

5.0 FAUNA

5.1 Introduction

A biodiversity survey of the fauna found in Derema Forest Corridor was conducted within the forest using standard, repeatable survey methods. Studies on small mammals, birds, bats, reptiles and various invertebrate groups were carried out and a list compiled with their respective status, where possible. The results can be compared with other faunal surveys elsewhere.

5.2 Sampling and data collection

5.2.1 Sampling units and sampling exercise

The sampling units were forest areas of the Derema Forest Corridor and its surrounding, established after a preliminary survey with great assistance of the map of Amani Nature Reserve and Derema Forest Corridor, Wildlife Conservation Society of Tanzania (WCST) researchers and forest officers and in the area.

Systematic sampling techniques were employed on four transects located 2 km inside the forest at a predetermined interval of at least 200 m. The transects ensured coverage of the following four forest cover types in Table 5.1.

Table 5.1 Forest cover types used in faunal survey in Derema Forest Corridor

Forest Cover Type	Description
Undisturbed forest	Less than 5% of the canopy cover occupied by <i>Maesopsis eminonii</i>
Slightly disturbed forest	About 5 – 15% of the canopy cover occupied by <i>Maesopsis eminonii</i>
Disturbed forest	Over 15% of the canopy cover occupied by <i>Maesopsis eminonii</i>
Traditional crops	Banana, cardamom, cloves, cassava etc. with significant number of trees remaining scattered among cultivations

5.2.2 Data collection

Baited snap trap lines were used in order to sample and collect data for the community of rodents whereas, for shrews, small mice and the ground dwelling reptiles and amphibians within the forest bucket pitfalls were used. Opportunistic captures of other reptiles and amphibians were also conducted by hand, and a snake stick where necessary. Bat mist netting was used to collect and study a representative sample of the forest bat community and the species ranges. Other mammals including primates were recorded opportunistically throughout the survey and sometimes dung surveys had to be employed.

In the bird survey, point count transects and opportunistic survey methods were used in which a census point was formed within 10 m of the laid plot. For some of the species, a playback method was employed. For consistency, in each census point data collection was given an allowance of 10 minutes.

Baited Blendon styled traps set in the tree canopy were used for the community of butterflies. The communities of molluscs and millipedes were sampled and data collected within three 1 m x 1 m and 3 m x 3 m plots respectively, at each trapping site. Plots were measured and string laid out along the boundaries. Leaf litter and the upper layers of soil were searched.

5.2.3 Description of the species

Each species encountered was described according to its taxon (whether mammal, bat, bird, reptile, amphibian, butterfly, mollusk or millipede) and where possible, ecological type, habitat and endemic status. The following are keys to the abbreviations used:

Ecological type, endemic status and IUCN status were compiled based on Kingdon (1989; 1997), National Biodiversity Database (1996) and IUCN (1996).

Ecological type:

- F Forest dependent species: This is defined as primary forest only. It does not include forest edge or secondary forest;
- F Forest dwelling but not forest dependent: Species occurring in primary forest as defined above as well as other vegetation types. Thus these are not forest-dependent species; and
- O Non-forest species: These are species that do not occur in primary or secondary forest or forest edge.

Endemic status:

- E Endemic to the East Usambara Mountains
- N Near endemic: Species with limited ranges usually only including coastal forest and/or East African lowland forests;
- W Widespread distribution.
- NT Near threatened
- DD Data deficient

IUCN status:

- EN Endangered
- CE Critically Endangered
- Lc Least concern
- Un Unknown
- V Vulnerable

5.3 RESULTS AND DISCUSSION

5.3.1 Vertebrates

Mammals

Table 5.2 below gives a summary of observations made on the mammals in Derema Forest corridor.

