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Front cover: *Chrysoritis dicksoni* ♂ in typical pose on dry twig: A. Curle
Back cover: *Chrysoritis dicksoni* in copula: A. Curle

The plot thickens - *Chrysoritis dicksoni* (Gabriel, 1947): Some recent field observations

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Introduction

The Southern African Butterfly Conservation Assessment (SABCA) Project and permits issued by various Nature Conservation organizations have been of tremendous assistance and an encouragement towards exploring and evaluating areas not previously researched in South Africa. This led directly to our findings and this paper presents some observations and facts which may be of value, particularly to promote conservation. It is not intended to be a scientific paper.

Field Work

Efforts to find new localities of *Chrysoritis dicksoni* in the westernmost areas of the Western Cape (Melkbosstrand) have not proved successful as yet. Neither have viable populations been traced near Vermaaklikheid. This does not mean the butterfly is no longer there; it simply means that the authors have not had the good fortune to locate the species in those areas. It was decided to expand the search to the Witsand area where one spot is well known and well protected by a farmer. The second spot near the Witsand rubbish dump has long been overgrown by alien vegetation (*Acacia cyclops*). The Afrikaans term " Rooikrans " is often used for this plant.

On 6 September 2008 Chris Ficq was lucky enough to run into a large population of *Chrysoritis dicksoni* on the farm Westfield near Witsand. The portion of the farm containing the butterfly belongs to Stellenbosch University but is presently leased to a farmer to run his cattle. The authors paid a short visit to the site in September 2009. Unfortunately, because of time constraints and the distances to be travelled, no detailed studies could be done. Yet a quick analysis of the situation suggests that some urgent intervention to secure the future of the species in this area is essential.

Observations

The word "colony" is intentionally avoided as the observations by the authors do

not support the idea that the species lives in colonies. Heath & Brinkman (1995) presented data on the life history, distribution and population fluctuations of *C. dicksoni* based on specimens recorded over many years in the west near Cape Town. The numbers recorded were extremely low and cannot be compared to the large numbers observed at the Westfield site. In this paper Heath refers to Clark and Dickson (1971) who noted that the species exhibited gregarious behaviour, the males in particular tending to congregate in little spots of their own. He further quotes Cottrell (1978) who noted that the females did not display the same attachment to a localized area as did the males. All this was confirmed by the authors who during their observations noted males congregating in small areas which are here termed "leks". Females were not present during the male gatherings. Males would chase each other within their "patch". Sometimes four or five whirled around each other, although at times there were greater numbers, only to break from their aerial battles and return to a favourite branch, twig, bush or rock on the ground. They stayed fairly low usually flying not much higher than about 300 mm above the ground. The males congregated down towards the bottom of a gentle slope, although one or two were seen from time to time on top of a rise. The veld type is perhaps Strandveld with rocky low dunes. It is doubtful if the species ever "hill tops" in the truest sense.

Very few ant nests were found within these male "territories". Females fly at random and were often found on their own flying about the veld. Attempts to follow them in order to see them laying proved difficult and unfortunately no egg laying activity was observed although one female was found within a bush housing an ants' nest. No eggs were found and she eventually flew away. On a number of occasions a female was observed flying through a male lek and males immediately chased her vigorously. Then too, when a male fluttered resolutely above a female, it seemed that he beat her onto a bush – not unlike an *Acraea* in mating mode. As she clutched at a branch he then sat next to her facing the same way nearly at a zero angle and then as he turned his abdomen to clasp hers he slowly faced away at a forty five-degree angle. The mating lasted but a few minutes and she flew off only to be "attacked" once again by a completely different male and mated again. This time the male ended up in the grass well below the female but just close enough to join their abdomens. They remained in this awkward position for a few minutes before going their separate ways. The female rested for some time before heading across the veld and the male returned immediately to his lek and old perch looking outwards away from the shrub behind him. There is some significance to the fact that males seem to lek, form groups and hold small territories from suitable perches. At the same time females seem to patrol the larger area seeking out leks and males.

The males prefer the lower parts of a gentle slope where there are a few low

scattered bushes. The ant nests in the general area seemed to be those of *C. peringueyi* although no positive identification was done. The ant nests located were all in or at the base of four different plants. Why these plants were preferred could not be deduced. An attempt was made to identify the plants and the information received with the kind assistance from Andrew Morton through The Compton Herbarium, Kirstenbosch Research Centre, South African National Biodiversity Institute, Kirstenbosch National Botanical Garden in Cape Town was that they are *Asparagus capensis*, *Passerina galpinii*, *Nylandtia spinosa* and a *Lycium* sp. (not positively identified but perhaps *L. ferocissimum* or "slangbessie"). No scale insects were noted in the vicinity of the ant nests but it is admitted that no concerted effort was made to locate them. The male butterflies sometimes used the same plants for their leks but not many ant nests were found within the male territories. Also, the nests were scattered in various other vegetation types. Some were on the top of a rise, others in a marshy area or heavily grassed areas on the flats. The soil should be analysed as the plants identified do not grow to their full potential in the area although they may be kept low by grazing cattle. Throughout the area of observation the alien plant *Acacia cyclops* is present to a greater or lesser degree and this is discussed later. This plant grows within all the micro-habitats in the wider area and is very widespread. It is undoubtedly the plant referred to in the literature as the alien vegetation that destroyed the locality at the town of Witsand (*vide* Heath & Brinkman, 1995).

Threats

It is clear that *Chrysoritis dicksoni* faces enormous challenges in the future.

The area near the town of Witsand used to be suitable for the butterfly but this is not the case any longer as that habitat now largely consists of *Acacia cyclops*, with no host ants being present. This alien is growing over a wide area on the farm Westfield. There have been some efforts made (by persons unknown) to contain the plant by cutting it down. This practice has ceased and hearsay has it that funds provided for its eradication have run out. Whatever the reason this is not an adequate method of control as the plants cut at ground level simply continue growing, usually with more stems – coppice growth – than they had in the first place. The plant has an extremely long tap root (see photograph) and this is difficult to remove even in the case of fairly small plants. Poison may be a solution although this would have to be very selective and controlled. This alien plant is by far the most obvious and ever present threat as the entire area could be overrun within a few years. This danger should not be underestimated. An example of its negative impact is the disappearance of this butterfly species from an area only a few kilometres away from the present site at the town of Witsand.

The area is presently used for cattle farming and there is no evidence to suggest that this in itself is a problem. If the cattle assist with the spread of the alien plant then that is a danger. On the other hand most of the shrubs growing in the area do not grow to their full size and this may be caused by the cattle grazing most of the fresh shoots. This may keep the veld in prime condition for the ants and the butterfly. We unfortunately don't know what part herbivores played in the region prior to the arrival of human populations.

Unfortunately the site is close enough to the town of Witsand to one day be subjected to the building of a holiday resort or urban development. One hopes and assumes, without much confidence, that any such development would be preceded by a full environmental study and report.

The host ant nests are not numerous and in fact the authors were surprised just how few ant nests seem to support a large population of butterflies. One immediate concern is that great care needs to be taken when any ant studies are undertaken. It is imperative to limit the number of ant nests interfered with at the site. The authors refrained from touching or disturbing any ant nests but sadly have to report that during the period 13th to 19th September 2009 something or someone destroyed four nests close to the main flying areas of the butterfly. In the opinion of the authors this type of loss is not sustainable. An appeal is made to all lepidopterists not to interfere with any ant nests in the area.

The habit of the female wandering hither and thither may have contributed to the loss of the species on the west coast. It is the opinion of the authors that this species will require a large conservation area to maintain a viable population. It is envisaged that the study of this species will have a large impact on recommendations for the future conservation of many of our Lycaenidae by stipulating areas which are not too small for continued viability in the long term. The observation that small tiny “subcolonies” of this species have disappeared seems to support this theory (Heath & Brinkman, 1995).

The area is close enough to wheat growing land to be affected if any crop spraying is done. The authors were unable to determine if any crop spraying takes place at present. Perhaps any further studies should include details of any crop spraying, the chemicals used and a study to see if or what chemical residues are present in the soils or plants.

