BUTTERFLIES AT
SAPO NATIONAL PARK

A male *Hallelesis halyma* is perching on an exposed leaf, guarding his territory in a sunny spot, at Sapo National Park

--- FINAL REPORT ---
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DR. OSKAR BRATTSTRÖM
oskar.brattstrom@gmail.com

Survey efforts and methodology

This report builds on data from a visit to the Northern part of Sapo national park in the Putu area of Grand Gedeh County. I visited the site from November 26 - December 8, 2009 and spent a total of twelve days in the field, surveying butterflies. The purpose of the survey was to update the list of butterfly species known from Sapo National Park and also estimate the quality of the forest from the species composition of the occurring butterflies.

The survey was conducted on a network of four different trail segments (Fig. 1). Most of the time was spent on the northernmost part of a trail leading to the park in a south-westerly direction (Trail1). Butterflies were mostly captured using hand nets (between 10:00-16:00 hours) and by traps baited with fermented bananas. The traps were left in the field over night and re-baited every three days. In total up to eighteen traps were used simultaneously. To complement the traps, fresh papaya was placed on the forest floor at some twenty locations to attract large fruit feeding butterflies of groups that often avoid the traps (mainly *Euphaedra* and *Euriphene*). Captured specimens were either identified immediately in the field or brought back to camp for later identification. Species that were only indentified in flight, where capture was not possible, are specifically labelled as such in the species list.

Presently, there are still a large number of specimens awaiting identification. All collected material is kept in my personal collection for future reference and should anything be moved for better access to other scientific work, I will keep track of the location of all specimens. Identification of butterflies was mainly done using Torben Larsen's (2005) book on West African Butterflies. The total number of additions during later identification work has been estimated in the order of ten species.

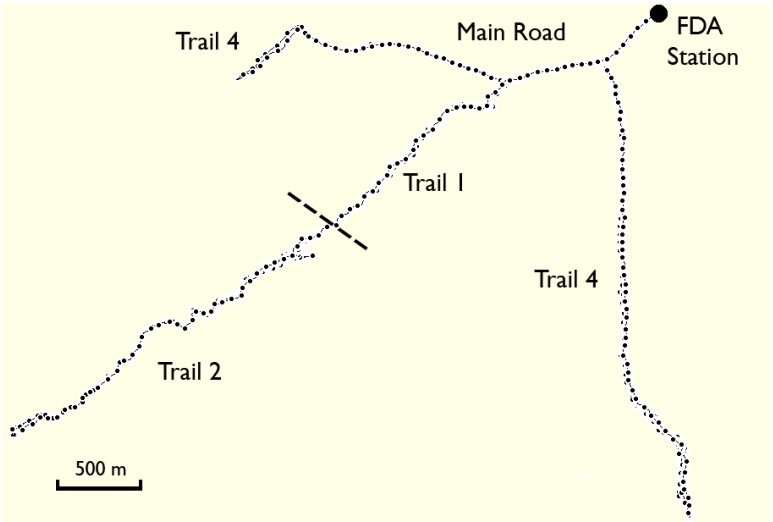

Figure 1: Map showing the location of the trails used in this survey. Trail 1 and 2 are parts of the same path but were used differently during the monitoring work. The highest butterfly diversity was found along Trail 1 in a secondary forest with reasonably intact canopy and fairly open undergrowth.

Results and Discussion

Number of observed species and new records for Liberia

In total 244 species of butterflies where positively recorded. A species list is found in Appendix I. For some species, identification has presently only been done to the genus level. In a case where there is no doubt that the unidentified specimens within the same genus are more than one species; this has been noted in the species list.

Twenty-three recorded species (almost 10% of the total number) were new additions to the known butterfly fauna of Liberia. Most of these are species that were expected to occur in the country, given their known distribution in the West African region. The most likely reason why they have not been recorded previously is because of the general deficit of butterfly studies in Liberia over recent decades. Species of special interest are discussed in Appendix II.

Accumulation curve and general comments on occurrence patterns

The accumulation curve for the total number of observed species during the study (Fig. 2) shows a stable increase throughout the whole study period. It is clear that many more species should have been found if more time had been available for the study. A lot of work remains before a complete picture of the butterfly fauna at Sapo national park is gained.

