



Publications on Afrotropical Lepidoptera during 2014

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Abstract: The articles published since the author's "Publications on Afrotropical Lepidoptera 2013", which deal with scientific research into Afrotropical Lepidoptera are listed alphabetically by author and abstracts are provided if they were published. Articles dealing with control of Lepidoptera as pests are excluded.

Citation: Williams, M.C. 2014. Publications on Afrotropical Lepidoptera during 2014. *Metamorphosis* 25: 156–173.

AFROTROPICAL LEPIDOPTERA

AARVIK, L. & AGASSIZ, D.J.L. 2014. Revision of African *Neaspasia* Diakonoff, 1989 and the related *Conaspasia*, n. gen. (Lepidoptera, Tortricidae). *Zootaxa* 3754(2): 117–132.

Abstract: The six species of *Neaspasia* Diakonoff present in mainland Africa are described and illustrated. *Niphadophylax albonigra* Razowski & Wojtusiak and *N. sophrona* Razowski & Wojtusiak are transferred to *Conaspasia*, new genus. Four new species are described: *Neaspasia coronana* Aarvik, new species, *N. karischi* Aarvik, new species, *N. malamigambo* Aarvik, new species, and *Conaspasia congolana* Aarvik, new species. *Argyroploce orthacta* Meyrick, *Argyroploce brevisecta* Meyrick, and *Penthina brevibasana* Walsingham are transferred to *Neaspasia*. *Neaspasia rhodesiae* Razowski & Brown is a junior synonym of *Neaspasia orthacta* (Meyrick), new combination. *Genetancylis homalota* Razowski and *Rhopobota cornuta* Razowski, both described from Oman, are transferred to *Neaspasia*. *Genetancylis* Razowski is synonymised with *Neaspasia*.

AARVIK, L. & AGASSIZ, D.J.L. 2014. Taxonomy of some African species hitherto placed in *Stenentoma* Diakonoff, 1969 and in *Eucosmocydia* Diakonoff, 1988 (Lepidoptera: Tortricidae). *Norwegian Journal of Entomology* 61(1): 27–36.

Abstract: *Stenentoma* Diakonoff, 1969 is synonymized with *Camptrodoxa* Meyrick, 1925. The following species hitherto placed in *Stenentoma* are transferred to *Camptrodoxa*: *C. bisecta* (Meyrick, 1918) comb. nov., *C. plectocosma* (Meyrick, 1921) comb. nov., *C. chrysolampra* (Diakonoff, 1969) comb. nov., *C. onychosema* (Diakonoff, 1969) comb. nov., and *C. sorindeiae* (Razowski & Brown, 2012) comb. nov. The new genus *Afroicelita* gen. nov. is established for *Stenentoma pholicosta* Razowski & Wojtusiak, 2012. *Camptrodoxa inclitya* Meyrick, 1925 is a junior synonym of *Laspeyresia plectocosma* Meyrick, 1921 syn. nov.

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Eucosmocydia monitrix (Meyrick, 1909) is transferred to the

genus *Namasia* Diakonoff, 1983, and the valid name for the species is established as *Namasia monitrix* (Meyrick, 1909) comb. nov. *Neonamasia* gen. nov. is proposed for *Neonamasia cryptica* sp. n.

AGASSIZ, D.J.L. & AARVIK, L. 2014. New Tortricidae (Lepidoptera) from East Africa with an account of the tortricid fauna of acacia in the Kenyan Rift Valley. *Zootaxa* 3861(4): 369–397.

Abstract: Species of Tortricidae whose larvae feed on acacia are listed, including five new species: *Hystrichophora bussei* Agassiz, *Endotera cyaneana* Agassiz, *Paraeccopsis variegana* Agassiz & Aarvik, *Coniostola flavitinctana* Agassiz & Aarvik, and *C. rufitinctana* Agassiz & Aarvik. Six additional species related to the aforementioned, whose life histories are not known, also are described: *Paraeccopsis tanzanica* Aarvik, *P. addis* Aarvik, *P. turi* Aarvik, *P. botswanae* Aarvik, *P. pseudoinsellata* Aarvik, and *Coniostola laikipiana* Agassiz & Aarvik. *Endotera nodi* Agassiz is synonymised with *Endotera cyphospila* (Meyrick) comb. n.: and *Coniostola omistus* Diakonoff is synonymised with *Coniostola stereoma* (Meyrick). *Paraeccopsis inflcata* (Meyrick) and *Paraeccopsis atricapsis* (Meyrick) are removed from the synonymy of *Paraeccopsis insellata* (Meyrick). *Eucosma pharangodes* Meyrick is transferred to *Eucosmocydia* Diakonoff. *Age onychistica* Diakonoff is recorded from Africa for the first time.

AGIUS, J. 2014. *Danaus chrysippus* form *alcippoides* (Linnaeus, 1758) a new form for the Maltese Islands (Lepidoptera: Nymphalidae: Danainae). *Shilap-Revista Lepidopterologia* 42(167): 429–432.

Abstract: *Danaus chrysippus* form *alcippoides* (Linnaeus, 1758) is recorded for the first time from the Maltese Islands. Notes on the distribution, different subspecies and forms of the adults are included.

ARMSTRONG, A.J. & LOUW, S.L. 2013. Monitoring of the eggs of the Karkloof blue butterfly, *Orachrysops ariadne*, for its conservation management. *Koedoe* 55(1): 1–11.

Abstract: The Endangered *Orachrysops ariadne* (Butler 1898) (Karkloof blue butterfly) is endemic to the Endangered Moist Midlands Grassland in KwaZulu-Natal, South Africa, and is extant at four sites. The results from the monitoring of the eggs laid by *O. ariadne* in a grassland area that is frequently burnt by poor rural people to ensure that palatable grass is available to their livestock, suggested the

implementation of management interventions (fencing and firebreak burning) to prevent the local extinction of the butterfly. The number of eggs at the monitoring site declined dramatically between 2002 and 2003 and fluctuated after the management interventions were initiated properly in 2008, but had nearly reached the target number of 250 by 2013. An index count method for the monitoring of *O. ariadne* eggs at the other three known colonies, where plant invasion rather than uncontrolled burning is a major threat, was developed and shown to be efficient with regard to time relative to the number of eggs sampled. The host ant *Camponotus natalensis* (F. Smith 1858) (Natal sugar ant) was found to be present in all the host-plant patches at one colony site, indicating that all host-plant patches are likely to be breeding areas for the butterfly. Invasive plant control at and appropriate burning of the habitat of *O. ariadne* should assist in ensuring the survival of these colonies. Conservation implications: Adaptive monitoring and management of threatened endemic invertebrates and their habitats may be crucial for their continued survival. The development of efficient methods for the monitoring of such species is required where resources are limited, as threats to the species may cause sudden and irreversible declines in population size.

AVULETEY, R. & NIBA, A.S. 2014. Butterfly (Lepidoptera) assemblage composition and distribution patterns in King Sabata Dalindyebo Municipality, Eastern Cape, South Africa. *African Entomology* **22**(1): 57–67.

Abstract: Butterflies (Lepidoptera) have attracted more attention as bio-indicators of terrestrial ecosystems than other terrestrial arthropods. This study determined butterfly species turnover at a priori selected habitat patches inside Nduli Nature Reserve and its surrounding landscape, and their response to measured environmental variables. Using the line transect method, 516 butterfly individuals belonging to 22 species were sampled from all 16 sampling units (Sus), of which 13 species occurred in two or more Sus across the study site. Habitat patches outside the reserve were higher in butterfly species richness and abundance than inside the reserve. *Papilio demodocus* Esper, *Borbo gemella* Mabille, *Precis octavia* (Cramer) and *Hypolimnas missipus* [sic] (Linnaeus) were each restricted to one sampling unit. Hierarchical clustering using Bray-Curtis similarity matrices and correspondence analyses grouped sampling units according to butterfly species sampled. Canonical correspondence analysis results indicated that certain site (environmental) variables, e.g. percentage herb cover, grazing intensity, distance to the city centre and average flower density accounted for species distribution patterns across Sus. The implications of the study suggest that habitat patch level management for conservation action should aim at preserving sufficient herb cover and nectaring plants, especially during the summer season to cater for all developmental stages of butterfly species in the study area. Furthermore, species richness within the reserve can be encouraged by using vegetation linkages and corridors between the reserve and its surrounding landscape. Butterflies identified during the study can serve as indicator species for assessing the conservation value of habitat patches in the study area and for increasing public awareness of the need to conserve butterflies and the invertebrate fauna of the King Sabata Dalindyebo Municipality between the months of November and April.

BAGINE, R., BWONG, B.A., GICHUKI, M., GIKUNGU, M., IMBOMA, T., KARANJA, D., KINUTHIA, W., KIOKO, E., KIOKO, O., MALOZA, P.K., MUGAMBI, J., MUNGAI, M., MUTUA, M., MWAKODI, R., NALIANYA, N.,

NJAGI, E., ODANGA, J.OTIENO, N.E., WACHIRA, J., WASONGA, D.V., OYIEKE, H., MURIUKI, J.M., INGRISH, S., LANGE, C., MUCHAI, M. & LAMPE, K.H. 2014. List of animals from Kakamega Forest (Kenya) and Budongo Forest (Uganda) with voucher specimens in the Department of Zoology of the National Museums of Kenya. *Bonn Zoological Bulletin Supplementum* **60**: 98–126.

Abstract: Lists of species from the Kakamega Forest in Kenya and the Budongo Forest in Uganda documented by voucher specimens in the National Museums of Kenya in Nairobi are given. 1371 species from Kakamega, of which 93 are vertebrates, 1278 invertebrates (insects and molluscs), are listed, and 611 species from Budongo with 21 vertebrates, 590 invertebrates. The results for Lepidoptera, Odonata, Tephritidae (Diptera), Aves, Reptilia and Amphibia are compared with previously published species lists for the Kakamega Forest.

BASSI, G. 2013. Revisione delle specie afrotropicali del genere *Ancylolomia* Hübner, [1825]. I: i gruppi indica e chrysargyria (Lepidoptera: Pyralidae, Crambinae). *Shilap-Revista de Lepidopterologia* **41**(164): 517–529.

Abstract: In this first part of the revision of the Afrotropical species of the genus *Ancylolomia* Hubner, (1825) the 4 species groups present in Africa are defined. The indica group is also treated with its species *A. melanella* (Hampson), *A. claudia* Bassi n. sp. and *A. elisa* Bassi n. sp. and the chrysargyria group is described and illustrated with its only species *A. chrysargyria* Hampson, whose lectotypus is here designated. All the species are described and illustrated.

BAYLISS, J., TIMBERLAKE, J., BRANCH, W., BRUESSOW, C., COLLINS, S., CONGDON, C., CURRAN, M., DE SOUSA, C., DOWSETT, R., DOWSETT-LEMAIRE, F., FISHPOOL, L., HARRIS, T., HERRMANN, E., GEORGIADES, S., KOPP, M., LIGGITT, B., MONADJEM, A., PATEL, H., RIBEIRO, D., SPOTTISWOODE, C., TAYLOR, P., WILLCOCK, S. & SMITH, P. 2014. The discovery, biodiversity and conservation of Mabu forest – the largest medium-altitude rainforest in southern Africa. *Oryx* **48**(2): 177–185.

Abstract: The montane inselbergs of northern Mozambique have been comparatively little-studied, yet recent surveys have shown they have a rich biodiversity with numerous endemic species. Here we present the main findings from a series of scientific expeditions to one of these inselbergs, Mt Mabu, and discuss the conservation implications. Comprehensive species lists of plants, birds, mammals and butterflies are presented. The most significant result was the discovery of a c. 7,880 ha block of undisturbed rainforest, most of it at medium altitude (900–1,400 m), a forest type that is not well represented elsewhere. It is possibly the largest continuous block of this forest type in southern Africa. To date, 10 new species (plants, mammals, reptiles and butterflies) have been confirmed from Mt Mabu, even though sampling effort for most taxonomic groups has been low. The species assemblages indicate a relatively long period of isolation and many species found are at the southern limit of their range. Conservationists are now faced with the challenge of how best to protect Mt Mabu and similar mountains in northern Mozambique, and various ways that

this could be done are discussed.

BOUYER, T. 2014. Description de nouvelles espèces d'*Iridana* Aurivillius, 1920 (Lepidoptera, Lycaenidae). *Lambillionea* **114**(1): 70–73. [*I. pseudobscura* sp. n.]

BOWLES, N. 2013. An observation of apparent dispersive movement in Long-tailed Blue *Lampides boeticus* (L.) (Lep.: Lycaenidae). *Entomologist's Record and Journal of Variation* **125**(5): 193–194.

BRAY, T. 2014. Spatial genetic pattern in an economically beneficial insect, the cyclical African wild silk moth (*Gonometa postica*). *African Zoology* **49**(1): 94–106.

Abstract: The African wild silk moth (*Gonometa postica*) exhibits large inter-annual population size fluctuations in the Kalahari region of southern Africa. Spent cocoons from this species are currently being utilized in a local silk industry. An understanding of the recolonization dynamics of a particular harvested site, and of the population genetic effects of such dispersal, are crucial for designing a scientifically-based harvesting strategy. I link morphological estimates of flying ability to microsatellite genotyping in the determination of dispersal ability of this species. Morphological results suggest that the moth is a poor disperser with high wing loadings and males are better fliers than females. There is a significant effect of isolation-by-distance. Spatial population genetic analyses of microsatellite data further indicate lower and upper bounds on dispersal of 90 m and 50 km. The combined evidence suggests male-biased dispersal over several dozen kilometers with females that do not disperse over large distances. I discuss the potential influences of large population size fluctuations on patterns of genetic diversity and the implications for the inference of dispersal in my study species.

BROWN, J.W., COPELAND, R.S., AARVIK, L., MILLER, S.E., ROSATI, M.E. & LUKE, Q. 2014. Host records for fruit-feeding Afrotropical Tortricidae (Lepidoptera). *African Entomology* **22**(2): 343–376.