On a more speculative note global warming may constitute a problem if the environment is much changed. There is no immediate or local solution to this but it cannot be ignored. At roughly thirty-five metres above sea level there should be no

flooding but a sea level rise might influence the local ecosystem as the water table rises ever closer to the ground surface. How this would impact on this ecosystem remains to be seen.

There are sure to be other concerns regarding the future of the butterfly and the authors believe the list provided is at best tentative.

Conclusions

These observations are somewhat anecdotal and can hardly been used for scientific purposes. Therefore the purpose of this paper would seem of little value, but could supplement a full scientific evaluation. The authors feel that full scientific studies are urgently needed and some protection should forthwith be put in place. While scientific studies on soil, plants, ants and the general environment are of great importance the authors suggest that a much more detailed behavioural study of this species will be necessary. Its future may hinge on its behaviour characteristics. The dangers posed to the Cape Town populations (West Coast) and clearly defined by Cottrell were completely ignored (Heath & Brinkman, 1995) and nothing was done to protect the species. While the exact reasons for its sudden demise in the Cape Town area were never identified there was a possible opportunity to have secured its future, but which was never taken. Placing the species on the Red Data list is important but this should be considered a minimum requirement. This is a second chance and the question arises "do we have the foresight and capacity to measure up to the task?" The present locality which is close to at least one other is probably only part of a larger population. It seems therefore that the whole area should be declared a conservation area and given high priority. Urgent steps are required to ensure that the present owner (Stellenbosch University) is made aware of the natural assets it holds and together with Western Cape Nature Conservation, Lepidopterists' Society of Africa, other conservation bodies or special interest groups are brought together to develop and ensure the implementation of a plan for action. The area also contains other interesting species of Lepidoptera such as *Chrysoritis thysbe* and *Chrysoritis brooksi tearei*. To all those concerned let us not prove wanting.

Acknowledgements

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surveys in the Western Cape. To members of the Lepidopterists' Society of Africa, in particular Graham Henning and Dave Edge, for their continuous encouragement. A special thanks to Andrew Morton for arranging for the identification of plants through Kirstenbosch. Thanks also to Edwina Marinus of The Compton Herbarium of the Kirstenbosch Research Centre for co-ordinating the identification of the plants. To Doug Kroon for his guidance and constructive comments on the article and his never ending enthusiasm and encouragement in the study of Lepidoptera.

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Butterfly (Lepidoptera: Papilionoidea & Hesperioidea) records from Mount Agou and Klouto (Kouma-Konda Region, near Kpalimé), Togo Mountains, Togo (with notes on species composition in highly degraded forest habitats)

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Abstract

A short visit to Klouto (near Kpalimé), Togo Mts., Togo in April 2005 resulted in several interesting butterfly records from the country, including several species that had not previously been recorded. In April 2008 and 2009 additional expeditions were organized to conduct research on the butterfly fauna of Klouto and Mount Agou near Kpalimé. Besides these expeditions further butterfly specimens were identified from collections compiled by local collectors to be sold to tourists visiting Klouto. Altogether 170 species have been recorded from the area. *Eresina pseudofusca* Stempffer, 1961, *Myrina subornata* Lathy, 1903, *Pilodeudorix caerulea* (Druce, 1890), *Bicyclus auricruda* (Butler, 1868), *Bicyclus angulosa* (Butler, 1868), *Charaxes candiope* (Godart, [1824]), *Charaxes imperialis* Butler, 1874, *Hypolimnas dinarcha* (Hewitson, 1865), and *Gorgyra mocquerysii* Holland, 1896 were recorded from the country for the first time. The composition of the present-day butterfly fauna shows that these localities were once covered with tropical forest but what is left are only the last remnants of the original habitat with a high percentage of ubiquitous and savannah species which could survive or penetrate the area after deforestation.

Key words

Papilionoidea and Hesperioidea records, Klouto, Mt Agou, Togo, West Africa, habitat degradation, species composition

Introduction

The publication of the comprehensive work 'Butterflies of West Africa' by Torben

B. Larsen (2005) made a vast amount of information widely available to support butterfly research and conservation in the West African region. Larsen also pointed out that his work was still at an early stage so that collecting and publishing all available data would make a useful contribution to butterfly research in the region and even support tourism development. This paper contributes to the knowledge of the butterfly fauna of Kpalimé Region, southwestern Togo, with the results of three expeditions by the authors in April of 2005, 2008 and 2009. Besides presenting faunistic data, the authors analyze the ecological composition of the butterfly fauna of the study areas in the context of the probable erstwhile butterfly fauna of the forests, which once covered large areas in the Togo Mountains, as known from the adjacent sites in Ghana's Volta Region.

The Habitats:

Around Klouto

Geographical coordinates: 6°57'15.07"N 0°34'54.40"E

The village of Klouto is situated in the Togo Mountains (altitude approx. 800 m), in the Volta biogeographical region (Larsen, 2005). It lies about 17 km north of Kpalimé (the closest major town at the foothills of the Togo Mts.). The area was once covered by dry semi-deciduous forests with significantly wetter types of forest in the valleys,and with Guinea savannah on the driest hilltops, but now the local agricultural management has almost completely destroyed the original vegetation through intensive logging and burning, converting the area into arable fields producing cassava and corn. Only a few small patches of degraded forests remain along streams and on steep slopes. There is also a small park in semi-natural condition around Château Vial, an old French-built castle belonging to the president of Togo which plays an important role of refuge for several butterfly species, including quite a few members of Lipteninae which require the presence of old trees occupied by *Crematogaster* ants, as the larvae of many (probably nearly all) species in the subfamily are associated with ants. Other, still partly forested areas are mainly coffee plantations on the mountain slopes and cocoa plantations in the valleys since both coffee and cocoa require partial shading, which is provided by old trees from the original vegetation. A small plateau with Guinea savannah habitat was also visited.

Mount Agou

Geographical coordinates: 6°53'22.33"N 0°44'48.16"E

Mount Agou is the highest peak in Togo with an altitude of 986 metres. It is an isolated mountain situated south-east of the easternmost slopes of the main Togo

Mountains, but in the past there may have been a connection between the two areas through forested lowlands which allowed forest fauna to colonize the rainforest that once covered Mt. Agou. Now, the entire area is deforested; only negligible patches of the original forest vegetation can be found on the mountain. There may be small isolated forests in remote and steep valleys where the landscape did not allow the loggers to clear-fell the area, but visiting those habitats proved impossible during our trip. The habitats visited were mostly fallow farmbush with regenerating young trees, and planted old mango trees along the road banks to the top of the mountain which provide shade for the surviving forest fauna.

Faunistic Results

During three visits in western Togo in 2005, 2008 and 2009 we recorded 170 species of butterflies (Papilionoidea and Hesperioidea). The majority of the material was sampled with nets during the day, while fruit-feeding butterflies were trapped with a mixture of fermented fruits (banana, pineapple) and palm-wine. Some additional species were identified from insect collections in Klouto, compiled and framed by local collectors for sale to visiting tourists. All those specimens were said to be collected in the surroundings of Klouto village.

The abbreviations of the localities are:

KLO Klouto village and its surroundings
MTA Mount Agou

Taxonomy and nomenclature used in this paper follow Larsen (2005), except where important taxonomic changes were proposed since the publication of Larsen's work (see notes in the species list). The ecological classification of the species is based on Larsen (2006a). Although most species are centered on these habitat types, they are also able to survive in adjacent habitats. The classification of the various zones was necessarily rather rough and ready, but has been found to be useful in ecological analyses (Larsen *et al.,* 2009).

WEF wet forests
MEF mesophilous forests
DRF dry forests
ALF all forests
GUI Guinea savannah (dense savannah)
SUD Sudan savannah (open savannah)
UBQ ubiquitous (widely distributed, generally common) species
SPEC special habitat (swamp, etc.)