Table 5.2 Summary of the status of the identified mammals in Derema Forest Corridor

Serial number	Status	Number observed	% of total
1. F	Forest dependent species	8	27.6
2. f	Forest dwelling but not forest dependent	10	34.5
3. O	Non-forest species	1	3.4
4. E	Endemic to the Usambara Mountains	0	0.0
5. N	Near-Endemic	2	6.9
6. W	Widespread	15	51.7
7. V	Vulnerable	2	6.9
8. NT	Near threatened	1	3.4
9. EN	Endangered	1	3.4
10. Unknown		23	79.3

Whereas 10 species of mammals (34.5%) were forest dwelling but not forest dependent, 8 species (27.6%) were forest dependent and only one species namely, *Rattus rattus* (common mice) was a non-forest. Two species were found to be vulnerable (*Dendrohyrax validus* and *Beamys hindei*) and one species near threatened (*Galago zanzibaricus*). Zanzibar elephant shrew (*Rhynchocyon petersi*) was found both near endemic in the Usambaras and globally endangered whereas lesser pouched rat (*Beamys hindei*) had a near endemic and vulnerable status. Vervet monkey (*Cercopithecus aethiops*) locally known as “ndrue”, blue monkey (*Cercopithecus mitis*) and bush pig (*Potamochoerus lavatus*), cane rat (*Thryonomys swinderianus*), giant rat (*Paraxerus ochraceus*) are hunted for protein.

Table 5.3 below portrays the details of the mammals found in Derema Forest Corridor. Altogether, 29 species of mammals distributed within 13 families were identified.

Table 5.3 Summary of the identified mammals in Derema Forest Corridor

Family name	Common name	Species name	Ecol. type	Endem. status	IUCN Status
Galagonidae	Bush baby	<i>Galago zanzibaricus</i>	f	W	NT
	Small-eared galago	<i>Otolemur garnetti</i>	f	W	
Colobidae	Angola pied colobus	<i>Colobus angolensis</i>	F	W	
Herpestidae	Slender mongoose	<i>Herpestes sanguineus</i>	f	W	
Cercopithecidae	Yellow baboon	<i>Papio cynocephalus</i>	f	W	
	Vervet monkey	<i>Cercopithecus aethiops</i>	f	W	
	Blue monkey	<i>Cercopithecus mitis</i>	f	W	
Macroscelididae	Zanj elephant shrew	<i>Rhynchocyon petersi</i>	F	N	EN
Thryonomyidae	Cane rat	<i>Thryonomys swinderianus</i>			
	Giant rat	<i>Paraxerus ochraceus</i>			
	Soft-furred rat	<i>Praomys</i> sp.			
	Spiny mice	<i>Acomys</i> sp.			
	Woodland mice	<i>Hylomyscus denniae</i>	F	W	
	Common mice	<i>Rattus rattus</i>	O	W	
Cricetidae	Lesser pouched rat	<i>Beamys hindei</i>	f	N	V
	Flying squirrel	<i>Anomalurus fraseri</i>	F		
Bovidae	Ader's duiker	<i>Cephalophus adersi</i>			
	Black-fronted duiker	<i>Cephalophus nigrifrons</i>			
	Blue duiker	<i>Cephalophus monticola</i>	F	W	
Suidae	Bush pig	<i>Potamochoerus larvatus</i>	f	W	
	Giant forest hog	<i>Hylochoerus meinertzhageni</i>	F	W	
	Porcupine	<i>Hystrix galeata</i>			
	Warthog	<i>Phacochoerus aethiopicus</i>			
Procaviidae	Eastern tree hyrax	<i>Dendrohyrax validus</i>	f	W	V
	Rock hyrax	<i>Heterohyrax brucei</i>			
Viverridae	Neumann's genet	<i>Genetta genetta</i>			
Pteropodidae	Fruit bat	<i>Lissonycteris angolensis</i>	F	W	
	Fruit bat	<i>Epomorphorus</i> spp.	F	W	
Vespertilionidae	Yellow-bellied bat	<i>Scotophilus nucella</i>	f	W	

Birds

Stuart (1989) estimated that at least 110 species of birds are found in the East Usambaras, during this study however, 41 species were identified. Table 5.4 below gives a summary of the status of the identified bird species in the study area.