Abstract: We present host records for the following Afrotropical Tortricidae reared from fruit in Kenya: *Idiothauma* nr *africanum* Walsingham, *Paraccra mimesa* Razowski, *Apotoforma* nr *uncifera* Razowski, *Eugnosta percnoptila* (Meyrick), *Phtheochroa aarviki* Razowski & Brown, *Actihema hemiacta* (Meyrick), *Choristoneura dinota* (Meyrick), *Choristoneura occidentalis* (Walsingham), *Procris* nr *ophiograptia* (Meyrick), *Metamesia* nr *episema* (Diakonoff), *Epichoristodes acerbella* (Walker), *Cryptasasma phycitina* Aarvik, *Cryptasasma subtilis* Diakonoff complex, *Cryptasasma caryothia* (Meyrick) complex, *Cryptasasma* n. sp., *Lobesia vanillana* Joannis, *Lobesia semosa* Diakonoff, *Eccopsis nebulana* Walsingham, *Eccopsis praecedens* Walsingham, *Afrothreutes madoffei* Aarvik, *Aroploce* nr *karsholti* Aarvik, *Metendothenia balanacma* (Meyrick), *Endothenia ator* Razowski & Brown, *Anthozela chrysoxantha* Meyrick, *Anthozela psychotriae* Razowski & Brown, *Concinocordis wilsonarum* Razowski & Brown, *Crocidosema plebejana* Zeller, *Crocidosema lantana* (Busck), *Gypsonoma scolopiae* Razowski & Brown, *Cosmetra nereidopa* (Meyrick), *Cosmetra* sp. 1, *Cosmetra* sp. 2, *Cosmetra* sp. 3, *Cosmetra podocarpivora* Razowski & Brown, *Cosmetra taitana* Razowski & Brown, *Thaumatotibia leucotreta* (Meyrick), *Thaumatotibia batrachopa* (Meyrick), *Thaumatotibia salaciae* Razowski & Brown, *Cryptophlebia semilunana* (Saalmüller), *Cryptophlebia* sp. 1, *Cryptophlebia peltastica* (Meyrick), *Cydia connara* Razowski & Brown, *Cydia sennae* Razowski & Brown, *Cydia* nr *cholerope* (Meyrick), *Fulcrifera*

crotalariae Razowski & Brown, *Fulcrifera* nr *periculosa* (Meyrick), *Fulcrifera* sp. 1, *Fulcrifera* sp. 2, *Dracontogena continentalis* Karisch, *Dracontogena solii* Aarvik & Karisch, *Grapholita limbata* Diakonoff, *Grapholita mesosocia* (Meyrick), *Grapholita* nr *mesosocia* (Meyrick), *Selania exornata* (Diakonoff), *Eucosmocydia monitrix* (Meyrick), *Stenentoma sorindeiae* Razowski & Brown, and *Thylacogaster garcinivora* Razowski & Brown. Nearly 75 % of all our reared tortricids are members of Grapholitini, a tribe that includes numerous pests of fruit worldwide. Approximately 77 % of the reared species are recorded from only one or two different plant species (frequently in the same plant genus). Plant families that support the greatest numbers of tortricid fruit-feeders are Rubiaceae (13 tortricid species), Ochnaceae (11 tortricid species), Sapindaceae (10 tortricid species), Rosaceae (8 tortricid species), Connaraceae (7 tortricid species) and Fabaceae (7 tortricid species). We also review previously reported food plants and provide a few new records for four foliage- and/or fruit-feeding tortricids from the Afrotropical Region, e.g. *Goniotorna erratica* (Diakonoff), *Taiteccopsis taitana* Razowski, *Cydia cholerope* (Meyrick) and *Leguminivora ptychora* (Meyrick). Identifications are based on morphology and DNA barcodes (COD).

CAMPBELL, H., TOWNSEND, I.R., FELLOWES, M.D.E. & COOK, J.M. 2013. Thorn-dwelling ants provide antiherbivore defence for camelthorn trees, *Vachellia erioloba*, in Namibia. *African Journal of Ecology* **51**(4): 590–598.

Abstract: Ants are widely employed by plants as an antiherbivore defence. A single host plant can associate with multiple, symbiotic ant species, although usually only a single ant species at a time. Different plant-ant species may vary in the degree to which they defend their host plant. In Kenya, ant-acacia interactions are well studied, but less is known about systems elsewhere in Africa. A southern African species, *Vachellia erioloba*, is occupied by thorn-dwelling ants from three different genera. Unusually, multiple colonies of all these ants simultaneously and stably inhabit trees. We investigated if the ants on *V. erioloba* (i) deter insect herbivores; (ii) differ in their effectiveness depending on the identity of the herbivore; and (iii) protect the tree against an important herbivore, the larvae of the lepidopteran *Gonometa postica*. We show that experimental exclusion of ants leads to greater levels of herbivory on trees. The ants inhabiting *V. erioloba* are an effective deterrent against hemipteran and coleopteran, but not lepidopteran herbivores. Defensive services do not vary among ant species, but only *Crematogaster* ants exhibit aggression towards *G. postica*. This highlights the potential of the *V. erioloba*-ant mutualism for studying ant-plant interactions that involve multiple, simultaneously resident thorn-dwelling ant species.

COACHE, A., RAINON, B., ZANNOU, E. & TCHIBOZO, S. 2014. Contribution à l'inventaire de l'entomofaune de la forêt marécageuse de Lokoli (Benin). Premier supplément: Les *Acraea* (Lepidoptera Nymphalidae). *Entomologiste (Paris)* **70**(2): 105–113.

COACHE, A., ZANNOU, E. & RAINON, B. 2014. Observation d'une migration de *Libythea labdaca* Westwood, 1851 en République du Bénin (Lepidoptera Nymphalidae). *Entomologiste (Paris)* **70**(4): 245–246.

Abstract: April 27, 2013 in the forest of Lama, Zogbodomey town (Benin), we could see a rally of thousands of Nymphalidae *Libythea labdaca* Westwood 1851.

COACHE, A., ZANNOU, E. & RAINON, B. 2014.

Première citation du genre *Caprona* Wallengren, 1857 en République du Bénin (Lepidoptera Hesperidae). *Entomologiste (Paris)* **70**(5): 301–302.

Abstract: During our research in the National Park Pendjari, we could observe two species of genus *Caprona* Wallengren, 1857, for the first time in the Republic of Benin: *C. pillaana* Wallengren, 1857 and *C. adelica* Karsch, 1892. *Entomologiste (Paris)* **70**(5): 301–302.

COCK, M.J.W. & CONGDON, T.C.E. 2014. Observations on the biology of Afrotropical Hesperidae (Lepidoptera). Part 7. Hesperidae *incertae sedis*: grass and bamboo feeders. *Zootaxa* **3872**(4): 301–354.

Abstract: Partial life histories for 17 Hesperidae *incertae sedis* that feed on grasses or bamboos (Poaceae) are described and illustrated. The genera dealt with are: *Astictopterus* (from Evans' (1937) *Astictopterus* group), *Prosopalpus*, *Kedestes* (from Evans' (1937) *Ampittia* group), *Ceratrachia*, *Pardaleodes*, *Ankola* (From Evans' (1937) *Ceratrachia* and *Acleros* groups), *Perrotia* (part), *Chondrolepis*, and *Monza* (part) (all from Evans' *Ploetzia* genera group). The Poaceae-feeders comprise a relatively small proportion of the Afrotropical Hesperidae fauna, particularly the mainland Afrotropical fauna. The caterpillars shown here are fairly homogeneous, with the head wider nearer the base, and lacking obvious setae on the body. Wax glands have been noted over most of the ventral surface A1–A8 in the final instar of *Ceratrachia*, *Pardaleodes* and *Monza*, but are absent in *Chondrolepis*, and either absent or not documented for other genera. The short double frontal projection of *Tsitana uitenhaga* is unusual, but pupae of the congeneric species have not been documented. The pupae of *Kedestes* spp. generally have extensive black or dark areas. The pupae of *Pardaleodes* and *Ankola* are very flimsy and collapse after emergence. All known pupae of *Chondrolepis* spp. have a short, blunt downturned frontal projection, not seen for any other Afrotropical genera, although *Semalea* spp. may have a short blunt projection. The remaining pupae are all generally similar and undistinguished. These are not substantial differences, but suggest that pupal characters may be useful in grouping some of the genera of Afrotropical Hesperidae *incertae sedis*.

COCK, M.J.W. & CONGDON, T.C.E. 2014. Observations on the biology of Afrotropical Hesperidae (Lepidoptera). Part 7. Hesperidae *incertae sedis*: grass and bamboo feeders. *Zootaxa* **3872**(4): 301–354.

Abstract: Partial life histories for 17 Hesperidae *incertae sedis* that feed on grasses or bamboos (Poaceae) are described and illustrated. The genera dealt with are: *Astictopterus* (from Evans' (1937) *Astictopterus* group), *Prosopalpus*, *Kedestes* (from Evans' (1937) *Ampittia* group), *Ceratrachia*, *Pardaleodes*, *Ankola* (From Evans' (1937) *Ceratrachia* and *Acleros* groups), *Perrotia* (part), *Chondrolepis*, and *Monza* (part) (all from Evans' *Ploetzia* genera group). The Poaceae-feeders comprise a relatively small proportion of the Afrotropical Hesperidae fauna, particularly the mainland Afrotropical fauna. The caterpillars shown here are fairly homogeneous, with the head wider nearer the base, and lacking obvious setae on the body. Wax glands have been noted over most of the ventral surface A1–A8 in the final instar of *Ceratrachia*, *Pardaleodes* and *Monza*, but are absent in *Chondrolepis*, and either absent or not documented for other genera. The short double frontal projection of *Tsitana uitenhaga* is unusual, but pupae of the congeneric species have not been documented. The pupae of *Kedestes* spp. generally have extensive black or dark areas. The pupae of

Pardaleodes and *Ankola* are very flimsy and collapse after emergence. All known pupae of *Chondrolepis* spp. have a short, blunt downturned frontal projection, not seen for any other Afrotropical genera, although *Semalea* spp. may have a short blunt projection. The remaining pupae are all generally similar and undistinguished. These are not substantial differences, but suggest that pupal characters may be useful in grouping some of the genera of Afrotropical Hesperidae *incertae sedis*.

COCK, M.J.W., CONGDON, T.C.E. & COLLINS, S.C. 2014. Observations on the biology of Afrotropical Hesperidae (Lepidoptera). Part 6. Hesperidae *incertae sedis*: palm feeders. *Zootaxa* **3831**(1): 1–61.

Abstract: Partial life histories for 12 Hesperidae *incertae sedis* that feed on palms (Arecaceae) are described and illustrated. The genera dealt with are: *Perrotia* (part), *Ploetzia*, *Zophopetes*, *Gretna* (part), *Pteroteinon*, *Leona*, and *Caenides* (part) (all from Evans' *Ploetzia* genera group). Although *Gamia* spp. have been reported to feed on palms, these records are considered to be in error, as caterpillars of this genus feed on *Dracaena* spp. (Asparagaceae). The life histories of the species documented are fairly uniform, in that caterpillars of most species have rounded brown heads, wider basally, with or without limited black markings, smooth bodies and make simple shelters by rolling leaves. Variation in caterpillar markings and male genitalia of *Zophopetes dysmephila* (Trimen) and caterpillar and adult markings of *Gretna carmen* Evans merit further study. In *G. carmen*, *G. waga* (Plötz) and *G. balenge* (Holland), the caterpillars' head and body are covered with hair-like setae, and develop an extensive covering of white waxy powder, which in *G. balenge* also covers the long setae.

Furthermore, the pupa of *G. balenge* is unusual in having a pair of large, elaborate processes frontally on the head; when disturbed, the pupa vibrates violently and rattles noisily against the sides of the shelter. *Ploetzia amygdalis* (Mabille) and *Pteroteinon laufella* (Hewitson) have gregarious caterpillars, whereas the remaining species are solitary. After eclosion, the first instar caterpillars of *Gretna* spp. moult to the second instar without feeding. The implications of a palm-feeding life-style are discussed, and economic damage and plant quarantine risks to coconut, oil palm and ornamental palms pointed out. The known life histories suggest that all Afrotropical palm-feeding Hesperidae will belong in the same tribe when the *incertae sedis* section is further elucidated, although the affinities of *Gretna* deserve further consideration.

COETZER, A.J. 2014. *Teniorhinus harona* (Westwood, 1881): a new species record for South Africa. *Metamorphosis* **25**: 58–59.

COLLINS, S.C., CONGDON, T.C.E., HENNING, G.A., LARSEN, T.B. & WILLIAMS, M.C. 2014. A review of d'Abrera's *Butterflies of the Afrotropical Region – Part III* (second edition), 2009 – Part 3 (Theclinae, Polyommatainae and Riodinidae). *Metamorphosis* **25**: 109–122.

Abstract: Part III of the *Butterflies of the Afrotropical Region*, dealing with the Lycaenidae and Riodinidae, was published by d'Abrera in 2009. The text of this work has been reviewed in detail and in this, the third part of the review the taxonomic changes implemented or suggested by the author in the lycaenid subfamilies Theclinae, Polyommatainae and the family Riodinidae are assessed. Whilst many are accepted, others are reversed or revised. The authors have also made a few minor taxonomic revisions. A complete list of taxonomic changes is included

as an Appendix.

CONDAMINE, F.L., SPERLING, F.A.H. & KERGOAT, G.J. 2013. Global biogeographical pattern of swallowtail diversification demonstrates alternative colonization routes in the Northern and Southern hemispheres. *Journal of Biogeography* **40**(1): 9–23.

Abstract: Aim: Swallowtail butterflies (Papilionidae) are a diverse and widespread group of insects that constitute a popular model system for ecological and evolutionary studies. We reconstruct the historical biogeography of Papilionidae to identify the dispersal or vicariance events that best explain their present-day distribution, and test several proposed biogeographical hypotheses about the processes that shape distribution patterns in cosmopolitan groups. Location: World-wide, with disjunct elements. Methods: The phylogenetic relationships of 203 swallowtail species were determined by Bayesian inference using DNA data from mitochondrial (COI and COII) and nuclear (EF-1a) genes. Divergence time estimates were inferred using Bayesian relaxed clock approaches. To investigate competing biogeographical hypotheses, geographical range evolution was reconstructed using recently developed approaches: (1) a Bayesian empirical approach to dispersal/vicariance analysis that takes phylogenetic uncertainty into account, and (2) a likelihood approach implementing the dispersal/extinction/cladogenesis model that uses time-dependent stratified palaeogeographical matrices. Results: Our biogeographical results are congruent regardless of the biogeographical approaches or dating estimates used and support the importance of dispersal events in shaping swallowtail distributions. Contrary to common observations for other groups, the origins and diversification of northern taxa are better explained by range expansion through the Bering land bridge than by the Thulean or De Geer routes. We also stress that the seemingly Gondwanan biogeographical pattern in the Southern Hemisphere is more likely to have resulted from multiple, independent, long-distance dispersals than old vicariance events. The role of alternative colonization routes is also demonstrated for Madagascar, which facilitated multiple stepping-stone colonizations from India or Southeast Asia to Africa, and also for South America via the Caribbean land bridge. Main conclusions: Overall, the present geographical distributions of swallowtails can be better explained by dispersal events than by the long-held view of ancient vicariance events. This biogeographical study represents one of the most comprehensive phylogenetic and biogeographical studies on swallowtails. This work highlights the importance of using novel methodological approaches that provide the robust statistical frameworks needed to distinguish between competing biogeographical hypotheses. We emphasize the value of extensive taxonomic coverage for assessing the direction and frequency of supposedly rare events such as the multiple independent colonizations of Madagascar.

COLLINS, S. C. & SÁFIÁN, S. 2014. Notes on the *Iridana obscura* species group with the description of a new species from western Cameroon (Lycaenidae: Lipteninae: Epitolini). *Metamorphosis* **25**: 141–146.