Species marked with an* are recorded as new to Togo

PAPILIONIDAE
Papilio dardanus Brown, 1776 **KLO, MTA** - *ALF*
Papilio chrapkowskoides nurettini Koçak, 1983 **KLO** - *MEF*
Papilio nireus Linnaeus, 1758 **KLO, MTA** - *ALF*
Papilio menestheus Drury, [1773] **KLO** - *WEF*
Papilio demodocus Esper, [1798] **MTA** - *UBQ*
Graphium angolanus baronis (Ungemach, 1932) **KLO** - *UBQ*
Graphium almansor carchedonius (Karsch, 1895) **KLO** - *DRF*
Graphium adamastor (Boisduval, 1836) **KLO** - *DRF*
Graphium leonidas (Fabricius, 1793) **KLO** - *UBQ*

PIERIDAE
Catopsilia florella (Fabricius, 1775) **KLO, MTA** - *UBQ*
Eurema hecabe solifera (Butler, 1875) **KLO** - *UBQ*
Eurema brigitta (Stoll, [1780]) **KLO** - *GUI*
Nepheronia argia (Fabricius, 1775) **KLO** - *ALF*
Nepheronia thalassina (Boisduval, 1836) **MTA** - *ALF*
Colotis euippe (Linnaeus, 1758) **MTA** - *UBQ*
Belenois theora (Doubleday, 1846) **KLO** - *MEF*
Appias epaphia (Cramer, [1779]) **KLO** - *UBQ*
Leptosia alcesta (Stoll, [1782]) **MTA** - *ALF*
Mylothris chloris (Fabricius, 1775) **KLO** - *UBQ*
Mylothris aburi Larsen & Collins, 2004 **KLO, MTA** - *DRF*
Mylothris jaopura Karsch, 1893 **MTA** - *ALF*
Mylothris schumanni Suffert, 1904 **MTA** - *MEF*

LYCAENIDAE
Spalgis lemolea pilos Druce, 1890 **KLO, MTA** - *DRF*
Pentila pauli Staudinger, 1888 **KLO, MTA** - *DRF*
Pentila picena Hewitson, 1874 **KLO** - *MEF*
Mimacraea neurata Holland, 1895 **KLO** *WET*
Mimeresia libentina (Hewitson, 1866) **KLO** *ALF*
Eresiomera bicolor (Grose-Smith & Kirby, 1890) **KLO** - *MEF*
Eresina pseudofusca* Stempffer, 1961 **KLO - *MEF*
Liptena septistrigata (Bethune-Baker, 1903) **KLO** - *DRF*
Liptena rochei Stempffer, 1951 **KLO** - *DRF*
Tetrarhanis symplocus Clench, 1965 **KLO, MTA** - *MEF*
Larinopoda aspidos Druce, 1890 **KLO** - *MEF*
Epitola posthumus (Fabricius, 1793) **KLO** - *MEF*
Stempfferia leonina (Staudinger, 1888) **MTA** - *MEF*

Stempfferia zelza (Hewitson, 1873) **KLO** - *WEF*
Myrina subornata* Lathy, 1903 **KLO - *GUI*
Spindasis mozambica (Bertoloni, 1850) **KLO** - *GUI*
Axiocerses harpax (Fabricius, 1775) **KLO** - *GUI*
Iolaus eurisus (Cramer, [1779]) **KLO** - *ALF*
Iolaus aethria Karsch, 1893 **KLO** - *MEF*
Hypolycaena philippus (Fabricius, 1793) **KLO** - *GUI*
Hypolycaena hatita Hewitson, 1865 **MTA** - *MEF*
Pilodeudorix camerona (Plötz, 1880) **MTA** - *MEF*
Pilodeudorix diyllus (Hewitson, 1878) **KLO** - *MEF*
Pilodeudorix caerulea* (Druce, 1890) **KLO - *GUI*
Paradeudorix eleala viridis (Stempffer, 1964) **KLO, MTA** - *ALF*
Deudorix antalus (Hopffer, 1855) **KLO** - *GUI*
Anthene rubricinctus (Holland, 1891) **KLO** - *MEF*
Anthene sylvanus (Drury, [1773]) **KLO, MTA** - *ALF*
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Euchrysops malathana (Boisduval, 1833) **KLO** - *UBQ*
Lepidochrysops synchrematiza (Bethune-Baker, 1923) **MTA** - *GUI*
Thermoniphas micylus (Cramer, [1780]) **KLO, MTA** - *MEF*
Oboronia punctatus (Dewitz, 1879) **KLO** - *MEF*
Azanus mirza (Plötz, 1880) **KLO, MTA** - *UBQ*
Azanus isis (Drury, [1773]) **MTA** - *ALF*
Zizina antanossa (Mabille, 1877) **MTA** - *GUI*
Zizula hylax (Fabricius, 1775) **MTA** - *UBQ*

NYMPHALIDAE
Libythea labdaca Westwood, 1851 **MTA** - *ALF*
Danaus chrysippus (Linnaeus, 1758) **KLO** - *UBQ*
Tirumala petiverana (Doubleday, 1847) **MTA** - *GUI*
Amauris niavius (Linnaeus, 1758) **KLO, MTA** - *GUI*
Amauris tartarea Mabille, 1876 **MTA** - *ALF*
Gnophodes betsimena (Boisduval, 1833) **KLO, MTA** - *ALF*

Melanitis libya Distant, 1882 **KLO** - *UBQ*
Elymniopsis bammakoo (Westwood, [1851]) **KLO** - *ALF*
Bicyclus vulgaris (Butler, 1868) **KLO** - *ALF*
Bicyclus dorothea (Cramer, [1779]) **KLO** - *ALF*
Bicyclus sandace (Hewitson, 1877) **KLO** - *ALF*
Bicyclus sangmelinae Condamin, 1963 **KLO** - *WEF*
Bicyclus auricruda* (Butler, 1868) **KLO - *MEF*
Bicyclus angulosa* (Butler, 1868) **KLO - *GUI*
Bicyclus funebris (Guérin-Méneville, 1844) **KLO** - *DRF*
Bicyclus madetes (Hewitson, 1874) **KLO, MTA** - *MEF*
Bicyclus martius (Fabricius, 1793) **KLO, MTA** - *MEF*
Ypthima doleta Kirby, 1880 **KLO**, **MTA** - *ALF*
Ypthimomorpha itonia (Hewitson, 1865) **KLO** - *SPEC*
Charaxes varanes vologeses (Mabille, 1876) **KLO** - *GUI*
Charaxes fulvescens senegala van Someren, 1975 **KLO** - *ALF*
Charaxes candiope* (Godart, [1824]) **KLO - *GUI*
Charaxes protoclea Feisthamel, 1850 **KLO** - *ALF*
Charaxes boueti Feisthamel, 1850 **KLO** - *DRF*
Charaxes lactetinctus Karsch, 1892 **KLO** - *GUI*
Charaxes epijasius Reiche, 1850 **KLO** - *GUI*
Charaxes castor (Cramer, [1775]) **KLO** - *DRF*
Charaxes tiridates (Cramer, [1777]) **KLO** - *ALF*
Charaxes numenes (Hewitson, 1859) **MTA** - *ALF*
Charaxes imperialis* Butler, 1874 **KLO - *ALF*
Charaxes achaemenes atlantica van Someren, 1970 **KLO** - *GUI*
Charaxes eupale (Drury, 1782) **KLO, MTA** - *ALF*
Charaxes cedreatis Hewitson, 1874 **KLO** - *MEF*
Charaxes viola Butler, 1866 **MTA** - *GUI*
[1]*Charaxes eurinome* (Cramer, [1775]) **KLO** - *MEF*
Precis octavia (Cramer, [1777]) **KLO, MTA** - *GUI*
Precis pelarga (Fabricius, [1775]) **KLO, MTA** - *ALF*
Hypolimnas misippus (Linnaeus, 1764) **KLO, MTA** - *UBQ*
Hypolimnas anthedon (Doubleday, 1845) **KLO, MTA** - *ALF*
Hypolimnas dinarcha* (Hewitson, 1865) **KLO - *WEF*
Hypolimnas salmacis (Drury, [1773]) **KLO** - *MEF*
Salamis cacta (Fabricius, 1793) **KLO** - *MEF*
Protogoniomorpha cytora (Doubleday, 1847) **KLO** - *MEF*
Protogoniomorpha parhassus (Drury, 1782) **KLO** - *MEF*
Protogoniomorpha anacardii (Linnaeus, 1758) **KLO** - *DRF*
Junonia hierta cebrene Trimen, 1870 **KLO** - *SUD*
Junonia sophia (Fabricius, 1793) **KLO** - *ALF*