Table 5.4 Summary of the status of the identified birds in Derema Forest Corridor

Serial number		Status	Number observed	% of total
1.	F	Forest dependent species	8	19.5
2.	f	Forest dwelling but not forest dependent	12	29.3
3.	O	Non-forest species	9	22.0
4.	E	Endemic to the Usambara Mountains	5	12.2
5.	N	Near-Endemic	4	9.8
6.	W	Widespread	23	56.1
7.	V	Vulnerable	5	12.2
8.	NT	Near threatened	4	9.8
9.	CE	Critically endangered	1	2.4
10.	Lc	Least concern	7	17.1
11.	Un	Unknown	3	7.3

Analysis in Table 5.4 shows that most of the bird species are forest dwelling and while 56.1% is widespread, 12.2% is endemic to the Usambara Mountains and 9.8% is near endemic to the area. The endemic species are southern banded snake-eagle (*Circaetus fasciolatus*), Amani sunbird (*Hedydipna pallidigaster*), long-billed tailorbird (*Orthotomus moreaui*), Usambara eagle-owl (*Bubo vosseleri*) and Usambara hyliota (*Hyliota usambarae*). The near endemic species are Banded green sunbird (*Anthreptes rubritorques*), Swynnerton's Robin (*Swynnertonia swynnertonii*), Sokoke scops owl (*Otus ireneae*) and East coast akalat (*Sheppardia gunningi*).

Whereas five species namely; dappled mountain robin (*Modulatrix orostruthus*), banded green sunbird (*Anthreptes rubritorques*), Usambara thrush (*Turdus olivaceus roehli*), Usambara eagle-owl (*Sheppardia gunningi*) and East coast akalat (*Bubo vosseleri*) are vulnerable, four species are near threatened. The near threatened species are Southern banded snake-eagle (*Circaetus fasciolatus*), Fischer's turaco (*Tauraco fischeri*), Banded green sunbird (*Anthreptes reichenowi*) and Swynnerton's Robin (*Swynnertonia swynnertonii*). Further analysis shows that one species of the birds namely *Orthotomus moreaui* (long-billed tailorbird) is critically endangered.

According to Cordeiro *et al.* (2001), the long-billed tailorbird can now be reliably found in parts of the East Usambara plateau in Amani and Nilo areas, Tanzania, virtually nothing is known about its recent status in northern Mozambique. Its low population density and the small area of suitable habitat indicate that its total population is extremely small.

Given that much of its habitat is being altered rapidly and is becoming increasingly fragmented, the species is likely to be undergoing a continuing decline, at least in some parts of its global range. It is therefore considered critically endangered. The author documented further that the species resides in forest edge and large forest gaps, but its precise habitat requirements, biology and status are poorly understood.

BIRD PHOTO

Plate 5.1 Long-billed tailorbird
(*Orthotomus moreaui*)

BIRD PHOTO

Plate 5.2 Olive sunbird
(*Nectarinia olivacea*)

