more importantly, these findings made the underlying assumption of this study that this army ant species is restricted to forest habitats in its distribution obsolete. If colonies can survive well in the surrounding matrix, forest fragmentation does not lead directly to local extinctions.

During field work up in the Taita Hills in December we found very much the situation I had anticipated. *Dorylus* (*Anomma*) colonies occurred in all the fifteen natural and plantation forests we examined (including Mt Kasigau) except for those which had burnt recently. And again many colonies were found in the matrix habitat between the patches which is smallholder agricultural land in which *D*. (*Anomma*) colonies can survive rather well as I had seen during earlier field studies at Mt Kenya. This situation had been anticipated because the climate is much more humid in the Taita Hills so that the matrix habitat was assumed to be more favourable for army ants.

The original objective was nevertheless not changed during the study because it was decided that it was important to thoroughly document this unexpected situation. Moreover, the short time period did not allow devising a new project.

3. How was your project successful in achieving the expected objectives?

The findings of this study are good news and at the same time bad news. They are good news because *Dorylus molestus* army ant populations and their associated birds and invertebrates can persist better in fragmented landscapes than previously thought. When matrix habitat areas can be afforested, army ant colonies will already be available as important forest ecosystem components and recolonization of isolated and remote patches which was originally envisaged to take a very long time will not be necessary, because army ants do not go extinct in such patches. But on the other hand, the data on army ant distribution along the Tana River and in the Taita Hills are not useful for the planning of "connectivity interventions". Creating corridors for this army ant species will not be necessary because these army ants occur in almost all patches, their absence in the other patches is not related to forest size and may only be temporary, and because they can also live outside of forests. The implications for the value of corridors for the associated birds are more complex. Along the Lower Tana River we found the red-tailed ant-thrush (*Neocossyphus rufus rufus*) to attend *D. molestus* swarm raids, while up in the Taita Hills the white-starred robin (*Pogonocichla stellata*) and the Taita thrush were seen at swarm raids. The colonies occurring outside forests along the Tana River do

usually not forage during the day so that their swarm raids do not improve the ant birds' food supply. At the Tana River corridors may help maintain the populations of associated ant birds if these cannot readily move between forests. The colonies occurring outside forests in the Taita Hills can under favourable conditions (cloudy or rainy conditions) or in shaded areas also hunt during the day which is important for the white-starred robin. This species is – in contrast to the Taita thrush – not restricted to forest habitat. The populations of the Taita thrush would probably benefit from corridors because they would allow the dispersal between patches and also simply increase the size of the area of suitable habitat.

4. Did your team experience any disappointments or failures during implementation? If so, please explain and comment on how the team addressed these disappointments and/or failures.

No.

5. Describe any positive or negative lessons learned from this project that would be useful to share with other organizations interested in implementing a similar project.

The lessons learnt from this project are as follows.

a) The army ant species *Dorylus* (*Anomma*) *molestus* is less vulnerable to local extinctions due to fragmentation effects than the neotropical swarm-raiding army ant *Eciton burchellii*. This study has helped significantly to extend the knowledge on the distribution and the habitat requirements of *D.* (*Anomma*) *molestus*.

b) The matrix habitat is of high conservation value for species that are flexible in their habitat requirements and not restricted to the interior of the forests such as the white-starred robin. Cultivation methods that facilitate the persistence of forest species in agricultural land such as tree planting should therefore be encouraged. Army ant colonies can survive well in smallholder agricultural plots but they are often not welcome by the local farmers. Many people in the Taita Hills told us that they would try to disturb the nest of an army ant colony on their plot to make it leave because they feared to be attacked in their home at night by these fierce ants. In one case, we saw a nest that had been burnt the previous day by the resident farmer because he wanted to get rid of the

ants (please see Fig. 2 at the bottom of the document). This is unfortunate because the ants also provide useful services. In their raids they kill many herbivorous insects feeding on crops. And when they enter houses, they also clean them of all insect “pests”. No study attempting to quantify whether the presence of army ants significantly reduces herbivory in crop plots has yet been conducted. Since these ants also prey on earthworms, the overall effects of their foraging in agricultural land is not easy to predict, so that an investigation into the usefulness of army ants as biocontrol agents would be helpful.