Abstract: *Iridana obscura* Stempffer, 1964 is a unique-looking species, with very dark, almost blackish hindwing underside, and for over 50 years no closely related species were described. Recently *I. agneshorvathae* Collins, Larsen & Sáfián, 2008 with a similarly dark hindwing underside, but a different pattern was described from Ghana. A series of both sexes of an *Iridana* with similar pattern on the hindwing underside have been collected in Cameroon and the Central African Republic. They were mentioned in the recent

Lycaenidae volume of Butterflies of the Afrotropical Region, as *I. near agneshorvathae* and both sexes were later illustrated in the addenda to this volume, and were also illustrated in a subsequent publication as an undescribed species. The description was already in preparation, when the same *Iridana* was published from a single female bred in Cameroon under the name *I. pseudobscura* Bouyer, 2014. The authors present supplementary information on *I. pseudobscura* including the description of the male and describe another closely related new species, *I. michaelgwynnei* from North-Western Cameroon. The existence of three very similar species justifies the introduction of an *I. obscura* species group. *I. obscura* might prove endemic to the Albertine Rift area, while *I. pseudobscura* is a Congolian lowland forest species, probably with wider distribution in Central Africa. The newly described *I. michaelgwynnei*, having been collected north-west of the Sanaga River, could either be a Central-Western African forest species or an upland element found only in mid-elevation forests in the Gulf of Guinea Highlands.

CROUS, C.J., SAMWAYS, M.J. & PRYKE, J.S. 2013. Exploring the mesofilter as a novel operational scale in conservation planning. *Journal of Applied Ecology* **50**(1): 205–214.

Abstract: Increased emphasis is being placed on developing effective biodiversity conservation tools for practical conservation planning. The mesofilter is such a biodiversity planning tool, but has yet to be fully explored to appreciate its effectiveness. The key premise of the mesofilter is that ecosystems contain certain physical elements that are specifically associated with a diversity of species. Identifying such mesofilters could therefore complement existing conservation planning tools such as coarse and fine filters. To explore the value of the mesofilter as an operational scale in conservation planning, we studied 18 remnant patches of endangered montane grassland in KwaZulu-Natal, South Africa, using the physical landscape feature of patch rockiness as an abiotic surrogate for biodiversity. The objective was to determine whether the mesofilter of rockiness can predict variation in species richness and composition for three dominant grassland taxa (plants, butterflies and grasshoppers) at the landscape scale. Variable levels of rockiness had significant interactions with all three focal taxa. Higher species richness of all taxa was closely associated with higher levels of rockiness in a patch. The rocky mesofilter only predicted significant differences in species composition for butterflies. Elevation was also important, possibly another mesofilter for plants and grasshoppers in this landscape. Synthesis and applications. The results indicate that the use of an abiotic surrogate such as rockiness can predict biodiversity value across multiple taxa. The mesofilter is therefore a valuable surrogacy and congruency tool for practical biodiversity conservation across this landscape and would likely have similar value if explored elsewhere. It also has value in the design and management of protected areas.

CROUS, C.J., SAMWAYS, M.J. & PRYKE, J.S. 2014. Rockiness determines meso-scale conservation of butterflies in Afro-montane grassland. *Journal of Insect Conservation* **18**(1): 77–83.

Abstract: Understanding how and why certain species respond to various habitat resources can optimize conservation strategies. Furthermore, behaviour can contribute significantly to predicting the presence or absence of a species under certain habitat conditions. There is a measurable interaction between higher percentage rock exposure in a landscape and butterfly species richness and composition in montane grasslands. Here, we attempt to

explain this interaction by measuring the behavioural responses of montane butterfly species to rock cover. The butterfly assemblage was observed across three increasing levels of rockiness in the landscape. At sites within each of these rockiness categories, we also sampled the different behavioural traits of the different species. We determined whether there were significant differences in behavioural traits among this assemblage in response to rockiness. We also identified the specific species which were responsible for driving differential behavioural responses under varying rock exposure in a landscape. The rockiest areas had significantly more behavioural events, and these behaviours were more often associated with direct utilization of rocks, and related to agonistic interaction. Certain butterfly species therefore use rocks as a utility habitat resource, in different ways, highlighting the importance of the resource-based habitat concept for conservation. As such, for butterfly conservation in these montane grasslands, emphasis is placed on including a rocky gradient in protected areas and conservation landscape designs.

DARGE, P. 2013. Nouveaux *Pseudobunaea* d'Afrique de l'est (Lepidoptera, Saturniidae, Saturniinae, Bunaeini). *Saturnafrika* **16**: 3–13.

DARGE, P. 2013. Considerations sur les *Aurivillius* du groupe de seydeli ROUGEOT 1962, avec description d'espèces nouvelles originaires d'Afrique orientale (Lepidoptera, Saturniidae, Saturniinae, Bunaeini). *Saturnafrika* **16**: 25–57.

DARGE, P. 2014. Étude d'une collection de Saturniidae d'Afrique sud-orientale déposée au zoologische staatsammlung de Munich (Lepidoptera, Saturniidae, Saturniinae). *Saturnafrika* **19**: 3–39.

Abstract: New species described from Zimbabwe: *Adafroptilum aberfoylensis*, *A. violaceum*, *Micragone lenzi*, *M. vukutuensis*, *Nudaurelia clarissima*, *Pseudobunaea bungaensis*, *P. montuosa*. New species described from Zambia: *Adafroptilum pullum*, *Gonimbrasia dissimilis*.

DE FREINA, J. 2014. Über zwei Syntomini-Arten aus der Kapregion, Südafrika: *Cacoethes polidamon* (Cramer, 1779) comb. rev. und *Cacoethes fulvatrum* sp. nov. (Lepidoptera: Erebidae, Arctiinae, Syntomini). *Entomologische Zeitschrift* **124**(1): 35–40.

Abstract: *Cacoethes fulvatrum* sp. nov. is described on the basis of material collected in the Western Cape, South Africa; detailed morphological information is provided. The holotype (male, in Ditsong Museum, Pretoria, South Africa), paratypes, male genitalia and female are illustrated. Its relationship to *Cacoethes polidamon* (Cramer, 1779) comb. rev., and re-described, is discussed. *Cacoethes polidamon*, the type species of *Cacoethes* Hubner, 1816 stat. rev., has been confused with *C. fulvatrum* in the past. The biology of both species, and the presumably brachypterous female of *C. polidamon*, remain unknown.

DUBATOLOV, V.V. 2013. A new genus of African tiger moths, with a review of the *Amsacta melanogastra* Holland species group (Lepidoptera, Erebidae). *Zootaxa* **3682**(4): 579–583.

DURANTE, A., APINDA-LEGNUO, E.A. & ROMANO, C. 2013. Second contribution to the knowledge of the Lithosiini of Gabon: the genus *Nanna* Birket-Smith (Lepidoptera, Erebidae, Arctiinae).

European Journal of Taxonomy **65**: 1–15.

Abstract: The presence of the genus *Nanna* in Gabon is treated. Four species are recorded, two of which are new to science (*N. molouba* sp. nov. and *N. semigrisea* sp. nov.), and the hitherto unknown female of *Nanna ceratopygia* is described. A checklist and a key to the species of the genus *Nanna* are provided.

DVORAK, B. 2014. Fund einer Raupe von *Panogena lingens* (Butler, 1877) durch Ilija Klejmjonov auf Madagaskar (Lepidoptera: Sphingidae). *Entomologische Zeitschrift* **124**(3): 162–164.

EDGE, D. A. 2014. Searching in the Waterberg for *Eriksonia edgei* Gardiner & Terblanche, 2010 during December 2011 & January 2012. *Metamorphosis* **25**: 77–81.

EGAN, B.A., TOMS, R., MINTER, L.R., ADDO-BEDIAKO, A., MASOKO, P., MPHOSI, M. & OLIVIER, P.A.S. 2014. Nutritional significance of the edible insect, *Hemijana variegata* Rothschild (Lepidoptera: Eupterotidae), of the Blouberg Region, Limpopo, South Africa. *African Entomology* **22**(1): 15–23.

Abstract: *Hemijana variegata* Rothschild, an edible caterpillar of Limpopo, South Africa, is little known to science but is a delicacy in the region. Harvesters believe the caterpillar is nourishing but there are no data on its nutritional value. This study reports on the proximate nutrient analysis of sun-dried (traditionally prepared) specimens and specimens oven-dried at 60 degrees C for three different time periods (24, 48 and 72 h). For the vitamin content analysis, fresh caterpillars were used. Drying at 60 degrees C for 24 h produced the highest energy value at 552 kcal/100 g while traditionally prepared caterpillars produce 306 kcal/100 g. The caterpillar was found to be rich in protein varying between 51 and 54 % for oven-dried and 44.5 % for traditionally prepared caterpillars. The fat content of 20 % is favourable, as is the percentage ash (10.47 % for traditionally prepared caterpillars), indicating elevated levels of nutrients. In fresh caterpillars, vitamin content was low for vitamin A (0.02 mg/100 g) and vitamin B-1 (0.01 mg/100 g). Vitamin B-2 (0.65 mg/100 g) and vitamin E (0.64 mg/100 g) were better represented. Vitamin C was high at 14.15 mg/100 g.

EITSCHBERGER, U. & MUELLER, G. 2014. Beitrag zur Sphingidae-Fauna von Zentralmali, Nordwest-Afrika. *Neue Entomologische Nachrichten* **69**: 208–213.

Abstract: In 2008, 2010, and 2011 in total 19 Sphingidae species were caught at light traps in Mali by Mueller and his team. All species are listed and discussed.

EITSCHBERGER, U. & STROHLE, M. 2014. Beitrag zur Kenntnis von *Chaerocina jordani* Berio, 1938. *Neue Entomologische Nachrichten* **69**: 49–57.

Abstract: Of the very scarce *Chaerocina jordani* Berio, 1938, also seldom mentioned in the known literature, several specimens of both sexes are figured in colour. With the figured specimens we hope to show a good part of the variability of the population available from Ethiopia. The female of this species, which seems to be unknown until today, is also figured here for the first time. The genitalia of both sexes are figured in detail with several images.

FELIX, A-E., CALATAYUD, P-A., LE RU, B.,

CAPDEVIELLE-DULAC, C., ONG'AMO, G., SILVAIN, J-F. & FREROT, B. 2013. To be or not to be a species: use of reproductive isolation experiments and genetic analysis to clarify the taxonomic status of two *Busseola* (Lepidoptera: Noctuidae) species in Kenya. *Annales de la Societe Entomologique de France* **49**(3): 345–354.

Abstract: Phylogenetic analysis combined with chemical ecology can contribute to the delimitation of closely related insect species, particularly in Lepidoptera. In this study, the taxonomic status of a species in the genus *Busseola* (Lepidoptera: Noctuidae) was discussed using morphological data, cross-mating experiments, sex pheromone chemistry, field-trapping, and molecular classification. The results of the chemical ecology experiments corroborated those from the phylogeny studies. It was concluded that several reproductive isolation components, namely host plants, geography, pheromone emission time, pheromone blend, and post-zygotic isolation factors, led to the separation of *Busseola* n. sp. from its closely related species *B. segeta*. Molecular data showed a strong difference between these two species, regardless of the marker used. The new species named *Busseola nairobiensis* was morphologically described and a hypothesis about the evolutionary history of the studied species was put forward.

FORBES, S. 2014. Butterflies of Semuliki National Park, Uganda. *Antenna* **38**(2): 82–89.

FRANKE, K., HEITMANN, N., TOBNER, A. & FISCHER, K. 2014. Fitness costs associated with different frequencies and magnitudes of temperature changes in the butterfly *Bicyclus anynana*. *Journal of Thermal Biology* **41**: 88–94.

Abstract: Plastic responses to changes in environmental conditions are ubiquitous and typically highly effective, but are predicted to incur costs. We here investigate the effects of different frequencies and magnitudes of temperature change in the tropical butterfly *Bicyclus anynana*, considering developmental (*Experiment 1*) and adult stage plasticity (*Experiment 2*). We predicted negative effects of more frequent temperature changes on development, immune function and/or reproduction. Results from *Experiment 1* showed that repeated temperature changes during development, if involving large amplitudes, negatively affect larval time, larval growth rate and pupal mass, while adult traits remained unaffected. However, results from treatment groups with smaller temperature amplitudes yielded no clear patterns. In *Experiment 2* prolonged but not repeated exposure to 39 °C increased heat tolerance, potentially reflecting costs of repeatedly activating emergency responses. At the same time fecundity was more strongly reduced in the group with prolonged heat stress, suggesting a trade-off between heat tolerance and reproduction. Clear effects were restricted to conditions involving large temperature amplitudes or high temperatures.

FRIQ, Z., DICKINSON, R., FETOUHI, G., LARSEN, T.B. SCHÖN, W. & WIERNERS, M. 2014. First record of the cycad blue, *Chilades pandava*, in Egypt – a new invasive butterfly species in the Mediterranean region and on the African continent (Lepidoptera: Lycaenidae). *African Entomology* **22**(2): 315–319.

Abstract: The cycad blue, *Chilades pandava*, is recorded from Egypt for the first time. According to molecular analysis, the species appears to have originated from South China or Northern Indochina, and was probably introduced

with ornamental *Cycas* plants.

FRIC, Z. & HULA, V. 2013. *Zizula hylax* (Fabricius, 1775) new butterfly species for Socotra (Lepidoptera: Lycaenidae). *Shilap-Revista de Lepidopterologia* **41**(164): 571–575.

Abstract: *Zizula hylax* (Fabricius, 1775) is a widespread butterfly species, known from West Africa across Tropical Asia to Northern Australia. We report the first record of this species for Socotra, Archipelago in Yemen, which increases Socotra's total number of recorded butterfly species to 26. We also present a revised list of Socotran butterflies.

GARVIE, O. G., DOBSON, J.C.H., EDGE, D. A., GARDINER, A. J., TERBLANCHE, R. F. & WILLIAMS, M. C. 2014. Research and conservation plan for the Waterberg Copper (*Erikssonina edgei* Gardiner & Terblanche, 2010) (Lepidoptera: Lycaenidae) at the Bateleur Nature Reserve. *Metamorphosis* **25**: 100–108.

Abstract: *Erikssonina edgei* Gardiner & Terblanche no longer occurs at its type locality on the Tilodi Game Farm in the Waterberg, despite the presence of its known host plant and seemingly favourable veld conditions. New localities for *E. edgei* have been discovered at the Bateleur Nature Reserve (BNR) 50 km south by Mark and Tildie Williams, and this provides a valuable opportunity to study and protect this critically endangered butterfly. An interim conservation plan has been established jointly by the Lepidopterists' Society of Africa (LepSoc) and the owner of BNR. The results obtained from field work completed during 2013–2014 are presented and ongoing research projects are outlined.

GORDON, I.J., IRERI, P. & SMITH, D.A.S. 2014. Hologenomic speciation: synergy between a male-killing bacterium and sex-linkage creates a 'magic trait' in a butterfly hybrid zone. *Biological Journal of the Linnean Society* **111**(1): 92–109.