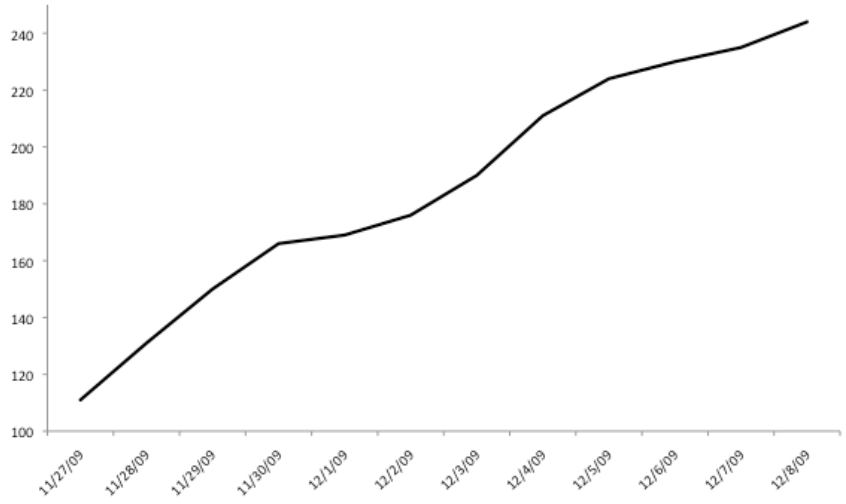

Figure 2: The curve shows the accumulative number of species observed during a twelve day survey of butterflies in Sapo National Park (Liberia) made in November-December 2009

The number of species observed each day (Fig. 3) showed a substantial fluctuation (Mean = 81, Range 53-111). It is plausible that this variation was mainly caused by changes in weather conditions, but also by other less dramatic factors (e.g. differences in habitat surveyed on different days and the age of the bait used in the traps). The number of species observed was also slightly higher than that presented in figure 3 (especially for the last days) as common but not easily field-identifiable species (e.g. *Eurema, Hypolycaena* etc.) were only investigated in detail on the first few days. When all the species that it was felt occurred here were recorded in these genera, on later days, they were just noted to the genus level (occasionally a few were collected for later identification) to give more time to find rare and discrete species not yet found. However, even after twelve days and the length of the survey period, about 10% of the

observations were of new species. I have personally, never recorded as many species at one site over such a short time period. Monitoring work at various West African locations, having a higher diversity than the expected diversity at Sapo national park, have often showed slower rate of species accumulation. While this difference may in part be due to temporal variation, and the fact that this survey was (or may have been?) done during a time when a lot of species were active, it also suggests that the Sapo national park area has very intact butterfly fauna with high numbers of individuals in suitable habitats.

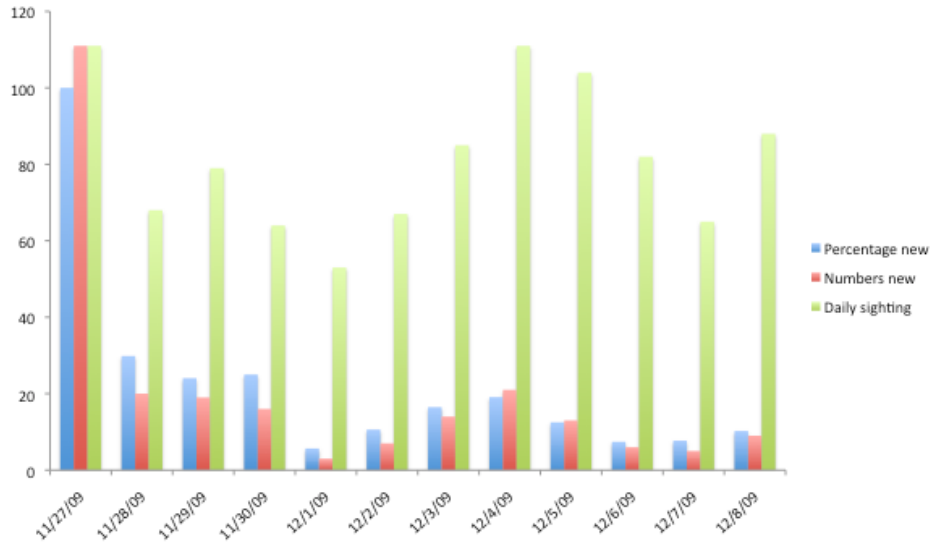

Figure 3: The graph shows the number of butterfly species observed every day (Green Bars), the amount of species seen for the first time (Red Bars) and the percentage new of the total observations during the same day (Blue Bars)

From the graph showing daily variations of observed number of species (Fig. 3) it can be seen that the percentage of new sightings is correlated to the total numbers observed. This suggests that on days with low number of observation (i.e. generally bad conditions for butterflies) the majority of observed butterflies were common species that are numerous and often have less specific requirements for being active. As can be seen in Figure 4, as many as 50% of the species observed during the twelve days were only seen on one or two days, demonstrating the variability in occurrence of different species.