Junonia stygia (Aurivillius, 1894) **KLO, MTA** - *ALF*
Junonia chorimene (Guérin-Méneville, 1844) **KLO, MTA** - *GUI*
Junonia terea (Drury, [1773]) **MTA** - *ALF*
Catacroptera cloanthe ligata Rothschild & Jordan, 1903 **KLO** - *GUI*
Cyrestis camillus (Fabricius, 1781) **KLO, MTA** - *ALF*
Byblia anvatara (Boisduval, 1833) **KLO** - *UBQ*
Mesoxantha ethosea (Drury, 1782) **KLO, MTA** - *MEF*
Ariadne enotrea (Cramer, [1779]) **KLO** - *ALF*
Neptidopsis ophione (Cramer, [1777]) **KLO** - *ALF*
Harma theobene Doubleday, 1848 **KLO** - *MEF*
[2]*Cymothoe druryi* van Velzen & Larsen, 2009 **KLO** - *ALF*
Cymothoe coccinata (Hewitson, 1874) **KLO** - *MEF*
Pseudacraea lucretia (Cramer, [1775]) **KLO** - *ALF*
Neptis metella (Doubleday, 1848) **KLO, MTA** - *ALF*
Neptis serena Overlaet, 1955 **KLO, MTA** - *DRF*
Neptis troundi Pierre-Baltus, 1978 **KLO** - *MEF*
Hamanumida daedalus (Fabricius, 1775) **MTA** - *GUI*
Aterica galene (Brown, 1776) **KLO** - *ALF*
Euriphene barombina (Aurivillius, 1894) **KLO** - *ALF*
Bebearia sophus (Fabricius, 1793) **KLO, MTA** - *ALF*
Euphaedra medon (Linnaeus, 1763) **KLO** - *ALF*
Euphaedra ruspina (Hewitson, 1865) **KLO** - *WEF*
Acraea translucida Eltringham, 1912 **KLO** - *MEF*
Acraea peneleos Ward, 1871 **KLO, MTA** - *ALF*
Acraea alciope Hewitson, 1852 **MTA** - *ALF*
Acraea lycoa Godart, [1819] **KLO** - *ALF*
Acraea serena (Fabricius, 1775) **KLO, MTA** - *UBQ*
Acraea egina (Cramer, [1775]) **KLO** - *ALF*
Acraea pseudegina Westwood, 1852 **KLO** - *UBQ*
Acraea zetes (Linnaeus, 1758) **KLO** - *DRF*
Acraea quirina (Fabricius, 1781) **KLO** - *ALF*
Acraea neobule Doubleday, 1847 **KLO** - *UBQ*
Acraea eugenia Karsch, 1893 **KLO** - *DRF*
Acraea umbra (Drury, 1782) **KLO** - *MEF*
Acraea epaea (Cramer, [1779]) **KLO** - *ALF*
Phalantha phalantha (Drury, [1773]) **KLO** - *UBQ*

HESPERIIDAE
Coeliades forestan (Stoll, [1782]) **KLO, MTA** - *UBQ*
Coeliades pisistratus (Fabricius, 1793) **KLO, MTA** - *ALF*
Celaenorrhinus galenus (Fabricius, 1793) **KLO, MTA** - *ALF*
Celaenorrhinus proxima maesseni Berger, 1976 **MTA** - *ALF*

Tagiades flesus (Fabricius, 1781) **MTA** - *ALF*
Eagris denuba (Plötz, 1879) **KLO** - *ALF*
Eretis plistonicus (Plötz, 1879) **KLO, MTA** - *ALF*
Sarangesa thecla (Plötz, 1879) **KLO, MTA** - *ALF*
Spialia ploetzi occidentalis de Jong, 1977 **KLO, MTA** - *ALF*
Gomalia elma (Trimen, 1862) **MTA** *DRF*
Astictopterus abjecta (Snellen, 1872) **KLO** - *GUI*
Gorgyra mocquerysii* Holland, 1896 **KLO - *ALF*
Pardaleodes edipus (Stoll, [1781]) **KLO** - *ALF*
Acleros mackenii olaus (Plötz, 1884) **MTA** - *ALF*
Meza meza (Hewitson, 1877) **KLO** - *ALF*
Pteroteinon caenira (Hewitson, 1867) **KLO** - *ALF*
Platylesches galesa (Hewitson, 1877) **KLO** - *ALF*
Pelopidas mathias (Fabricius, 1798) **KLO, MTA** - *UBQ*
Borbo perobscura (Druce, 1912) **KLO, MTA** - *GUI*
Gegenes hottentota (Latreille, [1824]) **KLO** - *GUI*

[1] The genus *Euxanthe* Hübner, [1819] was formally synonymised with *Charaxes* Ochsenheimer, 1816 by Aduse-Poku *et al.* (2009) based on similarities of mitochondrial DNA.

[2] The *Cymothoe caenis* species complex was recently divided by van Velzen *et al.* (2009) who described a sibling species of *C. caenis* with West African distribution (*C.druryi* van Velzen & Larsen, 2009) that actually occurs in Togo. *Cymothoe caenis* (Drury, [1773]) should therefore be deleted from the checklist of Togo.

The list of scientific papers dealing with the butterfly fauna of Togo is very short (Karsch, 1893; Bernardi, 1952; Condamin, 1952; Stempffer, 1952); most records reflected in Larsen (2005) were compiled from old museum specimens and the recent collections made by the African Butterfly Research Institute, Nairobi (ABRI), and it is therefore not surprising that butterflies are still under-recorded in the country. Our three short field trips produced ten new country records (see details below), more than 5% of the total collected species. Only a few of them are rare and all have been recorded from the adjacent Volta Region (Ghana) (Larsen, 2006b).

***Eresina pseudofusca* Stempffer, 1961**

The species is widely distributed in the Volta Region of Ghana, where it inhabits the drier forests of the hilltops. Its presence in Togo was expected; the specimens were found only around old trees in the park of the presidential castle, which hosted *Crematogaster* ants.

***Myrina subornata* Lathy, 1903**
A single female was caught of this rare savannah species as new to Togo.

***Pilodeudorix caerulea* (Druce, 1890)**
This is a Guinea savannah butterfly which has the ability to penetrate disturbed areas in the forest zone and was expected to occur in Togo.

***Bicyclus auricruda* (Butler, 1868)**
The species is generally uncommon in Ghana apart from a few forests in good condition (e.g. Atewa Range); it has also recently been caught in Kyabobo National Park and Amedzofe in the Volta Region (Ghana) (Sáfián, unpublished).

***Bicyclus angulosa* (Butler, 1868)**
A generally common and widely distributed savannah species which was expected from Togo.

***Charaxes candiope* (Godart, [1824])**
This Pan-African species is generally rare and local in Ghana, also in the Volta Region, and confined mostly to forest-savannah transition and drier outlier forests with similar structure to the original habitat cover in the mountains around Klouto.

***Charaxes imperialis* Butler, 1874**
This rare *Charaxes* has recently been recorded in Wli Nature Reserve on the Ghana-Togo border. The species is very local in Ghana. The Klouto specimens were seen in the collections compiled by locals to sell to visitors. They were collected around the castle.

***Hypolimnas dinarcha* (Hewitson, 1865)**
This is a very elusive species of forests in good condition, only solitary specimens were collected in a few locations in Ghana by Larsen (2005), including Wli Nature Reserve. Only one specimen was found by the authors in a small forest near Klouto.

***Gorgyra mocquerysii* Holland, 1896**
This is a widely distributed but generally rare forest species which was expected to be found in Togo by Larsen (2005).