Abstract: *Danaus chrysippus* (L.) in Africa comprises four substantially isolated semispecies that are migratory and hybridize on a seasonal basis throughout the eastern and central part of the continent. In the hybrid zone (but not elsewhere), the butterfly is commonly host to a male killing endosymbiotic bacterium, *Spiroplasma* sp., which principally infects one semispecies, *Danaus chrysippus chrysippus* in Kenya. A W-autosome mutation, inherited strictly matrilineally, links B and C colour gene loci, which have thus gained sex-linkage in *chrysippus*. We have monitored variation in sex ratio and genotype at the A and C colour gene loci for two extended periods of 18 months (2004–5) and 12 months (2009–10) in adults reared from wild eggs laid on trap plants in Kasarani, near Nairobi, Kenya. Additionally, in 2009–10, all surviving adult butterflies were screened for *Spiroplasma* infection. The hybridizing Kasarani population is highly atypical in three respects, and has apparently been so for some 30 years: first, the sex ratio is permanently female-biased (as expected), although subject to seasonal fluctuation, being lowest (male/female) when *D. c. chrysippus* (cc) peaks and highest when *Danaus chrysippus dorippus* (CC) predominates; second, the population is invariably dominated by Cc heterozygotes of both sexes but especially females; and third, cc males are always scarce because they are systematically eliminated by male killing, whereas the CC genotype is male-biased. It is this imbalance of sex versus genotype that determines the massive departure from Hardy-Weinberg equilibrium in the population, in part because cc females have little choice but to pair with C- males. We suggest that: first, Cc hybrids of both sexes fail to disperse in the company of either parental

semispecies; second, *Spiroplasma* positive females carrying the W-autosome mutation have a selective advantage over females that lack the translocation; third, the endoparasite and the translocation create a ‘magic trait’ linkage group that underlies hologenomic reproductive isolation between two emerging species, *D.c. chrysippus* and *D.c. dorippus*; and, fourth, that the predominance of males in *dorippus* suggests that individuals must be protected by a male-killing suppressor gene. By contrast to the C locus, Aa heterozygotes are in substantial and permanent deficit, suggesting either assortative mating between AA (*chrysippus* and *dorippus*) and aa (*Danaus chrysippus alcippus*), or heterozygote unfitness, or both.

GREENFIELD, R., AKALA, N. & VAN DER BANK, F.H. 2014. Heavy metal concentrations in two populations of Mopane worms (*Imbrasia belina*) in the Kruger National Park pose a potential human health risk. *Bulletin of Environmental Contamination and Toxicology* **93**(3): 316–321.

Abstract: Metal concentrations in Mopane worms from Phalaborwa and Shangoni sites in the Kruger National Park were determined. Metal concentrations were evaluated by inductively coupled plasma optical emission spectroscopy (ICP-OES) and ICP-MS spectrometry after microwave digestion. The results indicate a substantial bioaccumulation of metals in Mopane worms. In Phalaborwa Cd concentrations were 15 times and Cu two times higher than the EU and UK recommended legal limits for human consumption, Zn levels were tolerable. Likewise, Cd, Cu and Zn concentrations at the Shangoni site were 26, 2.5 and 0.4 times over the EU and UK approved limits. Manganese concentrations were 20 and 67 times higher than FDA standards respectively. During the study the condition factor of the worms was determined. No significant difference between the condition factors indicated the worms at both sites are in similar condition. Potential sources of metals in the worms are either from the food they eat or pollution settling on the leaves.

HACKER, H.H. 2013. Additions to several revisions of Noctuid genera revised from 2001 to 2011, with descriptions of nine new species and three new subspecies from Africa, Arabian Peninsula and Iran, with faunistic notes (Noctuoidea). *In: HACKER, H.H. [ED.] Esperiana* **18**: 199–220.

Abstract: Descriptions of nine new species: *Rhynchina staudei* Hacker spec. nov. *Arcyophora amydropoliata* Hacker spec. nov. *Brevipecten mirifica* Hacker spec. nov. *Honeyia ankarana* Hacker & Le Grain spec. nov. *Honeyia elachista* Hacker spec. nov. *Clytie devissima* Hacker & Gyam spec. nov. *Acontia (Emmelia) albiovittata* Hacker spec. nov. *Acrobyla aulombardi* Hacker spec. nov. *Feliniopsis isographa* Hacker spec. nov. and three new subspecies: *Escarpamenta damarana abyssinica* Hacker subspec. nov. *Oraesia (Oraesia) emarginata malgassica* Hacker & Le Grain subspec. nov. *Clytie arenosa garaia* Hacker & Gyulai subspec. nov. Most of these taxa are from Africa, the Arabian Peninsula and Iran, and are given as an addendum to several Noctuid revisions made by the author during the last decade. One taxon proved to be a synonym and is officially synonymized here: *Mekrania punctalis* Brandt, 1941 = *Churia unipunctata* Hacker, 2011, syn. nov.

HACKER, H.H. [ed.] 2014. *Esperiana Memoir* Volume 7: 355 pp.

Abstract: This 355-page book presents and describes the afro-tropical Scythrididae, volume 7. The book is a single chapter book, which highlights on different sections. The

sections deal with the family Scythrididae embraces about 680 species assigned to about 30 genera. The species of Scythrididae are rather small moths having a wingspan of 6–30 mm with the most common value in the span 10–15 mm. In temperate and boreal regions the moths are mostly dark with brownish or greenish coloration, while in the tropic regions the scythridids frequently have pale forewings with beige or ivory ground colour. The book describes all species from obtainable material are re-described or described as new species. In many cases only one single specimen has been available for description, but due to the unique construction of the genitalia very seldom doubt about the rank arises. Another typical trait in Scythrididae is the rare occurrence of sexual dimorphism, which facilitates the matching of males and females from different localities within reasonable distance. The book highlights a list of contributors and their respective institutions. Each chapter contains a list of references. The text is written in English and indexed by subject with figures. Users of this book will include taxonomists, ecologists, and biologists.

HASSAN, S.S.M., IDRIS, E. & MAJERUS, M.E.N. 2013. Male-killer dynamics in the tropical butterfly, *Acraea encedana* (Lepidoptera: Nymphalidae). *Insect Science* **20**(6): 717–722.

Abstract: Sex ratio distortion in the tropical butterfly *Acraea encedana* is caused by infection with a male-killing bacterium of the genus *Wolbachia*. Previous research on this species has reported extreme female bias, high bacterial prevalences, and full sex role reversal. In this paper, we provide an assessment for the dynamics of the male-killer, based on a survey for sex ratios and *Wolbachia* prevalences among wild populations of *A. encedana* in Uganda. The study reveals that *Wolbachia* infection showed considerable variation over both spatial and temporal scales.

HASSAN, S.S.M., IDRIS, E. & MAJERUS, M.E.N. 2013. Morph ratio dynamics under male-killer invasion: The case of the tropical butterfly *Acraea encedon* (Lepidoptera: Nymphalidae). *Tropical Lepidoptera Research* **23**(1): 14–21.

Abstract: This study aimed to provide field-based assessment for the theoretical possibility that there is a relationship between colour polymorphism and male-killing in the butterfly *Acraea encedon*. In an extensive, three year study conducted in Uganda, the spatial variations and temporal changes in the ratios of different colour forms were observed. Moreover, the association between *Wolbachia* susceptibility and colour pattern was analyzed statistically. Two hypotheses were tested: first, morph ratio dynamics is a consequence of random extinction-colonization cycles, caused by *Wolbachia* spread, and second, particular colour forms are less susceptible to *Wolbachia* infection than others, implying the existence of colour form-specific resistance alleles. Overall, obtained data are consistent with the first hypothesis but not with the second, however, further research is needed before any firm conclusions can be made on the reality, scale and nature of the presumed association between polymorphism and male-killing in *A. encedon*.

HASSAN, S.S.M., IDRIS, E. & MAJERUS, M.E.N. 2014. Reassessment of sex role-reversal hypothesis in the tropical butterfly *Acraea encedon* (Lepidoptera: Nymphalidae). *Journal of Insect Behavior* **27**(1): 14–26.

Abstract: Species with extremely female-biased sex ratios are expected to show alteration in the normal sex roles, as a response to male scarcity. The tropical butterfly *Acraea encedon* is known to be infected with a male-killing

bacterium of the genus *Wolbachia*, which has led to severe sex ratio distortion in some populations where more than 95 % of wild females are infected with the male-killer. Thus, the aggregation of female *A. encedon* at resource-free landmarks has been interpreted as “female lekking” behaviour, a sex role-reversed form of lekking normally seen in males of many animals. For this paper, sites in Uganda where female-leks have previously been reported (in 1998) were revisited and surveyed for both sex ratio and bacterial prevalence, for 3 years (2005–2007). The hypothesis of sex role-reversal in *A. encedon* was evaluated in light of the field data obtained. The study concluded that the response of host populations to the gradual spread of the male-killer toward fixation occurs initially at the behavioural level, as sex role-reversal, and finally at the demographic level, by succumbing to extinction.

HAUSMANN, A., PARISI, F. & SCIARRETTA, A. 2014. The geometrid moths of Ethiopia I: tribes Pseudoterpnini and Comibaenini (Lepidoptera: Geometridae, Geometrinae). *Zootaxa* **3768**(4): 460–468.

Abstract: In this paper we present a checklist for Ethiopian Geometridae, subfamily Geometrinae, tribes Pseudoterpnini and Comibaenini. Six species were found to belong to the tribe Pseudoterpnini, two species to the tribe Comibaenini. One species is described as new, *Comibaena theodori* sp. nov. Adults of all species are illustrated, genitalia are figured for the new species.

HEATH, A. 2014. Uncovering secrets of the ‘cuckoo’ butterfly species *Chrysoritis dicksoni* (Gabriel, 1947), a social parasite of *Crematogaster* ants: A summary to the end of the 20th century with current conclusions. *Metamorphosis* **25**: 5–10.

Abstract: Current evidence suggests that juvenile stages of *Chrysoritis dicksoni* may rely on acoustic as well as chemical signals to survive as a parasite within the *Crematogaster peringueyi* ant nest. It is hypothesized that the sounds produced by the *C. dicksoni* larva may be mimicking those of a queen ant in order to enhance its hierarchical status and trophic priority within the nest. Interactions between *C. dicksoni* larvae and their host ants observed in captivity are summarized and illustrated. There is no evidence of ant brood being the larva’s diet as proposed by Clark & Dickson (1971), indeed the larvae repeatedly refused to feed on brood. In view of the strictly sedentary nature of all three larval instars studied and the trophallaxis observed, parsimony would suggest that trophallaxis is the main or sole source of food for all larval instars of this butterfly. No explanation could be found for the demise of the population of *C. dicksoni* near Mamre in the 1990s but it is suggested that excessive veld fires may have contributed. It is postulated that the species of scale insect associated with the host ant might delimit the range of *C. dicksoni*.

HEPPNER, J.B. 2013. *Prodidactis mystica* in Malawi and transfer to Hyblaeidae as subfamily Prodidactinae (Lepidoptera: Hyblaeidae: Prodidactinae). *Lepidoptera Novae* **6**(1): 1–4.

Abstract: The genus *Prodidactis* Meyrick (1921), and its single known species, *P. mystica* (Meyrick, 1918), are recorded for Malawi for the first time. The genus is transferred to the Hyblaeidae, as the newly re-assigned subfamily Prodidactinae, new status, from its original placement as the separate family Prodidactidae (Epstein and Brown, 2003). Larval, pupal, and adult characters of Prodidactinae align with Hyblaeidae in all features except for the reduced labial palpi, now considered a primitive state for Hyblaeidae. Hyblaeinae, revised status, is the concordant new

subfamily for previous members of the family.

HRABAR, H. & DU TOIT, J.T. 2014. Interactions between megaherbivores and microherbivores: elephant browsing reduces host plant quality for caterpillars. *Ecosphere* **5**(1): 7, 1–6.

Abstract: Direct effects of herbivory, and indirect effects through induced responses to herbivory, can both influence the susceptibility of plants to subsequent attacks by herbivores. There has, however, been very little research (if any) to investigate how the large-scale effects of browsing by megaherbivores (> 1000 kg body mass) on woody plants might influence the subsequent use of those plants by phytophagous insects. We conducted a field study in Kruger National Park, South Africa, to investigate whether browsing by elephants (*Loxodonta africana*) on mopane trees (*Colophospermum mopane*) had any influence on the subsequent selection of those trees by ovipositing mopane moths (*Imbrasia belina*). Our results showed that, after controlling for differences in canopy volume, the density of egg masses was almost halved in mopane woodlands recovering from severe elephant browsing in the previous season. This is despite the regrowth on heavily browsed trees having lower tannin: protein ratios and longer shoots. Our suggested explanation is that large monophagous caterpillars can only feed in the canopies of the trees in which they hatch and so the quantity of food in each canopy is more important than its quality. There are implications for the sustainable harvesting of mopane caterpillars, which represent an important food resource for rural communities in southern Africa. Future avenues for research include patch selection by large herbivores in response to local nutrient enrichment by frass deposited during caterpillar outbreaks.

IHLE, S. 2014. Praeimaginalstadien und Angaben zur Biologie von *Borocera cajani* (Vinson, 1863) (Lepidoptera: Lasiocampidae). *Entomologische Zeitschrift* **124**(3): 183–186.

JUERGENS, A. & WITT, T. 2014. Pollen-ovule ratios and flower visitors of day-flowering and night-flowering *Conophytum* (Aizoaceae) species in South Africa. *Journal of Arid Environments* **109**: 44–53.

Abstract: In desert environments mutualistic relationships between plants and their pollinators are believed to be strongly synchronized by rainfall that triggers flowering periods. However, recent studies have shown that this might not always be the case and that the level of specialization may also play a role. Although spring is the main flowering season in Namaqualand, the winter-rainfall region of southern Africa’s Succulent Karoo, a pronounced flowering peak occurs in autumn, outside of the normal winter spring period. One example is the genus *Conophytum* where, in contrast to the vast majority of the Aizoaceae, most species flower in autumn before the winter rain. About 25% of the species in the genus are night-flowering, maybe as a consequence of the shift in the seasonal flowering time. We therefore studied flower visitors in 30 *Conophytum* species in South Africa and, for comparison of pollination systems, analysed pollen-ovule ratios in diurnal and nocturnal conophytums. Pollen wasps of the genus *Quartinia* (Vespidae: Masarinae) were found to be the main flower visitors in diurnal species, whereas in night-flowering species different moth species were observed. We found no significant differences between pollen-ovule ratios of diurnal and nocturnal *Conophytum* species, suggesting that diurnal and nocturnal pollinators are equally efficient.

KARISCH, T. 2013. Taxonomic revision of the African *Cyana* species (Lepidoptera: Arctiidae,

Lithosiinae). *In*: HACKER, H.H. [ED.] *Esperiana* **18**: 39–198.

KAROLYI, F., MORAWETZ, L., COLVILLE, J.F., HANDSCHUH, S., METSCHER, B.D. & KRENN, H.W. 2013. Time management and nectar flow: flower handling and suction feeding in long-proboscid flies (Nemestrinidae: Prosoeca). *Naturwissenschaften* **100**(11): 1083–1093.