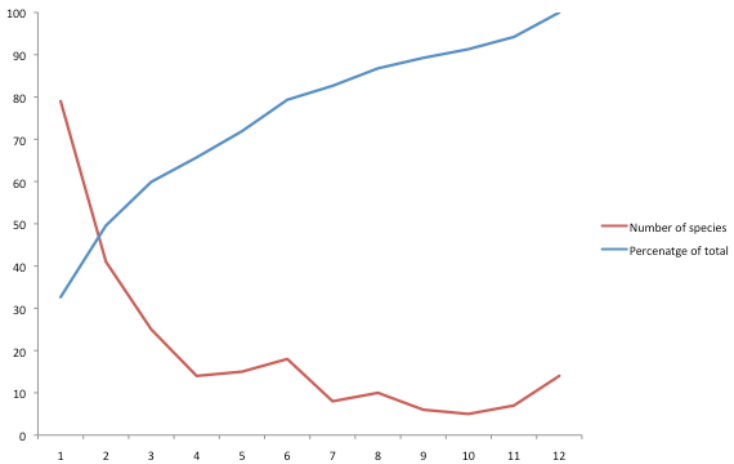

Figure 4: The red line shows the total number of butterfly species that was observed on the same amount of days during the survey (12 days in total). The blue line shows the cumulative percentage of the total species count. Note that 50% of all the species seen during the whole study were only seen during one or two days, showing that most species are rarely observed

General notes on the butterflies of Liberia and species composition at Sapo national park

Liberia is estimated to have the highest diversity of rainforest butterflies in the Upper Guinea Forest block but as comparably few surveys have been implemented, the number of known species is still higher in Sierra Leone and Ivory Coast. Almost all the species found can be considered deep forest butterflies that are sensitive to habitat degradation. This demonstrates that Sapo national park is presently intact and in good condition because it can sustain these kind of sensitive insects.

As butterflies are relatively short-lived (no species is expected to survive more than a year as adult) they are suitable for habitat quality estimates. Larger and long-lived animals like birds and mammals can potentially survive for decades as nonviable populations in degraded habitats that can no longer support healthy ones. Only a few identified species of butterfly were opportunistic savannah species of the kind that quickly colonize degraded areas. I have never seen such a conspicuous absence of these savannah species in re-growing secondary habitats (mostly old farms or tree fall clearings) and this indicates a much lower level of degradation in the Sapo national park area, compared to areas in most other West African countries I have visited. To really verify this, more studies of forests in other regions in Liberia are needed.

A short study like the present one cannot accurately estimate the total number of species occurring at Sapo national park. However, based on the accumulation curve, the number of new country records and the biogeography of species in the countries surrounding Liberia, the estimates of at least 500 species for Sapo alone (possibly more than 800 for Liberia as a whole) made by Dr. Torben B. Larsen (2009) appears very plausible. It is clear that much more research, both at Sapo national park and nationally is required in order to acquire a better knowledge of Liberia's butterflies.