Ecological overview of the butterfly fauna

The Togo Mountains form a small but quite distinctive autonomous biogeographical unit inside the Dahomey Gap, which was once covered with

tropical forest (Larsen, 2005). Although a few endemic butterfly species are known from the area (e.g. *Papilio nobicea, Capys vorgasi*), its major ecological role is in forming a clear boundary of distribution for many species. A number of forest species have never managed to cross the river Volta on the western foothills of the Togo Mts., but are represented by strong colonies in the forests right on the western edge of the Dahomey Gap (e.g. *Larinopoda aspidos*, *Euphaedra ruspina*). Unfortunately the forests of the Togo Mts. have mostly disappeared on both sides of the Ghana-Togo border due to excessive clear-felling, and it seems that destruction of the habitats is almost complete in the surveyed areas of Togo. We had difficulty in finding even small areas where remnants of the original vegetation could support the survival of the butterfly fauna. The habitat loss is also reflected in the records. While Larsen (2005) lists above 400 species from Togo, we could find only 170 species during three surveys from two areas (Klouto: 146, Mt. Agou: 68). In the first scientific publication on the butterflies of Togo, Karsch (1893) identified 202 species from the surroundings of the old German settlement Bismarckburg and the original number of species could have been actually well over 500 because most species occurring in mountains of the Volta Region, Ghana should have occurred in Togo as well (Larsen, 2006b). Even a small area of only 3 km^2 in good condition maintains butterfly diversity: the tiny Wli Falls Nature Reserve has as estimated number of about 500 species on the Ghana side of the Togo Mountains (Larsen, 2006a). Nowadays forest butterflies have a very scattered distribution pattern in the surveyed areas of Togo Mountains since they are restricted to the remaining degraded forest fragments, which are no longer able to maintain the original butterfly diversity. In the Klouto area the number of recorded species is about 30% of the estimated original (146 of the estimated 500), while the records from Mt. Agou remains below 15% (68 of the estimated 500). This is extremely low and though long-term butterfly studies or repeated surveys in a different season would probably reveal a number of further species, just finding a suitable patch of forest habitat is now very difficult. The present-day species composition still clearly indicates that the original habitats were tropical forests since the majority of the species are associated with forest habitats in both areas, but typical forest floor indicator groups, such as *Euriphene*, *Euphaedra* and *Bebearia* are almost completely missing. The highest number of species falls into the category 'all forest species (ALF)' that normally can tolerate severe habitat degradation: *Papilio dardanus*, *Nepheronia argia*, *N. thalassina*, *Leptosia alcesta*, *Anthene larydas*, *Phlyaria cyara stactalla*, *Charaxes eupale*, *Acraea alciope*, *Sarangesa thecla,* etc.

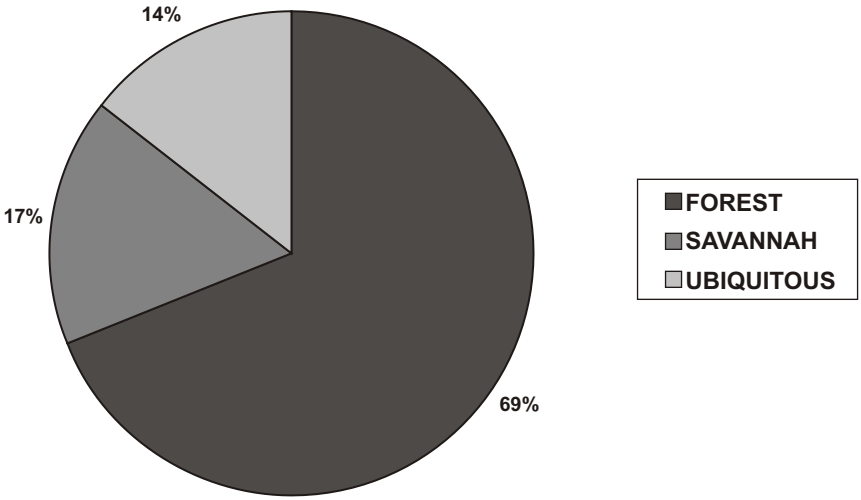

Fig. 1. Butterflies associated with the main habitat types from Klouto and Mt. Agou.

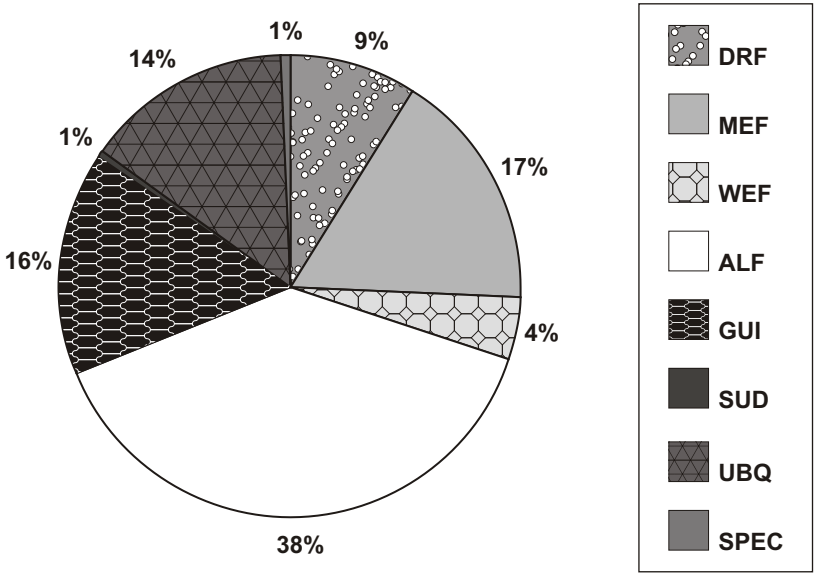

Fig. 2. Ecological composition of the butterfly species collected in Klouto and Mt. Agou.

The number of wet forest species (WEF) is very low (4%), since these species usually have no ability to tolerate habitat disturbance; none of the rare wet forest indicators, which have been recorded from the neighbouring Wli Falls and Kyabobo National Park in Ghana were found during the surveys, e.g. *Liptena pearmani*, *Kakumia otlauga*, *Neurellipes chryseostictus*, *Bicyclus italus*, *Bicyclus uniformis*, *Charaxes subornatus*, *C. doubledayi*, *Leona leonora*, *L. meloui* (Larsen, 2006b). The Sudan savannah (SUD) elements are few (1%); these species normally do not penetrate disturbed areas in the forest zone, or even Guinea savannah. A number of Guinea savannah elements naturally occur in the Togo Mountains occupying the drier hilltops of the original forest-savannah mosaic landscape (Larsen, 2006b, Sáfián unpublished), although real savannah specialists are largely missing from our samples, reflecting the fact that even dry hilltops were converted into farmland. The only two strict savannah indicator species were *Myrina subornata* and *Charaxes lactetinctus*, all other Guinea savannah centred species (GUI) found display higher tolerance for habitat degradation and might also occur in disturbed habitats (16%). These species (e.g. *Euchrysops osiris*, *Bicyclus angulosa*, *Junonia chorimene*, *Acraea caecilia*) have been recorded from dry or degraded forests in Ghana (Larsen, 2006a; Larsen *et al.,* 2007). The number of ubiquitous (UBQ) species is also high (14%); these species normally do not occur in closed canopy forest stands although they readily occupy open areas in the forest: *Catopsilia florella*, *Mylothris chloris*, *Lampides boeticus*, *Danaus chrysippus*, *Hypolimnas misippus*, *Acraea egina*, *Coeliades forestan* fall into this category. Only one species is associated with special habitat types: *Ypthimomorpha itonia* (recorded from Klouto) is known to live near swamps and floodplains according to Larsen (2005) (Figs 1-4). It is important to mention that the number of the generally forest-dwelling Lipteninae (Lycaenidae) species is relatively high in the samples compared to other forest butterfly groups. The total number of species is 13 (7,6%), which indicates that these myrmecophilous (ant-associated) species are more tolerant to climatic changes caused by deforestation if their micro habitats (trees that host nests of *Crematogaster* ants) remain intact.