Abstract: A well-developed suction pump in the head represents an important adaptation for nectar-feeding insects, such as Hymenoptera, Lepidoptera and Diptera. This pumping organ creates a pressure gradient along the proboscis, which is responsible for nectar uptake. The extremely elongated proboscis of the genus *Prosoeca* (Nemestrinidae) evolved as an adaptation to feeding from long, tubular flowers. According to the functional constraint hypothesis, nectar uptake through a disproportionately elongated, straw-like proboscis increases flower handling time and consequently lowers the energy intake rate. Due to the conspicuous length variation of the proboscis of *Prosoeca*, individuals with longer proboscides are hypothesised to have longer handling times. To test this hypothesis, we used field video analyses of flower-visiting behaviour, detailed examinations of the suction pump morphology and correlations of proboscis length with body length and suction pump dimensions. Using a biomechanical framework described for nectar-feeding Lepidoptera in relation to proboscis length and suction pump musculature, we describe and contrast the system in long-proboscid flies. Flies with longer proboscides spent significantly more time drinking from flowers. In addition, proboscis length and body length showed a positive allometric relationship. Furthermore, adaptations of the suction pump included an allometric relationship between proboscis length and suction pump muscle volume and a combination of two pumping organs. Overall, the study gives detailed insight into the adaptations required for long-proboscid nectar feeding, and comparisons with other nectar-sucking insects allow further considerations of the evolution of the suction pump in insects with sucking mouthparts.

KEBEDE, A.T., RAINA, S.K. & KABARU, J.M. 2014. Structure, composition, and properties of silk from the African wild silkworm, *Anaphe panda* (Boisduval) (Lepidoptera: Thaumetopoeidae). *International Journal of Insect Science* **6**: 9–14.

Abstract: Silk cocoon nests, as well as the fiber structure, compositions, and properties of the African wild silkworm, *Anaphe panda*, collected from Kakamega tropical rainforest (western Kenya) were studied using scanning electron microscopy, high-pressure liquid chromatography, tensile tests, and thermogravimetric analysis, and they were compared with the industrial standard, *Bombyx mori*. Cocoon nests are complex structures made up of inner, middle, and outer layers. The inner hard parchment was found to protect a mass of (20–200) individual soft flossy cocoons that enclose the pupae. The outer surface of the cocoon nests was covered with a mass of hair-like bristles. Fibers contained crescent-shaped and globular cross-sections with nodes at regular intervals. Alanine (34%) and glycine (28%) were the dominant fibroin amino acids observed. Total weight loss after degumming the cocoon nest was 25.6%. Degummed fibers showed higher moisture regain of 9% when compared with cocoon nests (8%). The fibers had 0.4 GPa breaking stress and 15.4% breaking strain. Total weight loss values after thermogravimetric analysis were 86% and 90% for degummed fibers and cocoon shells, respectively.

KIEPIEL, I. & JOHNSON, S.D. 2014. Shift from

bird to butterfly pollination in *Clivia* (Amaryllidaceae). *American Journal of Botany* **101**(1): 190–200.

Abstract: Premise of the study: Pollinator shifts have been implicated as a driver of divergence in angiosperms. We tested the hypothesis that there was a transition from bird-to butterfly pollination in the African genus *Clivia* (Amaryllidaceae) and investigated how floral traits may have been either modified or retained during this transition. Methods: We identified pollinators using field observations, correlations between lepidopteran wing scales and pollen on stigmas, and single-visit and selective exclusion experiments. We also quantified floral rewards and advertising traits. Key results: The upright trumpet-shaped flowers of *C. miniata* were found to be pollinated effectively by swallowtail butterflies during both nectar-feeding and brush visits. These butterflies transfer pollen on their wings, as evidenced by positive correlations between wing scales and pollen loads on stigmas. All other *Clivia* species have narrow pendulous flowers that are visited by sunbirds. Selective exclusion of birds and large butterflies from flowers of two *Clivia* species resulted in a significant decline in seed production. Conclusions: From the distribution of pollination systems on available phylogenies, it is apparent that a shift took place from bird-to butterfly pollination in *Clivia*. This shift was accompanied by the evolution of trumpet-shaped flowers, smaller nectar volume, and emission of scent, while flower color and nectar chemistry do not appear to have been substantially modified. These results are consistent with the idea that pollinator shifts can explain major floral modifications during plant diversification.

KIOKO, E.N., MUGAMBI, J.R., MURIUKI, J.M., INGRISH, S., LANGE, C.N., MUCHAI, M., OYIEKE, H. & LAMPE, K.H. 2014. Type specimens of the Insect Order Lepidoptera in the collection of the National Museums of Kenya. *Bonn Zoological Bulletin Supplementum* **60**: 70–88.

Abstract: This paper presents the list of Lepidoptera type specimens held in the collection of the Invertebrates section of the National Museums of Kenya. The Lepidoptera type collection covers 639 type specimens representing 245 species or subspecies in 24 families. Those type specimens comprise 64 holotypes, 572 paratypes, two allotypes and one neallotype. The taxa are listed alphabetically. Reference to the original description, the type locality, geo-reference data, the name of collector(s), and collecting dates are provided.

KOHL, S. 2013. Les premiers états de ‘*Holocerina* sp. tz Minziro 10-X-2012’ (Lepidoptera, Saturniidae, Saturniinae, Micragonini). *Saturnafrika* **16**: 15–23.

KOVTUNOVICH, V., USTJUZHANIN, P. & MURPHY, R. 2014. Plume moths of Malawi (Lepidoptera: Pterophoridae). *Zootaxa* **3847**(4): 451–494.

Abstract: A review of Pterophoridae of Malawi is presented; 96 species from 35 genera and five subfamilies are recorded. Fourteen species are described as new: *Agdistis nyasa* Kovtunovitsh & Ustjuzhanin sp. nov., *Platyptilia mugesse* Kovtunovitsh & Ustjuzhanin sp. nov., *Stenoptilia juniper* Kovtunovitsh & Ustjuzhanin sp. nov., *Sphenarches mulanje* Kovtunovitsh & Ustjuzhanin sp. nov., *Marasmarcha lamborni* Kovtunovitsh & Ustjuzhanin sp. nov., *Arcoptilia malawica* Kovtunovitsh & Ustjuzhanin sp. nov., *Apoxyptilus uzumarus* Kovtunovitsh & Ustjuzhanin sp. nov., *Gypsochares murphy* Kovtunovitsh & Ustjuzhanin sp. nov., *Crassuncus livingstoni* Kovtunovitsh & Ustjuzhanin sp. nov., *Hellinsia namizumu* Kovtunovitsh & Ustjuzhanin sp. nov.,

Hellinsia chewa Kovtunovitch & Ustjuzhanin sp. nov., *Picardia leza* Kovtunovitch & Ustjuzhanin sp. nov., *Picardia raymondi* Kovtunovitch & Ustjuzhanin sp. nov., *Picardia tumbuka* Kovtunovitch & Ustjuzhanin sp. nov. New synonymies are established for 10 species: *Deuterocopus deltoptilus* Meyrick, 1930 = *Deuterocopus socotranus* Rebel, 1907 syn. nov.; *Deuterocopus henriotti* Bigot & Boireau, 2006 = *Deuterocopus socotranus* Rebel, 1907 syn. nov.; *Platyptilia periacta* Meyrick, 1910 = *Platyptilia farfarella* Zeller, 1867 syn. nov.; *Platyptilia claripicta* Fletcher, 1910 = *Platyptilia farfarella* Zeller, 1867 syn. nov.; *Platyptilia pygmaeana* Strand, 1913 = *Sphenarches anisodactylus* (Walker, 1864) syn. nov.; *Exelastis bergeri* Bigot, 1969 = *Exelastis crudipennis* (Meyrick, 1932) syn. nov.; *Prichotilus tanzanicus* Gielis, 2011 = *Prichotilus tara* Ustjuzhanin & Kovtunovich, 2011 syn. nov.; *Crassuncus chappuisi* Gibeaux, 1994 = *Crassuncus ecstasticus* (Meyrick, 1932) syn. nov.; *Paulianilus lolibai* Arenberger, 2011 = *Hellinsia madecasseus* (Bigot, 1964) syn. nov.; *Pterophorus purus* Meyrick, 1913 = *Crassuncus pacifica* (Meyrick, 1911) syn. nov. New combinations are established for six species: *Marasmarcha bengtssoni* (Gielis, 2009) comb. nov.; *Marasmarcha locharcha* (Meyrick, 1924) comb. nov.; *Marasmarcha rubriacuta* (Gielis, 2009) comb. nov.; *Procopperia insomnis* (Townsend, 1956) comb. nov.; *Crassuncus ecstasticus* (Meyrick, 1932) comb. nov. Images of the male genitalia are presented for the first time, for *Marasmarcha bengtssoni* (Gielis, 2009), and *Stenodacma cognate* Gielis, 2009. Female genitalia are illustrated for the first time. Species of wide pantropical or cosmopolitan distribution are not reported as new for the fauna of Malawi. However, 65 species of Pterophoridae are reported for the fauna of Malawi for the first time. One of them, *Stenoptilia viettei* Gibeaux, 1994, described from Madagascar, is reported for continental Africa for the first time.

KURSHAKOV, P.A. & ZOLOTUHIN, V.V. 2013. A review of the genus *Ectropa* Wallengren, 1863 with descriptions of a new genus and six new species (Lepidoptera: Chrysopolomidae). *Shilap-Revista de Lepidopterologia* **41**(164): 431–447.

Abstract: The genus *Ectropa* Wallengren, 1863, is revised, and a new species, *E. adam* Kurshakov & Zolotuhin, sp. n., is described. Based on the wing pattern and male genitalia characters, a new genus *Ectropona* Kurshakov & Zolotuhin, gen. n., related to *Ectropa*, is erected here, with *Ectropona dargei* Kurshakov & Zolotuhin, sp. n., as a type-species. Five more new species are also described: *Ectropona dargei* Kurshakov & Zolotuhin, sp. n., *E. larsa* Kurshakov & Zolotuhin, sp. n., *E. kubwa* Kurshakov & Zolotuhin, sp. n., *E. aarviki* Kurshakov & Zolotuhin, sp. n., and *E. revelli* Kurshakov & Zolotuhin, sp. n.. All species and type specimens are figured and distributional data are summarized.

KURSHAKOV, P.A. & ZOLOTUHIN, V.V. 2013. A review of the genus *Strigivenifera* Hering 1937 (Lepidoptera, Chrysopolomidae) with a description of ten new species. *Zoologicheskii Zhurnal* **92**(7): 808–824.

Abstract: Twelve species are considered within the afro-tropic genus *Strigivenifera* Hering 1937 and ten of them are described as new ones: *S. eborea* sp. n., *S. livingstonei* sp. n., *S. marina* sp. n., *S. tanja* sp. n., *S. ocellaris* sp. n., *S. cruisa* sp. n., *S. bartschi* sp. n., *S. oris* sp. n., *S. tatooifera* sp. n., and *S. neo* sp. n. The species *S. albidiscalis* (Hampson 1910) is raised from synonymy with *S. venata* (Aurivillius 1895) and considered as a separate species.

KYEREMATEN, R.A.K., BOATENG, B.A.,

HARUNA, M. & EZIAH, V.Y. 2013. Decomposition and insect succession pattern of exposed domestic pig (*Sus scrofa* L.) carrion. *ARPN Journal of Agricultural and Biological Science* **8**(11): 756–765.

Abstract: Pig carrion decomposition and insect succession patterns were monitored in the dry and wet seasons at the University of Ghana, Legon in the Greater Accra Region. The sequence and composition of the local carrion visiting fauna, as well as, the rate of decomposition of the carrion and their determinant climatic factors were measured. The complete decomposition of the carrion lasted 16 and 24 days for dry and wet season, respectively. Five stages of decomposition of the cadaver namely the fresh, bloated, active decay, advanced decay and dry remains were observed. In total, 19 species of insects from 14 families: Calliphoridae, Muscidae, Dolichopodidae, Gasterophilidae, Formicidae, Histeridae, Dermestidae, Cleridae, Lycidae, Staphilinidae, Pyrrhocoridae, Saturniidae and Theraevidae were collected. A few species from the family Ixodidae (Arachnidae) were also collected during the decomposition of the carrion. On account of their activity and frequency, the Calliphorid species, *Lucilia rufifacies* were the insects of greatest forensic importance. These blowflies were the early colonizers of the carrion in both seasons and remained throughout the decomposition process. Temperature, though important in controlling decomposition rates of carrion, could not account for the differences in decomposition rates observed between the two seasons. Rainfall delayed colonization of carrion during both seasons and this might have played a major role in the delayed rate of degradation observed during the wet season. The succession patterns were typical for the seasonal periods and provide data on baseline fauna important for estimating postmortem interval in cases of human death in Ghana.

LARSEN, T.B. 2013. Two new species in the African skipper genera *Borbo* (Hesperiinae, Baorini) and *Platylesches* (Hesperiinae, *incertae sedis*). *Tropical Lepidoptera Research* **23**(2): 92–98.

Abstract: *Borbo cottrelli* is described as a new species from Zambia. It is close to the sympatric and widespread *B. holtzi*, but differs in both external features and genitalia and the two species are sympatric. *Platylesches morigambia* is described as a new wholly West African species; Evans (1937) listed it under the name *P. batangae*, but the latter is a very different, rare skipper from Cameroun and Congo.

LARSEN, T.B & COLLINS, S.C. 2014. Some new and interesting African Hesperiiidae – the fifth ABRI research paper. *Metamorphosis* **25**: 60–76.

Abstract: Taxonomic changes are made in the hesperiid subfamilies Pyrginae and Hesperinae. *Abantis leucogaster rotundala* is described as a new subspecies. *Abantis leucogaster iruma* is raised to species rank. *Abantis ituri* is described as a new species from the eastern Democratic Republic of Congo (DRC), sympatric with the related *A. lucretia*. *Gorgyra kasungu* is described as a new submontane species from the Kivu Mountains in the DRC. The poorly known *G. vosseleri* from Tanzania is illustrated and re-described in comparison with *G. subfacatus*, of which it was placed as a subspecies by Evans. The new *Ceratrachia manengouba* is described from the submontane zone of Cameroun, related to *C. lewisi* from the submontane Obudu Plateau in Nigeria. *Gretna dargei* is described as new from Cameroun and Liberia and compared with the other members of the *Gretna waga*-group. *G. leakeyi* is illustrated in colour and with a genitalia scan for the first time. Finally, *Caenides lukolela*, allied to both *C. dacela* and *C. soritia*, is described as a new species from a single specimen from the Equateur

Province of the DRC. The male genitalia of all the new taxa are illustrated by scans and compared with their closest relatives.

LAWRENCE, J.M. 2014. *Field Guide to Butterflies of Seychelles. Their Natural History and Conservation.* Siri Scientific Press, Manchester, U.K. 125pp.

LIBERT, M. 2014. Nouveaux taxons du genre *Euptera* Staudinger, 1891 (Lepidoptera, Nymphalidae). *Bulletin de la Société Entomologique de France* **119**(1): 79–90.