c) The spatio-temporal population dynamics of army ants may be rather complex in a patchy landscape such as the one along the Lower Tana River. So far I have only mentioned the effect of habitat fragmentation in this system (or rather the lack of an effect of fragmentation) but there are other factors that are certainly relevant in the population dynamics. We found two savannah colonies of *D. molestus* which must have been attacked by *D*. (*Typhlopone*) army ants in their nests. There were many dead workers of both species on the refuse piles and most of them were interlocked with workers of the opposite species. Species of the subgenus *D*. (*Typhlopone*) seem to occur in higher densities in savannah areas and so their predation impact on *D. molestus* colonies may be stronger outside the forests. The forest colonies can forage all the time, while the savannah colonies can usually hunt only during cooler and more humid conditions (i.e. at night or during overcast or rainy conditions). These observations could lead one to believe that the population dynamics might follow a simple source-sink scenario with colonies in forests having a higher reproduction and lower mortality rate. However, there are also dramatic floods on a regular basis along the Lower Tana River which should easily kill all *D*. (*Anomma*) colonies in forests close to the river. And after such events, it may take a rather long time for forests to be recolonized from the savannah areas, but then the source-sink dynamics would be reversed. The absence of *D. molestus* colonies in some forest patches observed in this study may be the long-term result of floods.

d) Before any new measures such as the creation of forest corridors can be considered in the Eastern Arc Mountains and in the Coastal Forests, the normal management and control of the protected areas needs to be effective. This is currently not the case in the Tana River National Primate Reserve where forest is still being cleared especially on the

eastern side of the river, nor in the Taita Hills where many rodent traps were found during our field work.

6. Describe any follow-up activities related to this project.

No follow-up activities are planned at the moment. But I would like to suggest two follow-up activities that will be useful in implementing the lessons learnt during this project. The first would be the study on the effects of army ant foraging in agricultural land outlined above. Recommendations to local farmers concerning the apparent usefulness of these ants need to have a sound scientific basis. But if it can be demonstrated in such a study that army ants have a beneficial effect on crop production, such information should be made available to local farmers and the compilation of a small, richly illustrated brochure on the biology and usefulness of army ants would be the second recommended follow-up activity. Several conversations lead me to believe that local farmers would be more than happy to help conserve species which are directly useful to them.

7. Please provide any additional information to assist CEPF in understanding any other aspects of your completed project.

IV. ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes

Additional funding should be reported using the following categories:

- ***A*** *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*
- ***B*** *Complementary funding (Other donors contribute to partner organizations that are working on a project linked with this CEPF project*
- ***C*** *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)*
- ***D*** *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Provide details of whether this project will continue in the future and if so, how any additional funding already secured or fundraising plans will help ensure its sustainability.

V. ADDITIONAL COMMENTS AND RECOMMENDATIONS

See above under point III.5.

VI. INFORMATION SHARING

CEPF aims to increase sharing of experiences, lessons learned and results among our grant recipients and the wider conservation and donor communities. One way we do this is by making the text of final project completion reports available on our Web site, www.cepf.net, and by marketing these reports in our newsletter and other communications. Please indicate whether you would agree to publicly sharing your final project report with others in this way.
Yes ___ X ____
No ____ ____

If yes, please also complete the following:

For more information about this project, please contact:

Name:	Caspar Schöning
Mailing address:	Institute of Biology, Department of Population Biology, University of Copenhagen, Universitetsparken 15, 2100 Copenhagen, DENMARK.
Tel:	+ 45 – 35 32 12 55
Fax:	+ 45 – 35 32 12 50
E-mail:	caspar@zedat.fu-berlin.de

Fig. 1
A foraging trail of *Dorylus* (*Anomma*) *molestus* in the dry scrubland along the Lower Tana River. This picture was taken early in the morning when the ants were all returning to the nest.

Fig. 2
A *Dorylus* (*Anomma*) *molestus* nest after the colony had been destroyed with fire on the previous day. This picture was taken up in the Taita Hills close to Fururu forest.