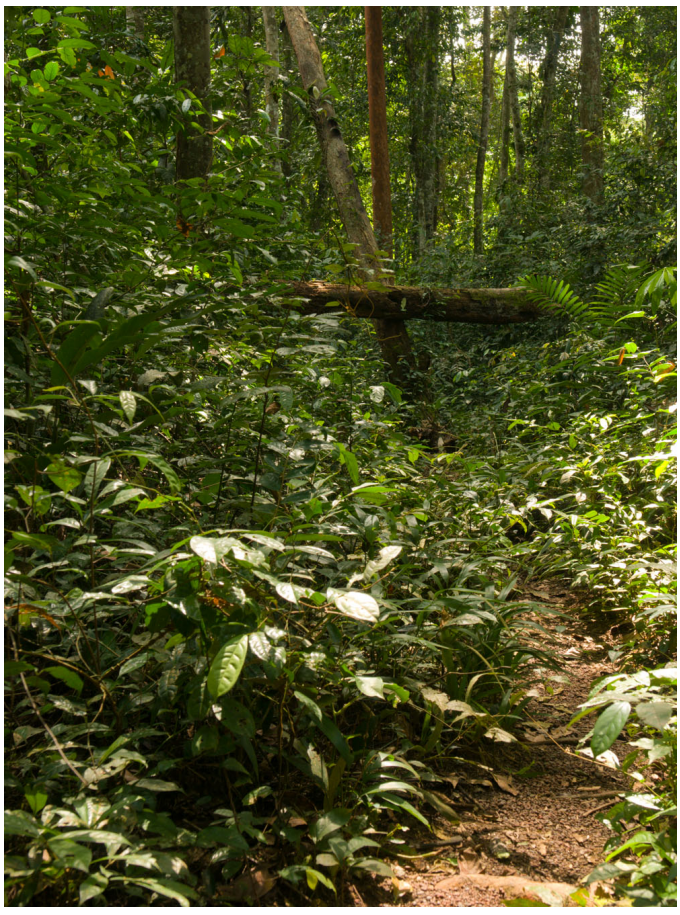

Figure 5: The picture shows the kind of forest found along 'Trail 1'. This kind of open forest with a relatively intact canopy usually provides the highest diversity of butterflies during monitoring work in rainforests. Even though the primary areas have a high diversity, they are very hard to study, as most species tend to stay up in the canopy. In these more open habitats canopy species often fly down to settle at lower levels and can therefore be observed by surveyors. Most of the butterflies found in this habitat are still dependant on the intact forest found close by, but for the purpose of recording them it is more efficient to work in boundary areas such as this.

Acknowledgements

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References

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Larsen, T.B. 2009. *Anthene georgiadisi sp. nov.* – a new butterfly from Liberia (Lepidoptera: Lycaenidae). *Entomologists' Record and Journal of Variation,* **121:**47-51.

Appendix I: List of species that were recorded during a twelve day butterfly monitoring made at Sapo National Park in Liberia during November-December 2009. Species of special interest are discussed in more detail in Appendix II.

Species	New to Liberia	Notes in Appendix II	Minor comments
Fam. Papilionidae			
Papilio dardanus dardanus			
Papilio phorcas phorcas			
Papilio horribilis			
Papilio chrapkowskoides nurettini			
Papilio nireus nireus			
Papilio menestheus menestheus			
Papilio demodocus demodocus			
Papilio cyproeofila cyproeofila			
Papilio zenobia			
Papilio cynorta cynorta			
Graphium tynderaeus			
Gaphium leonidas leonidas			
Graphium policenes			
Fam. Pieridae			
Pseudopontia gola			
Catopsilia florella			
Eurema senegalensis			
Eurema hecabe solifera			
Eurema brigitta brigitta			
Nepheroina thalassina thalassina			
Belenois aurota	✓	✓	
Belenois calypso calypso			
Leptosia alcesta alcesta			
Leptosia medusa			
Mylothris chloris chloris			
Mylothris dimidiata			
Mylothris poppea			
Mylothris rhodope			

Appendix I – Species List

Lycaenidae	New?	Appendix II	Minor Notes
Megalopalpus zymna			Could be two species
Spalgis lemolea pilos			
Pentila petreia			
Telipna acraea acraea			
Telipna semirufa ivoiriensis			
Mimacraea darwinia			
Mimeresia libentina			
Mimeresia semirufa	✓	✓	
Mimeresia cellularis	✓	✓	
Eresiomera isca occidentalis			
Citrinophila similis			
Liptena submacula			
Liptena catalina			
Falcuna leonensis			
Falcuna campimus			
Tetrarhanis sp.			
Larinopoda eurema			
Epitola sp.		✓	One hindwing found on ground
Stempfferia sp.			
Epitolina dispar			
Oxylides faunus faunus			
Dapidodigma hymen			
Axiocerces harpax			
Iolaus eurisus			
Iolaus paneperata	✓	✓	
Iolaus iasis iasis			
Hypolycaena sp.			At least two species
Pilodeudorix virgata			
Pilodeudorix violetta			
Pilodeudorix sp.			Smaller species than *P. violetta*
Hypomyrina mimetica			
Anthene rubricinctus			
Anthene sylvanus sylvanus			
Anthene larydas			
Anthene lachares lachares			
Anthene radiata		✓	
Anthene scintillula aurea	✓	✓	
Neurellipes lusones fulvimacula			
Triclema sp.			At least two species
Cupidesthes sp.			
Uranothauma falkensteini			
Tuxentius carana kontu			
Thermoniphas micylus micylus			
Oboronia ornata ornate			
Azanus isis			
Zizina antanossa			