Abstract: *Euptera grepi* n. sp., a new species hitherto confused with *E. mirifica* Carpenter & Jackson, 1950, is described; the nominate subspecies *E. grepi grepi* n. ssp. flies in eastern Democratic Republic of Congo, while *E. grepi cameruna* n. ssp. is found in Cameroon. A new synonymy is proposed: *E. mirabilis* Libert, 2005, n. syn. for *E. mirifica*, and two other new species from North-Eastern Democratic Republic of Congo (*E. miranda* n. sp. and *E. fallax* n. sp.) are described.

LISEKI, S.D. & VANE-WRIGHT, R.I. 2014. Butterflies (Lepidoptera: Papilionoideae) of Mount Kilimanjaro: family Pieridae, subfamily Pierinae. *Journal of Natural History* **48**(25–26): 1543–1583.

Abstract: This paper, which presents an annotated checklist of the whites (Pieridae: Pierinae), is the third in a series on the butterfly fauna of Mount Kilimanjaro. Four genera (*Colotis*, *Nepheronia*, *Belenois*, *Mylothris*), with a total of ten included species, are known to occur within the main forest zone, from c. 1800 to c. 2800 m. Of the species, only *Mylothris sagala* appears restricted to the primary forests. The fauna from the lower slopes, below 1800 m, is far richer, with a total of 11 genera and 40 species listed. An identification key to the genera of Pierinae that occur in Tanzania, together with a key to the adults of all pierine butterflies considered to occur or have occurred on Kilimanjaro, with 310 colour images, are included as online Supplementary Information.

LOSADA ANILLO, M.E. 2013. *Hypolimnna misippus* (Linnaeus, 1764) (Lepidoptera: Nymphalidae), a pantropical species present in Venezuela. *Entomotropica* **28**(3): 237–241.

Abstract: *Hypolimnna* Hubner, [1819] is a butterfly genus embracing 30 species distributed mainly in tropical regions of Africa and Asia. *Hypolimnna misippus* (Linnaeus, 1764) shows not only this Afro-Asiatic distribution, but it also extends to Tropical America. It has been found in the Canary Islands, the West Indies and in North and South America. The aim of the present study was to know the distribution pattern of that species in Venezuela, previously unknown. The information available in literature and museums was compiled and analysed. It was found that *H. misippus* is present, sporadically within a fringe of the north-coastal side of the country, and in part of Bolivar state. The most frequently recorded host plant for this butterfly species has been the pigweed, *Portulaca oleracea* L., which is common in Venezuela.

LOXDALE, H.D. 2013. Gorillas were his neighbours... and lots of large tropical insects too. *Antenna* **37**(3): 116–123.

MAKHADO, R., POTGIETER, M., TIMBERLAKE, J. & GUMBO, D. 2014. A review of the significance of mopane products to rural people's

livelihoods in southern Africa. *Transactions of the Royal Society of South Africa* **69**(2): 117–122.

Abstract: This paper provides a review of the existing literature on the significance of mopane wood and non-wood products to rural people's livelihoods, especially those in northern South Africa, southern Zimbabwe and eastern Botswana. Most rural dwellers in mopane areas are poor and therefore make wide use of mopane products for subsistence and commercial purposes. Mopane wood is primarily used for firewood, while the poles are used for construction of traditional structures. A household of 7 to 8 people uses on average 7.8 kg of mopane firewood for cooking one meal per day, or 2.8 tonnes per year, while a mean volume of 1.22 m³ to 1.86 m³ of poles is required for the construction of a traditional hut. Villagers also harvest the larvae of the moth *Imbrasia belina* (mopane worms) in order to supplement their diet. Dry mopane worms are nutritious, containing protein levels of up to 65% and an energy concentration of 543 Kcal/100g. Mopane worms are also traded to generate income and its trade provides a good economic return. This paper shows that the consumption of and trade in mopane products contribute significantly to rural people's livelihoods. One challenge is that information on the importance of mopane products in sustaining rural people's livelihoods is limited, old and scanty, hence the value of this review. To address the problem, this paper aims to contribute to a better understanding of the value of mopane products to rural people's wellbeing, and also stimulate the need to sustainably manage mopane into the future.

MARTIN, I. & COBOS, P. 2014. *Abisara rutherfordii* Hewitson, 1874 in Bioko Island (Equatorial Guinea): 100 years later (Lepidoptera: Riodinidae). *Shilap-Revista de Lepidopterologia* **42**(167): 423–428.

Abstract: In the present work is confirmed the presence of *Abisara rutherfordii* Hewitson, 1874 in the Bioko Island, recorded 100 years after the only existing appointment to date. The species shown are those found in the Caldera de Luba being the second records of Riodinidae in the south area of Bioko Island. The prospected area has not been studied before: therefore all the species found represent the first records of the inside of the Scientific Reserve of Gran Caldera de Luba. The field work was done in March 2007, in a total number of 16 working days. All the records, as already mentioned, were taken in the primary monsoon forest habitat, undisturbed and under pristine conditions.

MHUKA, V., DUBE, S. & NINDI, M.M. 2013. Chemical, structural and thermal properties of *Gonometa postica* silk fibroin, a potential biomaterial. *International Journal of Biological Macromolecules* **52**: 305–311.

Abstract: In the present study, chemical, structural and thermal properties of fibroin from *Gonometa postica*, a wild silkmoth species were investigated. Silk from *Gonometa rufobrunnea* and *Bombyx mori* species were included in this study for comparison. The results indicated that *G. postica* and *G. rufobrunnea* silk exhibited similar properties whereas distinct differences were observed with *B. mori* silk. Amino acid analysis showed that glycine, alanine and serine accounted for more than 70% of the total amino acid content in all species. The amount of polar amino acids in *Gonometa* fibroin makes it a promising biomaterial in cell and tissue culture. Structural analysis revealed a unique beta-sheet structure of *Gonometa* fibroin which is comprised of both poly-alanine and poly-glycine-alanine sequences. The maximum decomposition temperatures for *Gonometa* and *B. mori* fibroin were 350 degrees C and 320 degrees C

respectively. The influence of amino acid composition on structural and thermal properties of the silks is also discussed.

MILLER, S.E., COPELAND, R.S., ROSATI, M.E. & HEBERT, P.D.N. 2014. DNA barcodes of microlepidoptera reared from native fruit in Kenya. *Proceedings of the Entomological Society of Washington* **116**(1): 137–142.

MILLER, S.E., MARTINS, D.J., ROSATI, M. & HEBERT, P.D.N. 2014. DNA barcodes of moths (Lepidoptera) from Lake Turkana, Kenya. *Proceedings of the Entomological Society of Washington* **116**(1): 133–136.

MUNYULI, M.B.T. 2013. Drivers of species richness and abundance of butterflies in coffee-banana agroforests in Uganda. *International Journal of Biodiversity Science Ecosystem Services & Management* **9**(4): 298–310.

Abstract: A study was conducted in 26 sites on agricultural landscapes in Central Uganda to collect baseline information about drivers of butterfly richness and abundance. Data were collected for 1 year (2006) using line transects, walk-and-counts, fruit-bait traps and handnets sampling methods. A total of 57,439 individuals belonging to 331 species were collected. Totals of 127, 131 and 299 species were recorded in transect counts, banana-bait and handnets, respectively. Of the 57,439 individuals registered, 75%, 19% and 6% were recorded in transect counts, handnet and banana-bait trap, respectively. Butterfly abundance and species richness were significantly ($p < 0.05$) affected by climatic factors (rainfall, temperature) in previous years (2004 and 2005) and richness and abundance of wild nectaring plants. Butterfly species richness (not the abundance) decreased with land-use intensity ($p < 0.05$) and was positively related to the cover of semi-natural habitats. Both butterfly species richness and abundance declined sharply with forest distance. Nearby forest remnants and high cover of semi-natural habitats are thus important for conservation of butterflies in coffee-banana agroforestry systems and farmers should be encouraged to protect such resources.

NEW, T.R. & SAMWAYS, M.J. 2014. Insect conservation in the southern temperate zones: an overview. *Austral Entomology* **53**(1): 26–31.

Abstract: Insect conservation in the southern hemisphere lags substantially behind developments in parts of Europe and North America, where the relatively small faunas are better documented, and where a historical culture of natural history has enabled conservation needs to be assessed and addressed by many sympathetic supporters. We contrast this scenario with the much more embryonic knowledge and capability available in Australia, southern Africa, southern South America and New Zealand, all regions with large and incompletely documented insect faunas, but an equivalent array of threats to their survival. While a few individual ‘flagship species’ (mainly within Lepidoptera, Orthoptera and Coleoptera) have been critical in promoting wider interests, in general insects do not signify highly on regional conservation agendas. We offer a perspective of the major needs to counter this.

NYAFWONO, M., VALTONEN, A., NYEKO, P. & ROININEN, H. 2014. Butterfly community composition across a successional gradient in a human-disturbed Afro-tropical rain forest. *Biotropica* **46**(2):

210–218.

Abstract: Knowledge of the recovery of insect communities after forest disturbance in tropical Africa is very limited. Here, fruit-feeding butterflies in a tropical rain forest at Kibale National Park, Uganda, were used as a model system to uncover how, and how fast, insect communities recover after forest disturbance. We trapped butterflies monthly along a successional gradient for one year. Traps were placed in intact primary forest compartments, heavily logged forest compartments with and without arboricide treatment approximately 43 years ago, and in conifer-clearcut compartments, ranging from 9 to 19 years of age. The species richness, total abundance, diversity, dominance, and similarity of the community composition of butterflies in the eight compartments were compared with uni- and multivariate statistics. A total of 16,728 individuals representing 88 species were trapped during the study. Butterfly species richness, abundance, and diversity did not show an increasing trend along the successional gradient but species richness and abundance peaked at intermediate stages. There was monthly variation in species richness, abundance, diversity and composition. Butterfly community structure differed significantly among the eight successional stages and only a marginal directional change along the successional gradient emerged. The greatest number of indicator species and intact forest interior specialists were found in one of the primary forests. Our results show that forest disturbance has a long-term impact on the recovery of butterfly species composition, emphasizing the value of intact primary forests for butterfly conservation.

NYAFWONO, M., VALTONEN, A., NYEKO, P. & ROININEN, H. 2014. Fruit-feeding butterfly communities as indicators of forest restoration in an Afro-tropical rainforest. *Biological Conservation* **174**: 75–83.

Abstract: There is scarcity of information pertaining to insect colonisation during forest restoration in the tropics. We investigated the pattern and timescale of butterfly recovery along a gradient of forest restoration in an Afro-tropical moist forest in Kibale National Park, Uganda. The restoration forests ranged from 3 to 16 years of age. We placed five traps in each of the eight forests along the restoration gradient and sampled butterflies for three days monthly for 12 months, beginning in May 2011. We (1) tested for the directional pattern in butterfly species richness, abundance, diversity, dominance and community composition from the youngest restoration to primary forests, (2) assessed the temporal and spatial patterns in butterfly community composition along the restoration gradient, (3) assessed the change in similarity between restoration and primary forests along the gradient, to estimate the time needed for recovery, and (4) determined specialist species characterising each forest age group. We recorded 10,092 individuals, representing 79 species. Butterfly species richness, abundance and diversity increased with age since restoration started. There was a remarkable temporal variation in butterfly community composition. The similarity of the butterfly community to that of primary forests increased linearly with time, without reaching an asymptote. We estimate that fruit-feeding butterfly communities of restored tropical forests can be similar to that of primary forests within 40 years, provided that primary forests are nearby. Our results demonstrate that tropical forest restoration aids the recovery of butterfly communities to their pre-disturbance states and probably aids biodiversity as a whole.

OCHSE, M., SÁFIÁN S., MEY, W., ZOLOTUHIN, V.V. & PROZOROV, A.M. 2014. Lepidoptera Research in the Afrotropics: Results of the 2011

workshop and field trip in Ghana, West-Africa. *Entomologische Zeitschrift* **124**(1): 41–53.

Abstract: A report on a workshop held in 2011 covering Afrotropical Lepidoptera research organised by the Butterfly Conservation Society, Ghana (BCGHANA) is given. The post-event field trip in various localities in southern Ghana revealed many interesting Lepidoptera records, including 33 species of Sphingidae, 31 species of Lasiocampidae, 23 species of *Zamarada* (Geometridae), and more than 200 species of Microlepidoptera, belonging to 25 families. This paper is the second presenting results of BCGHANA's long term research project "Butterfly and Moth Inventory and Prime Butterfly Areas in Ghana".

OKONYA, J.S. & KROSCHER, J. 2013. Pest status of *Acraea acerata* Hew. and *Cylas* spp. in sweetpotato (*Ipomoea batatas* (L.) Lam.) and incidence of natural enemies in the Lake Albert Crescent agro-ecological zone of Uganda. *International Journal of Insect Science* **5**: 41–46.

Abstract: The present study presents the results of farmers' field surveys of the sweetpotato butterfly, *Acraea acerata* Hew., and the two African sweetpotato weevils, *Cylas puncticollis* Boheman and *C. brunneus* F. infestation and damage. The objectives of this study were to determine (i) occurrence and distribution of *A. acerata* and *Cylas* spp. as well as infestation and losses in sweetpotato (*Ipomoea batatas* (L.) Lam.), and (ii) the occurrence and abundance of parasitoids of *A. acerata* in the Lake Albert Crescent (LAC) agro-ecological zone of Uganda. Field surveys were conducted in 240 sweetpotato fields in eight subcounties in Masindi and Buliisa districts at the end of each of the two cropping seasons of 2012 (March to May and September to November). *A. acerata* and *Cylas* spp. occurred in 17% and 90% of the fields, respectively. *A. acerata* did not occur in two subcounties of Buliisa district. *A. acerata* infestation was low, with up to two and four larvae per plant in the first and second cropping season, respectively, causing minor defoliation of up to 4.1% of the sweetpotato plant. Larvae of *Cylas* spp. caused root yield losses of up to 56.5% and 47.5% in the first and second cropping seasons, respectively. Parasitism rates of *A. acerata* larvae ranged from 0.0% to 15.1% in season 1 and 0.0% to 6.3% in season 2. Out of a total of 1020 larvae collected, 8.43% were found to be parasitized. Parasitoids occurred in 56% of fields infested by its host. *Charops* spp. was the main parasitoid. It was evident that *Cylas* spp. were more prevalent than *A. acerata* in the LAC agro-ecological zone of Uganda. Conservation of *A. acerata* natural enemies may contribute to better management of this pest. Urgent attention for management of *Cylas* spp. is required.

OTTO, H. H. H. 2014. Applying lepidopteran oviposition science to establish new butterfly larval host plants from Mpumalanga and Limpopo provinces, South Africa. *Metamorphosis* **25**: 82–89.

Abstract: This paper reviews lepidopteran oviposition science and describes the many specific plant and environmental cues that female butterflies and moths seek prior to oviposition. Single oviposition observations are looked upon as an inconclusive method of determining larval host plants (LHP)s. Repeat oviposition and larval feeding observations are therefore presented that provide conclusive evidence for 28 new LHPs for butterfly species from Mpumalanga and Limpopo Provinces, South Africa.