Table 5.5 Summary of the identified birds in Derema Forest Corridor

Family name	Common name	Scientific name	Ecol. type	End. status	IUCN status
Accipitridae	Southern banded snake-eagle	<i>Circaetus fasciolatus</i>	F	E	NT
Accipitridae	Tawny eagle	<i>Aquila rapax</i>	O	W	Lc
Accipitridae	Long-crested eagle	<i>Lophaetus occipitalis</i>	f	W	Lc
Accipitridae	Augur buzzard	<i>Buteo augur</i>	O	W	Lc
Coliidae	Speckled mousebird	<i>Colius striatus</i>	O	W	
Columbidae	Red-eyed dove	<i>Streptopelia semitorquata</i>	O	W	
Corvidae	Pied crow	<i>Corvus albus</i>	O	W	
Corvidae	White-naped raven	<i>Corvus albicollis</i>	O	W	
Cuculidae	White-browed coucal	<i>Centropus superciliosus</i>	O	W	
Dicruridae	Square-tailed drongo	<i>Dicrurus adsimilis</i>	f	W	
Estrildidae	Common waxbill	<i>Estrilda astrild</i>	O	W	
Muscicapidae	White-chested alethe	<i>Alethe fuellerborni</i>			Un
Muscicapidae	Spot-throat	<i>Modulatrix stictigula</i>			Lc
Muscicapidae	Dappled mountain robin	<i>Modulatrix orostruthus</i>			V
Musophagidae	Fischer's turaco	<i>Tauraco fischeri</i>	f	W	NT
Nectariniidae	Banded green sunbird	<i>Anthreptes rubritorques</i>	F	N	V
Nectariniidae	Olive sunbird	<i>Nectarinia olivacea</i>	f	W	
Nectariniidae	Amani sunbird	<i>Hedydipna pallidigaster</i>		E	EN
Nectariniidae	Uluguru violet-backed sunbird	<i>Anthreptes neglectus</i>			Lc
Nectariniidae	Collared sunbird	<i>Anthreptes collaris</i>	f	W	
Nectariniidae	Banded green sunbird	<i>Anthreptes reichenowi</i>	F	W	NT
Nectariniidae	Scarlet-chested sunbird	<i>Nectarinia senegalensis</i>	f	W	
Nectariniidae	Variable sunbird	<i>Nectarinia venusta</i>	f	W	
Sylviidae	Long-billed tailorbird	<i>Orthotomus moreaui</i>		E	CE
Turdidae	Usambara thrush	<i>Turdus (olivaceus) roehli</i>			V
Oriolidae	African golden oriole	<i>Oriolus auratus</i>	f	W	
Ploceidae	Usambara Mountain weaver	<i>Ploceus nicolli</i>			EN
Ploceidae	Dark-backed weaver	<i>Ploceus bicolor</i>	f	W	
Strigidae	Usambara eagle-owl	<i>Bubo vosseleri</i>	F	E	V
Strigidae	Sokoke scops owl	<i>Otus ireneae</i>	F	N	EN
Sturnidae	Red-winged starling	<i>Onychognathus morio</i>	O	W	
Sturnidae	Black-bellied starling	<i>Lamprotornis corruscus</i>	f	W	
Sturnidae	Black-bellied starling	<i>Lamprotornis corruscus</i>	f	W	
Sylviidae	Usambara hyliota	<i>Hyliota usambarae</i>		E	EN
Sylviidae	Red-capped forest warbler	<i>Orthotomus metopias</i>			Lc
Timaliidae	Pale-breasted illadopsis	<i>Illadopsis rufipennis</i>	F	W	Un
Turdidae	Red-tailed ant-thrush	<i>Neocossyphus rufus</i>			Lc
Turdidae	Sharpe's akalat	<i>Sheppardia sharpie</i>			Un
Turdidae	East coast akalat	<i>Sheppardia gunningi</i>	F	N	V
Turdidae	Swynnerton's Robin	<i>Swynnertonia swynnertoni</i>	F	N	NT
Picidae	Mombasa woodpecker	<i>Campethera mombassica</i>	f	W	Un

Reptiles

Table 5.6 Summary of the status of the identified reptiles in Derema Forest Corridor

Serial number	Status	Number observed	% of total
1. F	Forest dependent species	12	34.3
2. f	Forest dwelling but not forest dependent	11	31.4
3. O	Non-forest species	3	8.6
4. E	Endemic to the Usambara Mountains	1	2.9
5. N	Near-Endemic	9	25.7
6. W	Widespread	15	42.9
7. V	Vulnerable	7	20.0
9. EN	Endangered	3	8.6
11. Lc	Least concern	2	5.7
12. Un	Unknown	7	20.0
13. DD	Data Deficient	1	2.9

In this study, 35 species of reptiles were identified. These were 8 species of chameleons, 2 geckos, 1 agama, 4 skinks, 1 lizard and 20 snakes all represented 9 in families. As shown in the summary in Table 5.6, most of the species are forest dependent with only three which are non-forest. Whereas one species of chameleon (*Bradypodion spinosum*) was found to be endemic in the area, nine species were near endemic as shown in Table 5.7. The endemic *Bradypodion spinosum* and the near endemic *Lygodactylus kimhowelli* and *Chamaeleo deremensis* are also endangered. The survey indicated that *Chamaeleo deremensis* and *Bradypodion spinosum* are common in Derema in undisturbed forest areas.

CHAMELEON PHOTO

Plate 5.3 A two horn chameleon (*Bradypodion fischeri fischeri*)

Among the listed snakes, Usambara Gabon viper (*Bitis gabonica*), Forest cobra (*Naja melanoleuca*) and Eastern green snake (*Philothamnus punctatus*) are common in Derema in undisturbed forest particularly Shamba Ngeda areas.