Nymphalidae	New?	Appendix II	Minor Notes
Danaus chrysippus chrysippus			
Amauris niavius niavius			
Amauris tartarea tartarea			
Amauris hecate hecate			
Melanitis leda			
Elymniopsis bammakoo bammakoo			
Bicyclus xeneas occidentalis			
Bicyclus evadne		✓	
Bicyclus ephorus ephorus			
Bicyclus zinebi			
Bicyclus procora			
Bicyclus trilophus jacksoni	✓	✓	
Bicyclus ignobilis ignobilis			
Bicyclus nobilis			
Bicyclus taenias			
Bicyclus vulgaris			
Bicyclus dorothea dorothea			
Bicyclus sandace			
Bicyclus sambulos unicolor			
Bicyclus sangmelinae			
Bicyclus dekeyseri			
Bicyclus madetes			
Bicyclus martius martius			
Hallelesis halyma			
Ypthima sp.			
Charaxes fulvescens senegala			
Charaxes protoclea protoclea			
Charaxes cynthia cynthia			
Charaxes brutus brutus			
Charaxes tiridates tiridates			
Charaxes imperialis imperialis			
Charaxes ameliae doumeti			
Charaxes hadrianus			
Charaxes zingha			
Charaxes eupale eupale			
Charaxes anticlea anticlea			
Charaxes pleione pleione			
Euxanthe eurinome eurinome			
Palla ussheri ussheri			
Kallimoides rumia rumia			
Hypolimnas misippus			
Hypolimnas anthedon anthedon			
Hypolimnas salmacis salmacis			
Protogoniomorpha parhassus			

Nymphalidae (cont.)	New?	Appendix II	Minor Notes
Junonia orithya madagascariensis			
Junonia oenone oenone			
Junonia sophia sophia			
Junonia stygia			
Junonia terea terea			
Cyrestis camillus camillus			
Byblia anvatara crameri			
Mesoxantha ethosea ethosea			
Ariadne enotrea			Probably two species
Neptidopsis ophione ophione			
Eurytela dryope dryope			
Eutytela hiarbas hiarbas			
Cymoythoe egesta egesta			
Cymothoe caenis			
Cymothoe jodutta jodutta			
Pseudoneptis bugandensis ianthe			
Pseudacraea eurytus			
Pseudacraea lucretia lucretia			
Pseudacreae semire			
Neptis nemetes nemetes			
Neptis puella	✓	✓	
Neptis najo type			
Neptis nysiades			
Neptis nicoteles			
Neptis nicobule			
Neptis mixophyes			
Neptis trigonophora melicertula			
Neptis melicerta			
Catuna crithea			
Catuna oberthueri			
Catuna angustatum			
Hamanumida daedalus			
Aterica galene galene			
Cynandra opis opis			
Euriphene incerta incerta	✓	✓	
Euriphene veronica			
Euriphene grosesmithi muehlenbergi	✓	✓	
Euriphene simplex			
Euriphene amicia gola			
Euriphene aridatha feronia			
Euriphene taigola	✓	✓	
Euriphene lomaensis	✓	✓	
Euriphene gambiae vera			
Euriphene ampedusa			
Euriphene atossa atossa			
Euriphene doriclea doriclea			

Nymphalidae (cont.)	New?	Appendix II	Minor Notes
Bebearia tentyris	✓	✓	
Bebearia osyris			
Bebearia carshena			
Bebearia zonara			
Bebearia oxione oxione			
Bebearia barce barce			
Bebearia mardania			
Bebearia cocalia cocalia			
Bebearia sophus sophus			
Bebearia arcadius			
Bebearia laetitia laetitia			
Bebearia warrengashi	✓	✓	
Bebearia maledicta			
Euphaedra mariaechristinae	✓	✓	
Euphaedra judith judith			
Euphaedra xypete			
Euphaedra hebes			
Euphaedra modesta	✓	✓	
Euphaedra ceres ceres			
Euphaedra phaethusa aurea			
Euphaedra francina francina			
Euphaedra zampa			
Euphaedra perseis			
Euphaedra harpalyce harpalyce			
Euphaedra eupalus			
Acraea circeis			
Acraea alciope			
Acraea lycoa			
Acraea serena			
Acraea bonasia bonasia			
Acraea rogersi rogersi			
Acraea zetes zetes			
Acraea quirina quirina			
Acraea neobule neobule			
Acraea vestalis vestalis			
Acraea macaria			
Acraea umbra umbra			
Acraea epaea epaea			
Lachnoptera anticlia			
Phalanta eurytis eurytis			