OTTO, H. H. H. 2014. A new locality and larval host plant recorded for *Brephidium exilis exilis* (Boisduval, 1852) on the Arabian Peninsula. *Metamorphosis* **25**:

97–99.

OTTO, H. H. H. & LARSEN, T.B. 2014. A new locality for *Euchrysops osiris* (Hopffer, 1855) in Sohar, Oman. *Metamorphosis* **25**: 149–151.

PIERRE, J. & BERNAUD, D. 2013. *Butterflies of the World. Part 39: Acraea subgenus Acraea*. Goecke & Evers, Keltern.

RANDRIANANDRASANA, M., RAZAFINDRAL-EVA, H.A. & BERENBAUM, M.R. 2014. Host plant records of *Antherina suraka* (Boisduval, 1833) (Saturniidae) in Madagascar. *Journal of the Lepidopterists' Society* **68**(2): 130–140.

Abstract: The larval stage of *Antherina suraka* (Boisduval) (Saturniidae) consumes leaves of plant species from 23 families. These host plant species belong mainly to families in the subclass Rosidae, although those in the family Oleaceae and Apocynaceae from another subclass (Asteridae) are nearly as numerous as those in the family Rosaceae. Documentation and field surveys from 2008 to 2011 in different regions of Madagascar enabled an update of the list of the host plants of *A. suraka*. As few records of host plants exist and no immature stages were found in the dry areas, in contrast with other regions of Madagascar, further studies of *A. suraka* in these special ecosystems will provide interesting ecological data. The discovery of several host plant species endemic to Madagascar showed that, although *A. suraka* has adapted to feed on non-native species in disturbed sites throughout its range, it remains reliant on native forests. Determination of its host availability in each region constitutes an important step in prioritizing the conservation of the edges of the remaining endangered forests, as it might help establish sericulture that can reduce deforestation by improving the livelihood of local people.

RAZOWSKI, J. 2013. Accessions to the Afrotropical fauna of Tortricidae (Lepidoptera), 2. *Polish Journal of Entomology* **82**(3): 159–174.

Abstract: Eighteen species of Afrotropical Tortricidae are discussed, eleven of which are described as new: *Plinthograptis iitae* sp. n., *Lobesia hecista* sp. n., *Teitecopsis davisorum* sp. n., *Anthozela daressalami* sp. n., *Herpystis isolata* sp. n., *Fulcrifera horisma* sp. n., *Cydia zariae* sp. n., *Cydia ergoda* sp. n., *Microsarotis samaruana* sp. n., *Ioditis mokwae* sp. n., *Grapholita hymenosa* sp. n.

RAZOWSKI, J. 2014. Tortricidae from the Tervuren Museum, 5: Archipini (Lepidoptera: Tortricidae). *Shilap Revista de Lepidopterologia* **42**(167): 449–479.

Abstract: Eight genera and 38 species are treated; one new genus (*Pachyluncaria* Razowski, gen. n.) and 30 new species (*Pandemis loesthia* Razowski, sp. n., *P. congenita* Razowski, sp. n., *P. congrua* Razowski, sp. n., *P. smicra* Razowski, sp. n., *P. saphes* Razowski, sp. n., *Choristoneura oluduana* Razowski, sp. n., *C. deuterus* Razowski, sp. n., *C. holovera* Razowski, sp. n., *C. nowakiana* Razowski, sp. n., *C. prostheta* Razowski, sp. n., *Pachyluncaria pachyluncus* Razowski, sp. n., *Procris misera* Razowski, sp. n., *P. rectogramma* Razowski, sp. n., *P. scorta* Razowski, sp. n., *P. olulua* Razowski, sp. n., *P. fulvastra* Razowski, sp. n., *P. dolia* Razowski, sp. n., *Cornips enoicyclus* Razowski, sp. n., *C. ruhurinius* Razowski, sp. n., *C. ignoratus* Razowski, sp. n., *Epichoristodes eurosta* Razowski, sp. n., *E. albatella* Razowski, sp. n., *E. gatamaiyu* Razowski, sp. n., *E. albulata* Razowski, sp. n., *E. ngangaona* Razowski, sp. n., *E. pallens* Razowski, sp. n., *E. ugoi* Razowski, sp. n., *E. lagara* Razowski, sp. n., *E. rwankwia* Razowski, sp. n., *Aphelia*

aberdarica Razowski, sp. n.) are described and illustrated. Four species are transferred to different genera (*Niphothixa ophima* Bradley, 1965 to *Pandemis* and *Paramesiodes aprepta* Bradley, 1965, *Capua liparochra* Meyrick, 1928, and *Tortrix edwardsi* Bradley, 1965 to *Epichoristodes*).

RAZOWSKI, J. & WOJTUSIAK, J. 2014. Tortricidae (Lepidoptera) of the Afrotropical fauna: accession 1. *Polish Journal of Entomology* **83**(3): 207–218.

Abstract: Eighteen species of Afrotropical Tortricidae are discussed; six species are described as new: *Choristoneura saotome* sp. n., *Afroploce bagamoyo* sp. n., *Anthozela macambrarae* sp. n., *Anthozela usambarae* sp. n., *Eucosmocydia terreirana* sp. n. and *Cydia amaniana* sp. n. Faunistic data on 12 species are provided.

ROTA, J., MILLER, S.E. 2013. A new genus of metalmark moths (Lepidoptera, Choreutidae) with Afrotropical and Australasian distribution. *ZooKeys* **355**: 29–47.

Abstract: *Niveas* Rota, new genus, and its two new species, *N. agassizi* Rota, new species, and *N. kone* Rota, new species, are described and illustrated. *Niveas* is assigned to the subfamily Choreutinae based on morphological and molecular data. *Niveas agassizi* is currently known only from Kenya and only from female specimens. *Niveas kone* has been found on the Solomon Islands and in Papua New Guinea (PNG). In PNG, larvae of this species have been reared from several species of *Ficus* (Moraceae). The two species are superficially quite dissimilar from each other. However, they share features in wing pattern and venation, as well as female genitalia, and the molecular data strongly support the monophyly of *Niveas*.

SÁFIÁN, S. 2013. Observation of hill-topping behaviour by the Giant African Swallowtail – *Papilio antimachus* Drury, 1782 and other recent records from Liberia (West Africa) (Lepidoptera: Papilionidae). *Shilap-Revista de Lepidopterologia* **41**(163): 323–329.

Abstract: Hill-topping, as a mate location strategy of the Giant African Swallowtail *Papilio antimachus* Drury, 1782 was observed in Liberia's Nimba Mountains (Nimba County) and Putu Range (Grand Gedeh County) and is presented in detail. Other recent observations are also included, since *P. antimachus* is considered extremely rare in West Africa and is included in the IUCN's red list, as "DD-data deficient". The observations and the new distribution data provide relevant information for further understanding of the ecology and for more effective conservation of the habitats of Africa's largest butterfly.

SÁFIÁN, S. 2014. Hill-topping in some African *Celaenorrhinus* Hübner, 1819. *Metamorphosis* **25**: 1–2.

SÁFIÁN, S. & COLLINS, S. C. 2014. A new *Iridana* Aurivillius, 1920 and a new *Teratoneura* Dudgeon, 1909 (Lepidoptera: Lycaenidae) from tropical Africa. *Metamorphosis* **25**: 90–96.

Abstract: A new species of *Iridana* Aurivillius, 1920 has been discovered in 2009 and is described as *I. kollariki* sp. nov. in relation to *I. perdita* (Kirby, 1890). It was bred from larva and pupa in the Bunso Arboretum, Ghana and was subsequently found also in Liberia. Descriptions of larva and pupa are given, as well as notes on the species' development and myrmecophilous relationship. A remarkable

species in the previously monotypic genus *Teratoneura* Dudgeon, 1909 is also described in comparison with *Teratoneura isabellae* Dudgeon, 1909. Although it was recognised for a while, the lack of accessibility of the few specimens in collections and a taxonomic misunderstanding of *T. isabellae* and *T. isabellae congoensis* Stempffer, 1954 in relation to the new species, prevented its description. The confusion was partly caused by the misidentification and illustration of the undescribed species in two relevant works.

SCHRÖDER, S. 2014. An unusual specimen of the genus *Iolaus* (*Epamera*) Druce (Lepidoptera: Lycaenidae) from Yakoli, Central African Republic. *Metamorphosis* **25**: 123–125.

SHARP, I. C. & SHARP, A. J. 2014. *Hypolycaena philippus philippus* larva observed feeding on *Coniodactylum chevalieri* fungal galls parasitic to *Ziziphus mucronata*. *Metamorphosis* **25**: 3–4.

SHARP, I. C. & SHARP, A. J. 2014. *Pentila tropicalis* – new records from the Limpopo lowveld. *Metamorphosis* **25**: 56–57.

SHIMELIS, A., BEKELE, A. & THIRGOOD, S. 2014. Prey abundance and patch usage for foraging by *Buteo augur* in the Afro-alpine habitats of the Bale Mountains National Park (BMNP), Ethiopia. *Nature Environment and Pollution Technology* **13**(1): 25–30.

Abstract: Quantifying diet related responses of species is key for understanding their functional relationship with their environment. Variation in its magnitude reflects differences in the adaptive value of spatial locations within the distributional range of a species. Amongst the key factors that may account for such variation, differences in prey abundance are critical particularly for predatory species. In this paper, the relationship of the use of patches for foraging by *B. augur* with prey abundance in the Afro-alpine habitats of the BMNP was studied. Data on the frequency of usage of patches for foraging by *B. augur* and the abundance of suitable-prey species was collected by having samples at three contrasting areas that reflect the overall variation in the Afro-alpine system. Classification of patches using prey abundance predicted their group membership along with the intensity of foraging by *B. augur*, which varied with very high significance. Two latent variates that were computed by linearly combining the abundance of prey species explained significantly *B. augur*'s foraging frequency significantly in a quadratic and linear regression models. The first variate that explained most of the group variation in prey abundance predicted the frequency of foraging by *B. augur* significantly in a quadratic model that explained 66% of the variation. This variate was mainly defined by the abundances of *A. blicki*, *L. melanonyx* and *O. bottae*. The second variate with a smaller proportion of group variation contributed significantly to the predictive value of a linear regression model that explained 77 % of the variation in the data set. The discriminant scores of this variate were mainly contributed by *A. blicki* and *S. albocaudata*. Interpretation of our results indicated that *A. blicki* along with *S. albocaudata* and *L. melanonyx* may have played principal role in affecting *B. augur*'s foraging decisions across patches. Generally, in this paper we determined the main prey species that affect the foraging behaviour of *B. augur* for the first time and presented a body of information and interpretation essentially laying the foundation for further understanding of the species ecology in the BMNP and also in Ethiopia. The findings also assist the general conservation effort in the NP and also initiatives

that may specifically target *B. augur*.

STAUDE, H.S. & SIHVONEN, P. 2014. Revision of the African geometrid genus *Zerenopsis* C. & R. Felder – moths with peculiar life histories and mating behaviours (Geometridae: Ennominae: Diptychini). *Metamorphosis* **25**: 11–55.

Abstract: The taxonomy of the African geometrid genus *Zerenopsis* C. & R. Felder, 1874, placed in the subfamily Ennominae and tribe Diptychini (cycad moths), is revised. Based on a detailed comparison of morphological characters, *Diptychis* C. & R. Felder, 1874 and *Paraptychodes* Warren, 1894 are placed as junior subjective synonyms of *Zerenopsis* C. & R. Felder, 1874 (**syn. n.**). Consequently, five new species combinations (**comb. n.**) are proposed: *Zerenopsis geometrina* (C. & R. Felder, 1874), *Zerenopsis meraca* (Prout, 1928), *Zerenopsis kedar* (Druce, 1896), *Zerenopsis tenuis* (Butler, 1878) and *Zerenopsis costimaculata* (Prout, 1913). Two new species are described: *Zerenopsis moi* Staude & Sihvonen (**sp. n.**) from Mozambique and *Zerenopsis flavimaculata* Staude & Sihvonen (**sp. n.**) from Malawi, raising the total number of species in the genus *Zerenopsis* from one to eight. The constituent species are diagnosable by morphological characters, particularly by facies and genetic COI data, whereas the male and female genitalia are rather uniform and less diagnostic. The life histories of *Z. lepida* (Walker, 1854), *Z. moi* and *Z. costimaculata* and the final-instar larvae of *Z. geometrina* and *Z. tenuis* are described. All known larvae are aposematic, feed on cycads during the early stages of their life cycle and accept other, unrelated plants in later instars. *Zerenopsis* adults are aposematic and diurnal. Lek behaviour is described for *Z. lepida*, *Z. tenuis* and *Z. moi*, and evidence is presented that it also occurs in other *Zerenopsis* species. This mating strategy is potentially unique among Geometridae. The androconial organs of the males are described and illustrated as forming a ‘pheromone pocket’ whose development is related to the lek behaviour. Information on habitat, distribution, conservation status and genetics is provided for the majority of the species. Diagnostic characters of the adults, including of the male and female genitalia where known, are described for all species.

TAYLOR, P.J., MONADJEM, A. & STEYN, J.N. 2013. Seasonal patterns of habitat use by insectivorous bats in a subtropical African agro-ecosystem dominated by macadamia orchards. *African Journal of Ecology* **51**(4): 552–561.

Abstract: We report on acoustic surveys of insectivorous bats conducted during seven months of the year using ANABAT recordings in two habitats (macadamia orchards and adjacent riparian bush) in a subtropical agro-ecosystem in northern South Africa. We defined two functional foraging groups of bats based on their echolocation calls: (i) open-air foragers (family Molossidae) having narrow-band, low-frequency, low duty cycle calls; and (ii) clutter-edge foragers (families Miniopteridae and Vespertilionidae), having broad-band, higher frequency, low duty cycle calls. Bat activity (number of bat passes) was not significantly influenced by habitat. Total bat activity and activity of both functional groups varied significantly between seasons, being highest in summer and autumn (coinciding with annual peaks in numbers of Twin spotted (*Bathycoelia natalicola*) and Green (*Nezara* spp) Stinkbugs, order Heteroptera, family Pentatomidae, and Macadamia Nut Borer moths, *Cryptophlebia ombrodelta*) and lower in winter and spring. No significant effect of moon phase was detected, either on total activity or activity of the two functional groups. We postulate that the significant pattern of seasonality of commuting and/or foraging activity of bats in macadamia

orchards (which is more marked in open-air foragers) may be driven by the seasonal abundance of pest insects such as stinkbugs and Macadamia Nut Borer moths.

THOMAS, A.J. & JACOBS, D.S. 2013. Factors influencing the emergence times of sympatric insectivorous bat species. *Acta Chiropterologica* **15**(1): 121–132.

THOMAS, B. 2013. Sustainable harvesting and trading of mopane worms (*Imbrasia belina*) in Northern Namibia: an experience from the Uukwaluudhi area. *International Journal of Environmental Studies* **70**(4): 494–502.