Table 5.7 Summary of the identified reptiles in Derema Forest Corridor

Family name	Common name	Scientific name	Ecol. type	End. status	IUCN status
Chamaeleonidae	Two horn chameleon	<i>Bradypodion fischeri fischeri</i>	F	N	V
	Three horn chameleon	<i>Chamaeleo deremensis</i>	F	N	EN

	One horn chameleon	<i>Bradypodion tenue</i>	F	N	V
	Flap chameleon	<i>Chamaeleo dilepsis</i>	f	W	
	Pygmy chameleon	<i>Rhampholeon temporalis</i>	F	N	V
	Two horn chameleon	<i>Bradypodion matschiei</i>			
	Soft horn chameleon	<i>Bradypodion spinosum</i>	F	E	EN
	Giant chameleon	<i>Chamaeleo melleri</i>			
Gekkonidae	Tropical house gecko	<i>Hemidactylus mabouia</i>	f	W	
	Tropical house gecko	<i>Lygodactylus kimhowelli</i>	F	N	EN
Agamidae	Montane rock agama	<i>Agama montana</i>	F	N	V
Scincidae	Long-tailed limbless skink	<i>Melanoseps longicauda</i>	f	N	DD
	Boulenger's skink	<i>Mabuya boulengeri</i>	O	W	
	Speckle-lipped skink	<i>Mabuya maculilabris</i>	f	W	V
	Savanna snake-eyed skink	<i>Panaspis wahlbergii</i>	O	W	
Cordylidae	E.A. spiny-tailed lizard	<i>Cordylus tropidosternum</i>	f	W	
Leptotyph-	Peter's black worm snake	<i>Leptotyphlops scutifrons</i>	f	W	Lc
lopidae	Worm-snake	<i>Leptotyphlops macrops</i>	F	N	
	Meker's worm-snake	<i>Leptotyphlops scutifrons merkeri</i>	f	W	Lc
Viperidae	Usambara Gabon viper	<i>Bitis gabonica</i>	F	W	
	Horned adder	<i>Bitis caudalis</i>			
	Puff adder	<i>Bitis arietans arietans</i>	O	W	
	Bibron's burrowing adder	<i>Atractaspis bibronii</i>			
Elapidae	Half-banded garter snake	<i>Elapsoidea semiannulata</i>			
	Günter's garter snake	<i>Elapsoidea guentheri</i>			
	Sundevall's garter snake	<i>Elapsoidea sundevallii</i>			
	Forest cobra	<i>Naja melanoleuca</i>	f	W	
	Mozambique spitting cobra	<i>Naja mossambica</i>			
Colubridae	Savanna vipe snake	<i>Thelotornis capensis mossambica</i>	f	W	
	Herald snake	<i>Crotaphopeltis tornieri</i>	F	W	V
	Brown house snake	<i>Lamprophis capensis</i>	f	W	
	Common house snake	<i>Boaedon fuliginosus</i>			
	Eastern green snake	<i>Philothamnus punctatus</i>	f	W	
	Usambara centipede-eater	<i>Aparallactus werneri</i>	F	N	V
Pythonidae	African python	<i>Python sebae</i>	F		

Amphibians

Table 5.8 below shows that all of the identified amphibians in the area are forest dwelling in which 66.7% is forest dependent. Two of the species namely *Boulengerula boulengeri* and *Hoplophryne rogersi* are endemic to the Usambara Mountains and six are near endemic.

Whereas six species are vulnerable, one species namely *Leptopelis vermiculatus* and *Mertensophryne micranotis* are near threatened and endangered, respectively.

Table 5.8 Summary of the status of the identified amphibians in Derema Forest Corridor

Serial number		Status	Number observed	% of total
1.	F	Forest dependent species	10	66.7
2.	f	Forest dwelling but not forest dependent	5	33.3
3.	O	Non-forest species	0	0.0
4.	E	Endemic to the Usambara Mountains	2	13.3
5.	N	Near-Endemic	6	40.0
6.	W	Widespread	7	46.7
7.	V	Vulnerable	6	40.0
8.	NT	Near threatened	1	6.7
9.	EN	Endangered	1	6.7

Table 5.9 Summary of the identified amphibians in Derema Forest Corridor

Family name	Scientific name	Ecological type	Endemic status	IUCN status
Bufonidae	<i>Bufo brownii</i>	F	N	V
	<i>Bufo gutturalis</i>	f	W	
	<i>Mertensophryne micranotis</i>	F	N	EN
Arthroleptidae	<i>Arthroleptis stenodactylus</i>	f	W	
	<i>Arthroleptis xenodactyloides</i>	f	W	
Hyperoliidae	<i>Hyperolius argus</i>	f	W	
	<i>Hyperolius mitchelli</i>	F	W	
	<i>Leptopelis vermiculatus</i>	F	N	NT
	<i>Leptopelis uluguruensis</i>	F	N	V
	<i>Leptopelis flavomaculatus</i>	F	W	
	<i>Leptopelis barbouri</i>	F	N	V
Microhylidae	<i>Hoplophryne rogersi</i>	F	E	V
Ranidae	<i>Arthroleptides martiensseni</i>	F	N	V
Caeciliidae	<i>Boulengerula boulengeri</i>	F	E	V
Hemicidae	<i>Hemisus marmoratus</i> sp. <i>marmoratus</i>	f	W	