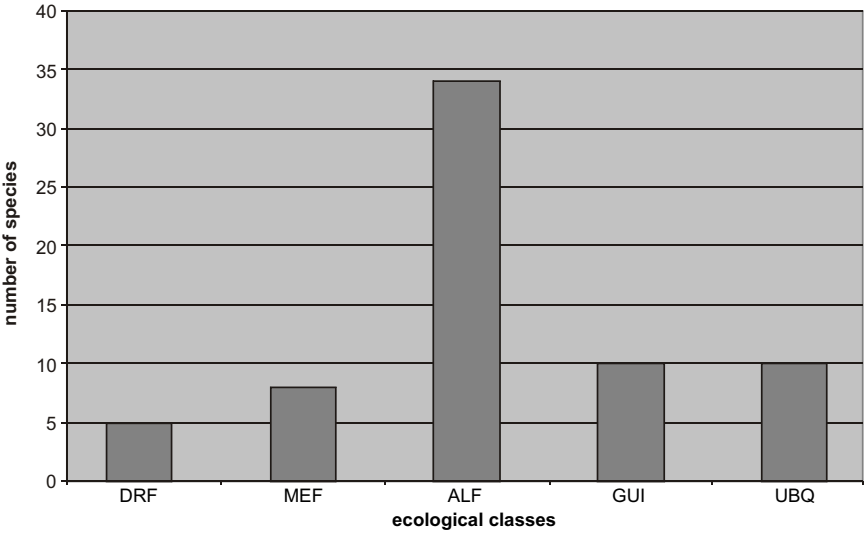

Fig. 3. Ecological composition of the butterfly species collected in Mt. Agou.

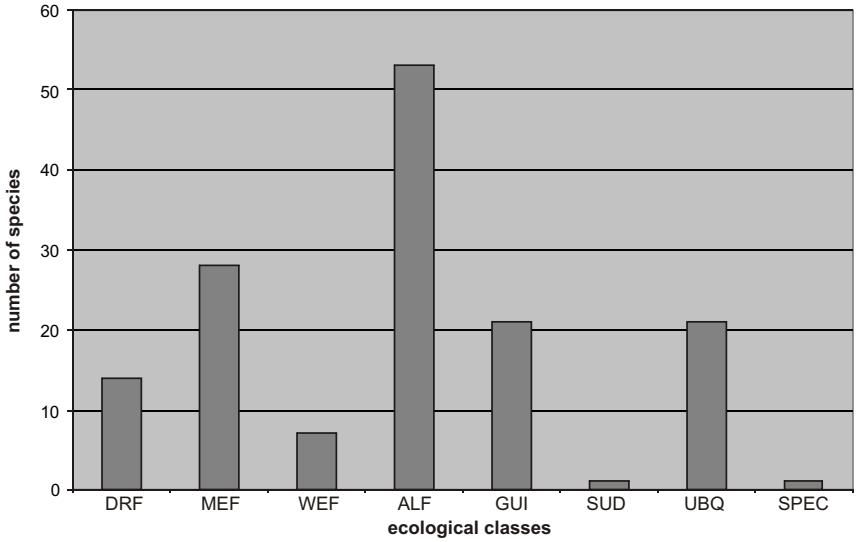

Fig. 4. Ecological composition of the butterfly species collected in Klouto.

Conclusions and Conservation Recommendations

The butterfly fauna near Klouto and Mount Agou in the Togo Mountains probably once numbered over 500 species but the original forest habitats have drastically shrunk during the last decades due to wood extraction and expansion of agriculture to the point where almost no forest habitats remain in the area. This is clearly reflected in the present-day butterfly fauna, as during three field trips we could collect only 170 butterfly species. This number of species can be observed on a single day in an intact tropical forest in West Africa. Although ten species were collected as new to the country, the reason is more the lack of scientific records than good quality habitats. Almost all species that indicate good quality forest were missing including typical forest floor groups (*Euriphene*, *Euphaedra*, *Bebearia*), while the number of ubiquitous species and species with a tolerance for habitat degradation constitute about 30% of the butterfly fauna. Although the pressure on the area and natural habitats from the local inhabitants is still extremely high, the butterfly fauna might be saved by initiation of community-based conservation projects. Since quite a few local people live from collecting and selling insects to visiting tourists, the local authorities might be convinced to create community nature reserves where a carefully selected area would be left to regenerate secondary habitats. These newly created habitats could easily be recolonized by butterfly (and other insects, birds etc.) species, now surviving only in negligibly-sized patches of the original natural habitats. They might become an important part of the local communities, playing the role of attraction for nature tourism as happened in nearby Ghana (Larsen *et al.,* 2007; Saj, 2006). Commercial collecting might turn into more sustainable nature guiding and hosting of tourists who seek recreation in a pleasant natural tropical environment. These newly created community nature reserves should be established in such a way that they host the best natural patches of habitats, include a wider range of habitat types (e.g. valleys and slopes) and other special natural attractions (waterfalls, a saved cluster of older trees, former sacred grove, etc.). Recolonization will also be supported from adjacent areas in Ghana, where biodiversity and habitats are still much more intact. The regeneration of biodiversity in such reserves can be monitored through the butterfly fauna.

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Habitat restoration and the decline of the African Grass Blue butterfly, *Zizeeria knysna* (Lepidoptera: Lycaenidae), on a small Seychelles island

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Introduction

Zizeeria knysna (Trimen), commonly known as the African Grass Blue, is a widespread species that occurs throughout the Afrotropical Region (Ackery *et al.,* 1995), including the Malagasy Subregion (Aurivillius, 1925; Lawrence, 2000a); the taxon has no recognized subspecies. Within Seychelles it has been recorded from the islands of Mahé, St Anne, Silhouette, Praslin, Aride, North, Cousine, Bird, Denis, Remire, Desroches, Farquhar and Aldabra (Fletcher, 1910; Fryer, 1912; Legrand, 1965; Gerlach *et al.,* 1997; Aride Island Research Group, 1999; Bourquin *et al.,* 2000; Gerlach *et al.,* 2001; Lawrence, 2004; 2005; Gerlach & Matyot, 2006).

The natural habitat preference of the African Grass Blue is mainly savannah, although it has colonized open areas in forested landscapes (Larsen, 2005). *Zizeeria knysna* is often seen in gardens, parks, sports fields and on the grasses bordering roads in built up areas (Swanepoel, 1953; Claassens & Dickson, 1980). On Cousine Island, Seychelles, *Z. knysna* was abundant on the coastal flat and generally absent or scarce on the forested hills (Bourquin *et al.,* 2000). The coastal flat of Cousine was until recently covered mostly with exotic scrub-type vegetation (Bourquin, 1996). A similar situation also occurs on the islands of Praslin, Mahé, Aride, and Bird, with *Z. knysna* being abundant in the open degraded habitats and rarely seen in the forested areas (J. Lawrence, *pers. obs.*).

Zizeeria knysna density on the coastal flat of Cousine has been monitored on an *ad hoc* basis over the last 11 years. The coastal flat has undergone extensive habitat restoration, in terms of exotic plant removal and re-planting with indigenous trees (Samways *et al.,* 2010). As a result, this study aims to record the decrease in *Z. knysna* density on the coastal flat of Cousine Island, Seychelles in relation to the ongoing habitat restoration programme on the island.

Site

Cousine is a small granitic island situated at 4°20'41"S and 55°38'44" E (Fig. 1a). It is just over 1 km long, 400 m at its widest point and 27 ha in area (Bourquin, 1997). The highest point on Cousine is approximately 70 m a.m.s.l.. The Seychelles experience a humid, tropical climate as defined by Tricart (1972), in that mean monthly temperatures are generally above 20°C and annual rainfall exceeds 700-800 mm. Although the climate is aseasonal, the summer NW monsoon (i.e. December to March) brings a higher rainfall than the winter SE trade winds (i.e. May to October). The transition months of April and November generally experience high rainfall (Walsh, 1984). Relative humidity varies little throughout the year, averaging 77% (Iyer & Francis, 1941).

Topographically, Cousine consists of two hills separated by a saddle, and a coastal flat on the northern and eastern sides of the island (Fig. 1b). The vegetation of the hilly region consists mostly of undisturbed forest dominated by *Euphorbia pyrifolia* Lam., *Ficus reflexa* Thunb., *F. lutea* Val., *Pisonia grandis* R.Br. and *Pandanus balfouri* Mart. trees. *Ipomoea pescaprae* (L.) R.Br. herblands, mowed grass areas (mostly *Cynodon dactylon* (L.) Pers. and *Stenotaphrum dimidiatum* (L.) Brongn.), and a secondary herbland/woodland which used to dominate the coastal flat.