Appendix I – Species List

Hesperidae	New?	Appendix II	Minor Notes
Coeliades chalybe chalybe			
Coeliades forestan forestan			
Pyrrhochalcia iphis			
Tagiades flesus			
Eagris denuba denuba			
Eagris decastigma	✓	✓	
Sarangesa tertullianus			Field observation only
Sarangesa brigida			Field observation only
Spialia sp.			Field observation only
Gorgyra sp.			
Ceratrichia phoicon			
Ceratrichia semilutea			
Ceratrichia crowleyi			
Ceratrichia nothus nothus			
Pardaleoes incerta murcia	✓	✓	
Pardaleodes sator sator			
Xanthodisca rega			
Paracleros sp.			
Acleros ploetzi			
Semalea sp.			Could be more than one species
Hypoleucis ophiusa ophiusa			
Hypoleucis tripunctata tripunctata			
Meza mabillei			
Paronymus xanthias xanthias	✓	✓	
Paranumus nevea	✓	✓	
Andronymus caesar caesar			
Andronymus hero			
Gamia shelleyi	✓	✓	
Pteroteinon iricolor			
Pteroteinon caenira			
Leona binoevatus	✓	✓	
Leona meloui			
Leona luehderi luehderi	✓	✓	
Caenides sp.			Looks different from other two
Caenides kangvensis	✓		
Caenides dacela			
Monza sp.			
Melphina tarace			
Melphina malthina			

The following list concerns only those species that were either found for the first time in Liberia or that for other reason are of particular interest

Belenois aurota Fabricicus, 1793
This common species is normally found in dry habitats in the Sudan savannah regions. The species is, however, strongly migratorial and has therefore been recorded in almost any region. This is the first record of this species in Liberia but it's not a representative of the fauna of Sapo, more a vagrant passing by.

Mimeresia semirufa Grose-Smith, 1902
This is a somewhat rare forest butterfly that has previously only been found in Ghana and Côte d'Ivoire. This is the first record of the species in Liberia and should also be the most westernmost finding so far.

Mimeresia cellularis Kirby, 1890
This is a very rare butterfly in West Africa and also never found west of the Abidjan area in Côte d'Ivoire so finding it in Liberia was not expected. According to Larsen (2005) it has not been recorded in West Africa since 1965. It is possible that this is a odd specimen of *M. issia* (a species known from Sierra Leone).

Epitola sp.
This record is based on the finding of a single hind wing lying on the ground in the forest. A bird eating the butterfly likely dislodged it, and since the wing was damaged it has not possible to determine the exact species. The only member of the genus that has been recorded for Liberia is *Epitola uranaia*, but since both the other West African species (*E. posthumus* and *E. uranoides occidentalis*) are likely to be present in Liberia it has to remain as undetermined further than to genus level. Sáfián Szabolcs (personal communication) studying digital images of the wing and believes it to be from *E. posthumus*.

Iolaus paneperata Druce, 1890
This is a somewhat rare butterfly not previously recorded form Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected.

Anthene radiata Bethune-Baker, 1910
This is a rare butterfly in West Africa. It is previously recorded from Liberia but only as a single specimen from the 1960:s and also known from Sierra Leone. In Sapo the species was definitely not common, but a handful of individuals was observed all perched on low tree saplings in a clearing in the forest edge.

Anthene scintillula aurea Bethune-Baker, 1910
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected.

Bicyclus evadne Cramer, 1779
This is a locally common deep forest butterfly. It is described as two distinct subspecies (*B. evadne evadne* and *B. evadne elionas*) that are supposed to have a narrow contact zone in western Côte d'Ivoire. The nominate form is described from the western part of the distribution (Type locality is Sierra Leone) and the females in the western area are supposed to lack the apical band present in *elionas*. In Sapo females varied broadly from having a full band to completely missing it. This suggests a much broader contact zone not typical for distinct subspecies and it is possible that the separation into subspecies in this case is unjustified. The species was very common in Sapo flying along almost any path in the forest and a regular visitor to the bait traps.