5.3.2 Invertebrates

Butterflies

There are more than 460 species of butterflies in the Usambara Mountains and in this study only 62 species could be scientifically identified, distributed within 16 families. The summarized results in Table 5.10 shows that out of this list, five species are endemic namely; *Charaxes usambarae*, *Cymothoe amaniensis*, *Hypolimnas antevorta*, *Euthecta* sp. and *Hypolimnas usambara* in which the former two are also endangered. Also, three species namely, *Charaxes contralius*, *Charaxes lasti* and *Astictopterus tura* are near endemic.

Table 5.10 Summary of the status of the identified butterflies in Derema Forest Corridor

Serial number	Status	Number observed	% of total
1. F	Forest dependent species	15	23.1
2. f	Forest dwelling but not forest dependent	37	56.9
3. O	Non-forest species	4	6.2
4. E	Endemic to the Usambara Mountains	5	7.9
5. N	Near-Endemic	3	4.6
6. W	Widespread	60	92.3

Further observations in Table 5.10 indicate that most of the butterfly species are forest dwelling and therefore their existence depend on plants. Table 5.11 reveals the dependence of the species on plants as their hosts.

PHOTOS

Belenios creona severina

Junonia oenone

Junonia hierta cebrene

PHOTOS

Precis octavia

Charaxes cithaeron

Charaxes candiope

Plate 5.4 Some of the common butterfly species in Derema Forest Corridor

Table 5.11 Summary of the identified butterflies in Derema Forest Corridor

Species family name	Species scientific name	Species host plant	Ecological type	Endemic status
Acraeidae	<i>Acraea engina</i>			W
	<i>Acraea satis</i>			W
	<i>Acraea aganice</i>			W
Nymphalidae	<i>Amauris albimaculata</i>	<i>Tylophora, Dregea, Cynanchum spp</i>	f	W
	<i>Amauris niavius</i>	<i>Tylophora, Dregea, Secamone, Cynanchum spp</i>	f	W
	<i>Amauris ochlea</i>	<i>Tylophora, Dregea, Cynanchum spp</i>	f	W
Arctiidae	Forest moth	<i>Brucea spp.</i>	F	W
	Tiger moth	<i>Clotalaria spp.</i>	f	W
Nymphalidae	<i>Aterica galene</i>		F	W
Pieridae	<i>Belenois thysa</i>		f	W
	<i>Catopsilia florella</i>	<i>Senna spp.</i>	O	W
Papilionidae	<i>Catuna sikorana</i>			W
Nymphalidae	<i>Charaxes acuminatus</i>	<i>Allophylus spp.</i>	F	W
	<i>Charaxes brutus</i>	<i>Allophylus spp.</i>	f	W
	<i>Charaxes candiope</i>	<i>Eucalyptus, Aloe spp.</i>	f	W
	<i>Charaxes cithaeron</i>	<i>Allophylus spp.</i>	f	W
	<i>Charaxes contralius</i>	<i>Allophylus spp.</i>	f	N
	<i>Charaxes etecipe</i>	<i>Allophylus spp.</i>	F	W
	<i>Charaxes lasti</i>	<i>Allophylus spp.</i>	F	N
	<i>Charaxes macclounii</i>	<i>Allophylus spp.</i>	f	W
	<i>Charaxes pollox</i>	<i>Allophylus spp.</i>	F	W
	<i>Charaxes protoclea</i>	<i>Allophylus spp.</i>	F	W
	<i>Charaxes usambarae</i>	<i>Allophylus spp.</i>	F	E
	<i>Charaxes varanes</i>	<i>Allophylus spp.</i>	f	W
	<i>Charaxes violetta</i>	<i>Allophylus spp.</i>	f	W
	<i>Charaxes xiphares</i>	<i>Allophylus spp.</i>	F	W
	<i>Cymothoe amaniensis</i>		F	E
	Hesperiidae	<i>Astictopterus tura</i>		f
<i>Coeliades chalybe</i>			f	W
Nymphalidae	<i>Cymothoe amaniensis</i>		F	W
Danaidae	<i>Danaus chrysippus</i>	<i>Calotropis procera</i>	f	W
Nymphalidae	<i>Tirumala petiverana</i>	<i>Dregea, Tylophora spp.</i>	f	W
	<i>Euphaedra neophron</i>	<i>Blighia unijugata, Deinbollia sp.</i>	f	W
	<i>Euphaedra orientalis</i>	<i>Phoenix spp.</i>	f	W
	<i>Euxanthe tiberius</i>	<i>Deinbollia spp.</i>	F	W
	<i>Euxanthe wakefieldi</i>	<i>Deinbollia spp.</i>	f	W
Papilionidae	<i>Graphium angolanus</i>	<i>Uvaria, Annona spp.</i>	O	W
	<i>Graphium leonides</i>	<i>Uvaria, Annona spp.</i>		W
	<i>Graphium policens</i>	<i>Uvaria, Annona spp.</i>	O	W
Nymphalidae	<i>Hypolimnna daedalus</i>	<i>Urera sansibarica, Urera trinervis</i>		W
	<i>Hypolimnna antevorta</i>	<i>Urera sansibarica, Urera trinervis</i>	F	E
	<i>Hypolimnna anthedon</i>	<i>Laportea, Urera trinervis</i>	f	W
	<i>Hypolimnna deceptor</i>	<i>Laportea, Urtica spp.</i>	f	W
	<i>Hypolimnna misippus</i>	<i>Justica, Asystasia spp.</i>	f	W