Over the last several years the coastal flat has undergone an extensive restoration programme (Samways *et al.,* 2010). Large areas of *Ipomoea pescaprae* (L.) R.Br. and various exotic and/or invasive species, such as *Stachytarpheta jamaicensis* (L.) Vahl., *Amaranthus dubius* Mart. ex Thell, *Achyranthes aspera* L., *Datura metel* L., *Carica papaya* L. and *Asystasia* sp. have been removed. Although it is unclear what the original vegetation of the coastal flat was, remnants of *P. grandis* forest on the northern section of the coastal flat indicate that forest used to occupy this area (Bourquin, 1997). As a result, large numbers of indigenous trees have been planted on the coastal flat. Fig. 2 clearly illustrates the results of the habitat restoration programme.

Methods and results

Zizeeria knysna density and vegetation complexity were monitored on an *ad hoc* basis between 1998 and 2009. Data were collected on the coastal flat of Cousine Island during April 1998, April 2003, October 2005, February 2007 and April 2009. During each of the five sampling years, data were collected over a period of five days for butterfly density estimates. The vegetation complexity data were collected on a single day during each sampling year. All data were collected

between 11h00 and 13h00 on sunny days with less than 30 % cloud cover.

On each day, a transect approximately 700 m long was walked on the plateau. A small dirt and tar path was used for the position of the transect. The transect ran in a NW/SE direction and covered most of the coastal flat. Using a standard 30 m tape measure, short 30-40 cm aluminium rods were placed in the ground every 100 m along the length of the transect. All *Z. knysna* butterflies in an approximately two metre radius sample area around the aluminium rod were recorded. Sampling time was limited to a one-minute period to prevent counting an individual more than once. This gave a sample size of 35 for each year and a total sample size of 175 over the 11-year period.

In order to determine vegetation complexity within each two-metre sample area, mean vegetation height, and mean shade cover of each sample area were estimated. This gave a sample size of 10 per sample year and a total sample size of 50 over the 11-year period.

For data analysis, vegetation height was divided into three categories: 1 = low vegetation less than 0.5 m high, generally grass areas; 2 = vegetation 0.5 m to approximately two metres in height, generally exotic scrub areas, and areas with young indigenous trees; 3 = vegetation more than two metres high, generally areas dominated by indigenous trees. The percentage shade covering the sample area was also divided into three categories: 1 = less than 30 % shading covering the sample area; 2 = between 30 % and 60 % shade covering the sample area; 3 = more than 60 % shade covering the sample area.

Fig. 3 shows the mean density of *Z. knysna* (individuals per sample area), and the vegetation complexity as indicated by vegetation height and shade cover, between 1998 and 2009. Clearly, as vegetation complexity increased between 1998 and 2009, due to the extensive planting programme on Cousine Island, the density of *Z. knysna* decreased.

Discussion

Habitat restoration has been shown to benefit certain butterfly species, often increasing butterfly diversity in a restored area (e.g. Ries *et al.,* 2001; Waltz & Covington, 2004) or providing suitable habitat for particular focal species (e.g. Marttila *et al.,* 1997; Schultz, 2001; Pfitsch & Williams, 2009).

However, not all restoration programmes are of benefit to butterflies. For example, Pöyry *et al.* (2005) found no change in species richness, even five years

after the completion of a restoration programme. The results presented here clearly indicate that as the vegetation complexity increased on the coastal flat of Cousine, *Z. knysna* density decreased. This was due to the habitat of the species changing as a result of the habitat restoration programme on the island. Furthermore, during the period June 2002 to April 2003 frequent oviposition observations were made on the invasive species *Amaranthus dubius* (Lawrence, 2005). This plant was abundant in the open areas on the coastal flat (Bourquin, 1996, J. Lawrence, *pers. obs.*). *Zizeeria knysna* also showed a particular preference for *A. dubius,* with adults often observed congregating around plants (J. Lawrence,*pers. obs.*). As part of the restoration programme on the island, *A. dubius* and numerous other invasive plants were removed. The removal of this larval foodplant would certainly have had an impact on *Z. knysna.*

While these results indicate that the habitat restoration programme has had a negative impact on a formally abundant species, it must be noted that *Z. knysna* is a widespread and abundant species and certainly of no conservation concern at present. The restoration programme on Cousine has been a remarkable success in that it has provided much needed habitat for many Seychelles endemic and threatened birds (Samways *et al.,* 2010).

Although it is unclear what the original vegetation of Cousine's coastal flat was, it has been suggested that *P. grandis* forest was the dominant vegetation type (Bourquin, 1997). If this was the case, then historically the vegetation of Cousine's flat would have provided poor habitat for *Z. knysna* in terms of vegetation complexity for adult butterflies, as well as a lack of abundant foodplants for the larval stages. It is therefore likely that the replacement of the coastal flats original vegetation in the latter part of last century aided this species in becoming established and subsequently abundant on Cousine Island. A similar situation has also been suggested for *Hypolimnas misippus* (L.) on Cousine (Lawrence, 2000b).

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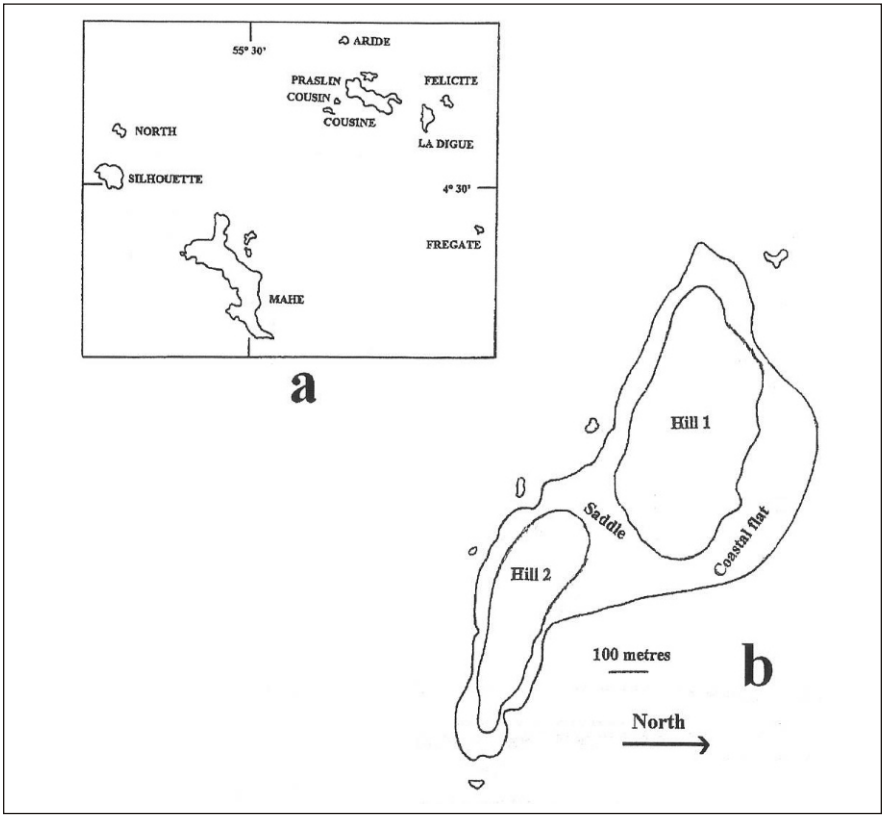
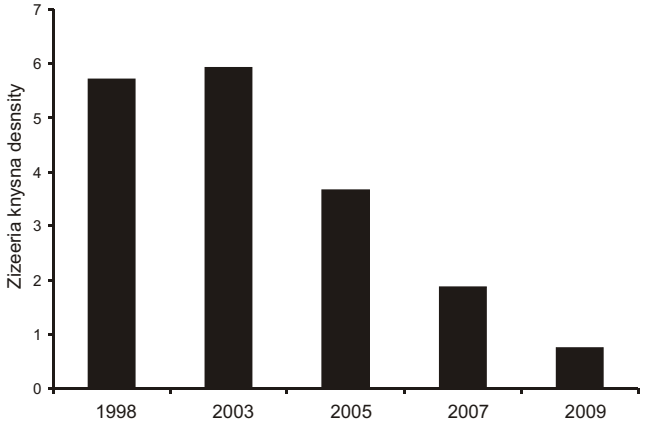
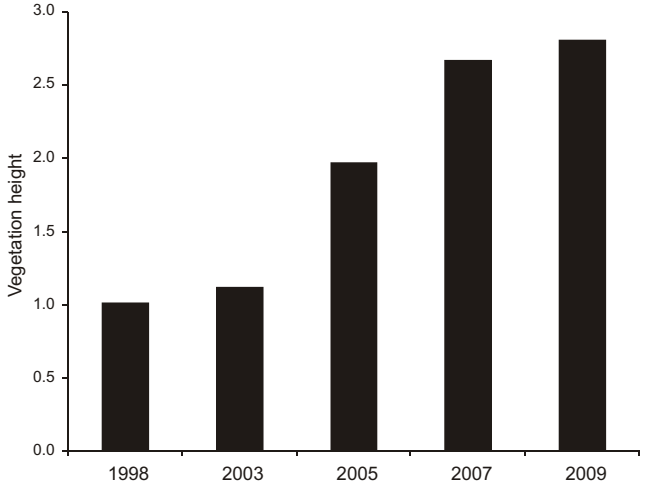