Bicyclus trilophus jacksoni Condamin, 1961
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected. It is a small species mostly found in the deep shady parts of the forest so it easily goes unnoticed. All specimens caught in this survey were taken in bait traps.

Neptis puella Aurivillius, 1894
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected. It is a generally rare east of Nigeria, being more frequent in Central Africa.

Euriphene incerta incerta Aurivillius, 1912
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected. It is a generally rare east of Nigeria, being more frequent in Central Africa.

Euriphene grosesmithi muehlenbergi Hecq, 1995
This is a very scarce butterfly west of Nigeria and never found before further west than the eastern parts of Côte d'Ivoire. One female were found and probable males were observed in the field, but never caught. The specimen collected is much smaller than what is normal for the species, and the broad apical band so typical of the females is narrow. The underside is highly characteristic, so there should still be no doubt regarding the identification.

Euriphene taigola Sáfián & Warren-Gash, 2010
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected. As it was just recently described it is not strange that it has been overlooked before. It was rather common in Sapo.

Euriphene lomaensis Belcastro, 1986
This butterfly was previously not recorded from Liberia, but since it is known to occur in both Sierra Leone and Côte d'Ivoire, its presence in Sapo was not unexpected. During this survey a female *Euriphene* was caught that must be the female of *E. lomaensis*, this is the first time a female has been seen, and it awaits proper description (picture on next page).

Bebearia tentyris Hewitson, 1866
This butterfly was previously not recorded from Liberia, but since it never been recorded further west than eastern parts of Côte d'Ivoire its presence in Sapo was a bit unexpected.

Bebearia warrengashi Hewitson, 1866
This butterfly was previously not recorded from Liberia. It is only known from a single forest in Côte d'Ivoire but as the species in this group are hard to separate and the collected specimens are somewhat worn this record is a bit doubtful.

Euphaedra mariaechristinae Hecq & Joly, 2003
This butterfly was previously not recorded from Liberia. It was believed to be restricted to the eastern parts of Côte d'Ivoire and Ghana.

Euphaedra modesta Hecq, 1982
This butterfly was previously not recorded from Liberia but as it is known from the areas in Côte d'Ivoire immediately east of Sapo it was not an unexpected discovery.

Euriphene lomaensis Belcastro, 1986
Sapo NP, Liberia - December 2009

A pair of *Euriphene lomaensis* collected in December 2009 in Sapo Natiaonal Park (Liberia). The female (left) was previously unknown but based on the pattern of the underside it is considered to be the same species as the male. Further studies will be done before this record is formally published and the female described in detail.

Eagris decastigma Mabille, 1891
This rare butterfly was previously not recorded from Liberia but as it is known from both Sierra Leone and Côte d'Ivoire it was not an unexpected discovery.

Pardaleodes incerta murcia Plötz, 1883
This butterfly is reasonably common in West Africa, but since it usually occurs in the Savannah/Forest transition areas it has not been recorded from Liberia before.

Paronymus xanthias xanthias Mabille, 1891
This somewhat rare butterfly was previously not recorded from Liberia but as it is known from both Sierra Leone and Côte d'Ivoire it was not an unexpected discovery.

Paronymus nevea Druce, 1910
This is a rare butterfly with a patchy distribution throughout tropical Africa. It has previously been recorded from the Nimba region in Guinea, so even though it is very local in its occurrence finding it in Liberia was not fully unexpected.

Gamia shelleyi Sharpe, 1890
This rare butterfly was previously not recorded from Liberia but as it is known from both Nimba in Guinea and Côte d'Ivoire it was not an unexpected discovery. It was reasonably common which is normally not the case with the large skippers in this genus.

Leona binoevatus Mabille, 1891
This is a very rare butterfly, and were up until very recently never recorded further west than Ghana. During a survey made 2008 in Gola Forest, on the Sierra Leone side, it was recorded so finding it in Sapo was not fully surprising.

Leona luehderi luehderi Plötz, 1879
This rare butterfly was previously not recorded from Liberia but as it is known from both Sierra Leone and Côte d'Ivoire it was not an unexpected discovery.

Caenides kangvensis Holland, 1896
This butterfly was previously not recorded from Liberia but as it is known from Côte d'Ivoire and further east it was not fully unexpected to be in Liberia as well.