	<i>Hypolimnas usambara</i>	<i>Urera sansibarica</i>	f	E
	<i>Junonia oenone</i>		O	W
	<i>Junonia terea</i>			W
	<i>Junonia natalica</i>		f	W
	<i>Junonia heirta cebrene</i>		f	W
Papilionidae	<i>Papilio constantinus</i>	<i>Toddalia, Vepris, Citrus spp.</i>	f	W
	<i>Papilio dardanus</i>	<i>Toddalia, Vepris, Clausina, Citrus spp.</i>	f	W
	<i>Papilio demodocus</i>	<i>Toddalia, Vepris, Citrus spp.</i>	f	W
	<i>Papilio desmondi</i>	<i>Toddalia, Vepris, Citrus spp.</i>	f	W
	<i>Papilio echeriodes</i>	<i>Toddalia, Vepris, Citrus spp.</i>	F	W
	<i>Papilio hornimani</i>	<i>Vepris, Zanthoxylum, Citrus spp.</i>	f	W
	<i>Papilio nireus</i>	<i>Toddalia, Vepris, Citrus spp.</i>		W
	<i>Papilio ophidicephalus</i>	<i>Vepris, Citrus, Zanthoxylum spp.</i>	f	W
	<i>Papilio pelodurus</i>	<i>Cryptocarya liebertiana</i>	f	W
	<i>Papilio phorcas</i>	<i>Vepris, Zanthoxylum spp.</i>	F	W
Nymphalidae	<i>Précis octavia</i>	<i>Calliandra, Delonyx, and Senna spp.</i>	f	W
	<i>Pseudacraea boisduvali</i>	<i>Mimusops, Chrysophyllum spp.</i>	f	W
	<i>Pseudacraea lucretia</i>	<i>Mimusops, Chrysophyllum spp.</i>	F	W
	<i>Salamis anacardii</i>	<i>Asystasia sp.</i>	f	W
	<i>Salamis cacta</i>	<i>Asystasia sp.</i>		W
	<i>Salamis parhassus</i>	<i>Asystasia, Justica spp.</i>	f	W
Lycaenidae	<i>Euthecta sp.</i>	<i>Calliandra, Delonyx, and Senna spp.</i>	f	E

Other invertebrates

The other groups of invertebrates were beetles (3 families), slug (1 family), snail (5 families) and millipedes (2 families). Details are given in Table 5.12 below in which a water snail scientifically identified as *Lanistes farleri* is endangered.