Fig. 1. (a) The main central group of granitic islands of Seychelles, showing the position of the study island, Cousine. (b) General topography of Cousine Island, Seychelles showing the position of the coastal flat.

Fig 2. View from Hill 1 (facing north) of the coastal flat of Cousine Island, Seychelles, taken in 1998 (A) and in 2009 (B) illustrating the extent of the habitat restoration programme on the island (J. Lawrence private collection)

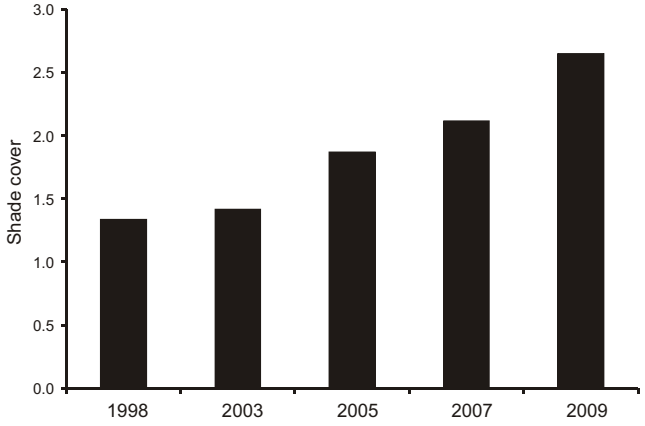


(a)



(b)

Fig. 3. The mean *Zizeeria knysna* density (a), mean vegetation height (b) on the coastal flat of Cousine Island, Seychelles, 1998 to 2009



(c)

Fig. 3. The mean shade cover (c) on the coastal flat of Cousine Island, Seychelles, 1998 to 2009

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Figure 1. Home of *Chrysoritis dicksoni* and many other wonderful species at Witsand, Western Cape.

Figure 2. Typical male lekking area of *Chrysoritis dicksoni* at Witsand, Western Cape.

Figure 1. Male *Chrysoritis dicksoni* sitting on thorns and watching the lekking area, presumably waiting for a female to pass by.

Figure 2. Male *Chrysoritis dicksoni* sitting on flowers. The flowers were not used for nectar but merely as a perch to watch the daily proceedings.

Figure 1. Typical of the ants, probably *Crematogaster peringueyi*, found in ant nests throughout the Witsand area. The ant nests were not numerous and collectors are requested not to disturb them.

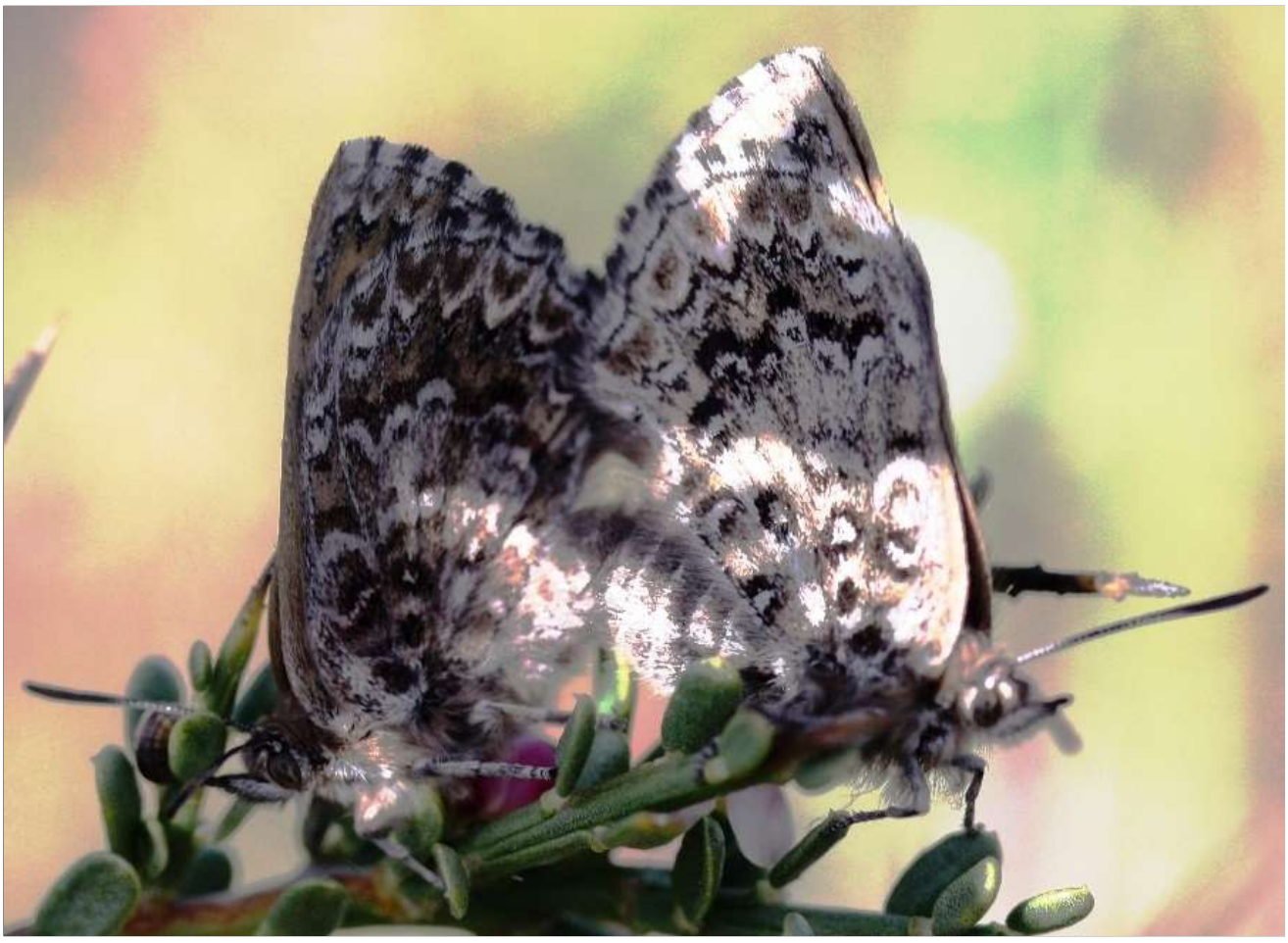

Figure 2. A copulating pair of *Chrysoritis dicksoni*.

Figure 1. The alien invader plant *Acacia cyclops* (the Afrikaans term “Rooikrans” is often used for this plant) has an extremely long tap root, making it difficult to remove even in the case of fairly small plants.

Figure 2. A typical *Chrysoritis dicksoni* lekking area in the foreground with a stand of the invasive *Acacia cyclops* growing in the background. A few dead plants of *Acacia cyclops* can be seen on the left of the picture. Cutting back this invasive species in this manner can only be considered a very temporary measure.