Abstract: The roles of the Uukwaluudhi Traditional Authority (UTA) and government institutions were assessed in the sustainable harvesting of the mopane worm *Imbrasia* (= *Gonimbrasia*) *belina* and in marketing this food item in northern Namibia. There has been a shift from harvesting mopane worms for subsistence to trading them in both rural and urban markets. The increasing importance of the mopane worms in the urban diet has caused overexploitation of the insect. Unless this common property food resource is managed in a sustainable manner, there could be very low populations and market failure for the crop. It is recommended that the government improves the property rights and institutional arrangements that govern the use of mopane worms by supporting communities to establish indigenous natural resource management systems.

THOMPSON, M.J. & TIMMERMANS, M.J.T.N. 2014. Characterising the phenotypic diversity of *Papilio dardanus* wing patterns using an extensive museum collection. *PLOS ONE* **9**(5): Article number: e96815. DOI: 10.1371/journal.pone.0096815

Abstract: The history of 20th Century evolutionary biology can be followed through the study of mimetic butterflies. From the initial findings of discontinuous polymorphism through the debates regarding the evolution of mimicry and the step-size of evolutionary change, to the studies on supergene evolution and molecular characterisation of butterfly genomes, mimetic butterflies have been at the heart of evolutionary thought for over 100 years. During this time, few species have received as much attention and in-depth study as *Papilio dardanus*. To assist all aspects of mimicry research, we present a complete data-derived overview of the extent of polymorphism within this species. Using historical samples permanently held by the NHM London, we document the extent of phenotypic variation and characterise the diversity present in each of the subspecies and how it varies across Africa. We also demonstrate an association between “imperfect” mimetic forms and the transitional race formed in the area where Eastern and Western African populations meet around Lake Victoria. We present a novel portal for access to this collection, www.mimeticbutterflies.org, allowing remote access to this unique repository. It is hoped that this online resource can act as a nucleus for the sharing and dissemination of other collections databases and imagery connected with mimetic butterflies.

THOMPSON, M.J., TIMMERMANS, M.J.T.N., JIGGINS, C.D. & VOGLER, A.P. 2014. The evolutionary genetics of highly divergent alleles of the mimicry locus in *Papilio dardanus*. *BMC Evolutionary Biology* **14**: Article 140 DOI: 10.1186/1471-2148-14-140

Abstract: Background: The phylogenetic history of genes

underlying phenotypic diversity can offer insight into the evolutionary origin of adaptive traits. This is especially true where single genes have large phenotypic effects, for example in determining polymorphic mimicry in butterflies. Here, we characterise the evolutionary history of two candidate genes for the mimicry switch in the polymorphic Batesian mimic *Papilio dardanus* coding for the transcription factors engrailed and invected. Results: We show that phased haplotypes associated with the dominant morphs f. *poultoni* and f. *planemoides* are phylogenetically highly divergent, at particular at non-synonymous sites. Some non-synonymous changes are shared between the divergent alleles suggesting either convergence or a shared ancestry. Gene trees for invected do not show this pattern. Despite their great divergence, all engrailed alleles of *P. dardanus* were monophyletic with respect to alleles of closely related species. Phylogenetic analyses therefore reveal no evidence for introgression from other species. A McDonald-Kreitman test conducted on a population sample from South Africa confirms a significant excess of intraspecific non-synonymous diversity in *P. dardanus* engrailed, suggesting long-term balanced polymorphism at this locus. Conclusions: The divergence between engrailed haplotypes suggests an evolutionary history distorted by selection with multiple changes reflecting recurrent selective sweeps. The high level of intraspecific polymorphism observed is characteristic of balancing selection on this locus, as expected if the gene engrailed is under phenotypic selection for the maintenance of multiple mimetic morphs. Non-synonymous changes in key functional portions of a major transcription factor are likely to be deleterious but if maintained in a dominant allele at low frequency, heterozygosity would reduce the associated genetic load.

TIMM, A.E. & BROWN, J.W. 2014. A new genus of Grapholitini from Africa related to *Thaumatotibia* (Lepidoptera: Tortricidae). *Zookeys* **438**: 113–128.

Abstract: *Thaumatovalva* gen. n. is described and illustrated from the Afrotropical region. As currently defined the genus includes four species: *T. deprinsorum* sp. n. from the Democratic Republic of Congo; *T. albolineana* sp. n. (type species) from the Democratic Republic of Congo; *T. spinai* (Razowski & Trematera) comb. n., from Ethiopia and Nigeria; and *T. limbata* (Diakonoff, comb. n., from the Seychelles and Kenya. *Thaumatovalva limbata* has been reared from the fruit of *Cordia somaliensis* Baker and *C. monoica* Roxb. (Boraginaceae) in Kenya. Although structures of the male and female genitalia are extremely similar among three of the four species, male secondary scales on the under surface of the hindwing easily distinguish them.

USTJUZHANIN, P.Ya. & KOVTUNOVICH, V.N. 2013. On the fauna of plume moths (Lepidoptera, Pterophoridae) of Zimbabwe. *Amurskii Zoologicheskii Zhurnal* **5(2)**: 153–160.

Abstract: The list of Zimbabwean Pterophoridae includes 56 species, with 48 species first recorded from Zimbabwe. The descriptions of 2 new species are given: *Walsinghamiella selinda* Ustjuzhanin & Kovtunovich sp. nov. and *Platyptilia swynnertoni* Ustjuzhanin & Kovtunovich sp. nov. New synonyms are established for 4 species: *Platyptilia periacta* Meyrick, 1910, syn. nov., junior synonym to *Platyptila farfarella* Zeller, 1867; *Platyptilia claripicta* Fletcher, 1910, syn. nov., junior synonym to *Platyptila farfarella* Zeller, 1867; *Marasmarcha pavidus* (Meyrick, 1908), syn. nov., junior synonym to *Marasmarcha bonaespei* (Walsingham, 1881); *Hellinsia purus* (Meyrick, 1913), syn. nov., junior synonym to *Crassuncus pacifica* (Meyrick, 1911). New combinations are given for 3 species: *Procapperia insomnis*

(Townsend, 1956) comb. nov.; *Marasmarcha locharcha* (Meyrick, 1924) comb. nov.; *Crassuncus pacifica* (Meyrick, 1911) comb. nov.

VALTONEN, A., MOLLEMAN, F., CHAPMAN, C.A., CAREY, J.R., AYRES, M.P. & ROININEN, H. 2013. Tropical phenology: bi-annual rhythms and interannual variation in an Afrotropical butterfly assemblage. *Ecosphere* **4(3)**: 36, 1–28.

Abstract: Temporal variation and phenology of tropical insect communities and the role of environmental factors controlling this variation is poorly understood. A better understanding is needed, for example, to predict the effects of climate change on tropical insect communities and to assess the long-term persistence of tropical communities. We studied seasonal and inter-annual variation in tropical fruit-feeding butterflies by exploiting a unique 137-month abundance time series of >100 species, sampled at 22 locations in the medium altitude montane rain forest of Kibale National Park, western Uganda. Precipitation peaked twice per year, about 20 d after each equinox. Vegetation greenness peaked approximately 33 d later. Species richness and abundance of butterflies peaked about 2 and 3 months, respectively, after the greenness peak. Furthermore, temporal shifts in peaks of butterfly abundances of each 6-month cycle positively correlated with temporal shifts in peaks of vegetation greenness approximately three months before. The butterfly assemblages of ENSO warm phase years differed significantly from assemblages of the other years. To our knowledge this is the first elucidation of bi-annual rhythms in butterfly assemblages. Host plant availability could explain the seasonal cycles in butterfly abundance and species richness, because the 3-month lag observed matches with the egg-to-adult development time in the studied species.

WANG, H.L., BRATTSTROM, O., BRAKEFIELD P.M., FRANCKE, W. & LOEFSTEDT, C. 2014. Identification and biosynthesis of novel male specific esters in the wings of the tropical butterfly, *Bicyclus martius sanaos*. *Journal of Chemical Ecology* **40(6)**: 549–559.

Abstract: Representatives of the highly speciose tropical butterfly genus *Bicyclus* (Lepidoptera: Nymphalidae) are characterized by morphological differences in the male androconia, a set of scales and hair pencils located on the surface of the wings. These androconia are assumed to be associated with the release of courtship pheromones. In the present study, we report the identification and biosynthetic pathways of several novel esters from the wings of male *B. martius sanaos*. We found that the volatile compounds in this male butterfly were similar to female-produced moth sex pheromones. Components associated with the male wing androconial areas were identified as ethyl, isobutyl and 2-phenylethyl hexadecanoates and (11Z)-11-hexadecenoates, among which the latter are novel natural products. By topical application of deuterium-labelled fatty acid and amino acid precursors, we found these pheromone candidates to be produced in patches located on the forewings of the males. Deuterium labels from hexadecanoic acid were incorporated into (11Z)-11-hexadecanoic acid providing experimental evidence of a Delta 1-desaturase being active in butterflies. This unusual desaturase was found previously to be involved in the biosynthesis of female-produced sex pheromones of moths. In the male butterflies, both hexadecanoic acid and (11Z)-11-hexadecanoic acid were then enzymatically esterified to form the ethyl, isobutyl and 2-phenylethyl esters, incorporating ethanol, isobutanol, and 2-phenylethanol, derived from the corresponding amino acids L-alanine, L-

valine, and L-phenylalanine.

WEBER, R.S. & CRAIG, C.L. 2014. Wild silk production to support farmers excluded from protected areas in Madagascar. *Biotechnology of Silk* **5**: 1–23.

Abstract: To design a project to meet the economic needs of farmers whose livelihoods have been restricted by formation of protected areas, we modelled the potential of wild silk production to generate income while adding value to adjacent forest and agricultural zones. We project that farmers who plant 250 silkworm host plants can produce 10,000 cocoons per year and earn a median added income of 125-275 USD per year, depending on the type of silk moth reared. Income returns can increase to a median of 480 USD/household/year when other household members produce yarn and textile. Our projections for added income exceed a recent estimate for how much farmers, who have been economically displaced from the Makira Protected Area, need to maintain a subsistence lifestyle. Our findings suggest that wild silk could provide incremental income that invests local communities in forest protection and allows farmers to establish a legacy for their children. We propose that entrepreneurial approaches, such as the wild silk project proposed here, could be a component of an effective livelihood strategy for biodiversity conservation in areas where programs based on payments for ecosystem services cannot be effectively implemented due to extreme poverty, lack of economic infrastructure and/or political instability.

WILKERSON, M.L., ROCHE, L.M. & YOUNG, T.P. 2013. Indirect effects of domestic and wild herbivores on butterflies in an African savanna. *Ecology and Evolution* **3**(11): 3672–3682.

Abstract: Indirect interactions driven by livestock and wild herbivores are increasingly recognized as important aspects of community dynamics in savannas and rangelands. Large ungulate herbivores can both directly and indirectly impact the reproductive structures of plants, which in turn can affect the pollinators of those plants. We examined how wild herbivores and cattle each indirectly affect the abundance of a common pollinator butterfly taxon, *Colotis* spp., at a set of long-term, large herbivore exclusion plots in a semi-arid savanna in central Kenya. We also examined effects of herbivore exclusion on the main food plant of *Colotis* spp., which was also the most common flowering species in our plots: the shrub *Cadaba farinosa*. The study was conducted in four types of experimental plots: cattle-only, wildlife-only, cattle and wildlife (all large herbivores), and no large herbivores. Across all plots, *Colotis* spp. abundances were positively correlated with both *Cadaba* flower numbers (adult food resources) and total *Cadaba* canopy area (larval food resources). Structural equation modeling (SEM) revealed that floral resources drove the abundance of *Colotis* butterflies. Excluding browsing wildlife increased the abundances of both *Cadaba* flowers and *Colotis* butterflies. However, flower numbers and *Colotis* spp. abundances were greater in plots with cattle herbivory than in plots that excluded all large herbivores. Our results suggest that wild browsing herbivores can suppress pollinator species whereas well-managed cattle use may benefit important pollinators and the plants that depend on them. This study documents a novel set of ecological interactions that demonstrate how both conservation and livelihood goals can be met in a working landscape with abundant wildlife and livestock.

WILLIAMS, M.C. & ALTENROXEL, B. 2014. The butterflies (Lepidoptera: Papilionoidea) of Lekgalameetse Provincial Park, Limpopo Province,

South Africa. *Metamorphosis* **25**: 126–137.

Abstract: Published and unpublished records of butterfly species found in Lekgalameetse Provincial Park, Limpopo Province, South Africa were compiled into an annotated checklist for the Park. This list comprises 268 species – 12 Papilionidae, 36 Pieridae, 98 Nymphalidae, 73 Lycaenidae and 49 Hesperidae. The topography and vegetation of the Park is summarized and the history of butterfly collecting in the region is briefly given. The cultural and political history of the Lekgalameetse area is outlined. Interesting aspects of the butterfly fauna are discussed.

WILLIS, C.K. & WILLIAMS, M.C. Oviposition behaviour in MacGregor's Blue (*Lepidochrysops mcgregori*) (Lepidoptera: Lycaenidae), in South Africa. *Metamorphosis* **25**: 152–153.

YAKOVLEV, R.V. 2014. A new species of *Afroarabiella* Yakovlev, 2008 (Lepidoptera, Cossidae) from the Republic of South Africa, including a world catalogue of the genus. *Zootaxa* **3793**(2): 297–300.

YAKOVLEV, R., IVINSKIS, P., RIMSAITE, J. & SALDAITIS, A. 2013. Description of two new species of *Meharia* Chretien, 1915 (Lepidoptera: Cossidae) from East Africa. *Zootaxa* **3635**(5): 587–590.

YAKOVLEV, R.V. & LENZ, J. 2013. On the fauna of Cossidae (Lepidoptera) of Zimbabwe with description of a new species. *Zootaxa* **3718**(4): 397–397.

Abstract: The annotated list of Cossidae of Zimbabwe consists of 15 species in 9 genera from the subfamilies Cossinae and Zeuzerinae. The species *Brachylia vukutu* Yakovlev & Lenz, sp. nov. is newly described.

ZIMA, J., LESTINA, D., JANSTA, P., PETRU, V. & TROPEK, R. 2014. Isolation and characterisation of microsatellite markers for *Mylothris jacksoni knutsoni* (Lepidoptera: Pieridae), an endemic butterfly of the Gulf of Guinea Highlands. *Conservation Genetics Resources* **6**(3): 763–764.

Abstract: Eight polymorphic microsatellite loci were developed and characterized for the *Mylothris jacksoni knutsoni*, an endemic butterfly of endangered montane habitats of the Gulf of Guinea Highlands, West/Central Africa. The loci were tested for polymorphism in 30 individuals from the Nkogam Massif, western Cameroon. The detected numbers of alleles per locus ranged from 2 to 5, and the observed and expected heterozygosities varied from 0.200 to 0.867, and from 0.186 to 0.739, respectively. All loci were in Hardy-Weinberg equilibrium, and no evidence of linkage disequilibrium was found. Despite its uniqueness, the biota of this area is still understudied and this is the first study describing microsatellite loci for any African species of the Pieridae family, as well as of any butterfly of the study area.