Table 5.12 Summary of beetles, molluscs and millipedes

Family name	Common name	Scientific name	Remarks
Cetoniidae	Flower beetle	<i>Dicronorhina micans</i>	
	Neptune beetle	<i>Neptunides polychrous</i>	
Scarabaeidae	African Goliath beetle	<i>Goliathus orientalis</i>	
	African Goliath beetle	<i>Goliathus albosignatus</i>	
	Flower beetle	<i>Argyrophegges kolbei</i>	
	Dung beetle	<i>Heliocopris dominus</i>	
Cetoniidae	African common beetle	<i>Fornasinius rusus</i>	
	Flower beetle	<i>Mecynorhina oberthuri</i>	
	Amordes	<i>Amaurodes passerinii</i>	
	Megalorrhina beetle	<i>Megalorrhina harrisi</i>	
	Eudicella beetle	<i>Eudicella euthalia</i>	
Urocyclidae	Slug	<i>Elisolimax rufescens</i>	
Ampullariidae	Water snail	<i>Lanistes farleri</i>	IUCN Endangered
Thiaridae	Water snail	<i>Cleopatra africana</i>	
Achatinidae	Giant land snail	<i>Achatina fulca</i>	
Subulinidae	Snail	<i>Pseudoglessula obtusa</i>	
Ariophantidae	Snail	<i>Sitala reloyi</i>	
Spirostreptidae	Millipede	<i>Otostreptus stylifer</i>	
Oxydesmidae	Millipede	<i>Ctenodesus pectinatus</i>	
	Millipede	<i>Rhododesmus mastophorus</i>	

PHOTO

Plate 5.5 A millipede sample trapping site

Table 5.13 Summary of faunal families and species identified

Taxon	No. of families	No. of species	Ecological type			Endemic status		IUCN status			
			F	f	O	E	N	CE	EN	NT	V
Mammals	13	29	8	10	1	0	2	0	1	1	2

Birds	18	41	8	12	9	5	4	1	0	4	5
Reptiles	9	35	12	11	3	1	9	0	3	0	7
Amphibians	7	15	10	5	0	2	6	0	1	1	6
Butterflies	16	62	15	37	4	5	3	-	2	-	-
Beetles	3	11	-	-	-	-	-	-	-	-	-
Molluscs	6	6	-	-	-	-	-	-	-	-	-
Millipedes	2	3	-	-	-	-	-	-	-	-	-
Total	74	202	53	75	17	13	24	1	7	6	20

5.4 CONCLUSION AND RECOMMENDATIONS

From this study, it is evident that most of the fauna species identified are forest dwelling, about half of them being forest dependent. The area is also endowed with a good number of either endemic or near endemic species which in the study 13 and 24 species were encountered, respectively.

The study nonetheless, shows that the endemic long-billed tailorbird (*Orthotomus moreaui*) is critically endangered facing extinction. Its low population density and the small area of suitable habitat indicate that its total population is extremely small. The number of the other endangered, near threatened and vulnerable species of 7, 6 and 20, respectively is also alarming. Continued alteration of the forest structure will have significant ramifications for the fauna of the forest.

The following are the recommendations drawn from the faunal survey:

- For the long-billed tailorbird, extensive surveys need to be carried out in the whole area of the East Usambaras including Amani Nature Reserve and its vicinity, the Ngua and Ndola areas and Nilo Forest Reserve to identify key conservation areas and incorporate these in the Management Plan. Each of the identified territory of the bird should be monitored every two months to evaluate the effectiveness of selected forest-management techniques.
- More ecological surveys to understand why tailorbird is apparently so rare and thinly distributed need to be conducted.
- An education and awareness scheme on long-billed tailorbird and other fauna conservation for local landowners and other key stakeholders need to be encouraged and implemented using simple but comprehensive educational materials like posters and leaflets.
- There should be protection of forest edge wetland habitats from uncontrolled opportunistic agriculture. There should also be consideration of methods to reduce disturbance in and around tea plantations.
- Provision of alternative income generating activities i.e. (i.e. bee keeping, butterfly keeping, promote cultivation of high value cash and food crops, fish farming, poultry keeping both exotic and local chicken, brick making, mushroom cultivation, livestock keeping). These will reduce the total dependence on the forest.
- More studies are required to establish the facts for the other species whose ecological, habitat and endemic status were not indicated.

