

# Chapter 13

## Butterflies and Skippers (Lepidoptera: Papilionoidea) of the Gulf of Guinea Oceanic Islands



Luís F. Mendes and António Bivar-de-Sousa

**Abstract** The three Gulf of Guinea oceanic islands, Príncipe, São Tomé, and Annobón, have always remained isolated from the African continent and correspond to the westernmost peaks of the Cameroon Volcanic Line, while the island of Bioko, part of the same ridge, was connected to the mainland during glaciations. Despite the small area of the oceanic islands, their relief and remoteness have enabled the evolution of remarkable ecological and biological diversity. Concerning diurnal Lepidoptera, 91 species and subspecies are known from the oceanic islands: 46 from Príncipe, 64 from São Tomé, and 8 from Annobón; and 35 are endemic: 17 to Príncipe, 23 to São Tomé, and only 5 shared among islands. Further species have been reported in error, either due to misidentification or to mislabelling. A revised checklist of the species and subspecies of the Gulf of Guinea oceanic islands Papilionoidea is presented as is a summary of their taxonomy, distribution, and ecology.

**Keywords** Africa · Conservation · Ecology · Endemism · Taxonomy

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## Introduction

The Gulf of Guinea Oceanic Islands (GGOI), Príncipe, São Tomé, and Annobón (=Pagalu), represent the Cameroon Volcanic Line's westernmost peaks; they have never been connected to one another nor to the mainland. Bioko (=Fernando Poo), on the other hand, is a continental island that was connected to mainland Africa during glaciations, most recently, ca. 11,000 years (Lambert and Chappel 2001). Annobón is part of Equatorial Guinea, and with ca. 17 km<sup>2</sup>, it is located ca. 180 km SSW from São Tomé and 340 km W from Gabon (Jones and Tye 2006). The maximum altitude of this small island is ca. 600 m (Quioveo peak) and its biodiversity (Exell 1944, 1956, 1973; Heras et al. 2002), Papilionoidea included, is much lower than that of the other GGOI. Príncipe is the smaller of the Democratic Republic of São Tomé e Príncipe main islands. With ca. 140 km<sup>2</sup>, it is ca. 210 km SSW off Bioko and 140 km NNE of ST with a maximum altitude ca. 935 m (Pico Príncipe). It was, however, much larger historically and extended to the SSW (Jones and Tye 2006), including the plantless Tinhosas Islets. The Tinhosas are currently a breeding colony of sea birds, a Ramsar site, from which no Papilionoidea are known. São Tomé is ca. 860 km<sup>2</sup>, and lies almost 150 km SW of Príncipe, 180 km NNE of Annobón and ca. 255 km NW of Gabon, with a maximum altitude (Pico São Tomé) ca. 2024 m. the Equator crosses Rolas Islet, which is just South of São Tomé.

The predominant natural ecosystem type of the GGOI was described as rainforest (Exell 1944, 1973) or tropical moist broadleaf forest (Gascoigne 2004), which is stratified into lowland (0–800 m), montane (800–1400 m), and mist forest (1400–2024 m), the last category being absent from Príncipe. In Annobón the three types appear compressed in its small altitudinal range as in the lower São Tomé southern peaks (Ogonovszky 2003). Due to rain shadow, NW São Tomé has a dry forest, which is rich in endemic butterfly species.

In relation to diurnal Lepidoptera, the skippers (Hesperiidae) were formerly placed in the superfamily Hesperioidea, independent from the butterflies, but Heikkilä et al. (2012), supported by morphological and genetic data, demonstrated that they are part of the same evolutionary group, the superfamily Papilionoidea. Their diversity and endemism in São Tomé and Príncipe has been the focus of several notable studies (Pyrz 1992a; Mendes and Bivar-de-Sousa 2012a) and a further contribution is currently in preparation (Mendes et al. *in prep.*). Here we provide an updated checklist of the Papilionoidea of the GGOI and review previously incorrectly cited taxa.

## The Papilionoidea of the Gulf of Guinea Oceanic Islands: Data Sources

The first references to the Papilionoidea of Annobón were given by Aurivillius (1910), who reported *Borbo fatuellus* (sub *Baoris*), and Kheil (1910) who noted *Leptotes pirthous* (sub *Syntarucus*), *A. zetes* (as monotypic) and *Telchinia pharsalus*

(sub *Acraea*). Aurivillius (1928) and Bacelar (1948) recorded *Euchrysops osiris* (sub *Cupido*). D'Abrera (1980) described *Acraea zetes annobona* (type locality), which also occurs in São Tomé and Príncipe, being endemic to the three islands. Viejo (1984) added *Melanitis leda*, *Danaus chrysippus*, *Hypolimnas misippus* and *Telchinia pharsalus* (sub *Acraea*) to the list of species of these islands but some of the samples were reported only from "Spanish Guinea". Olano and Marcos (1993) report the species assigned by Viejo (1984) but consider *D. chrysippus* as restricted to Rio Muni and Bioko while *Euchrysops osiris* is assigned to the mainland only. *Acraea zetes annobona* is not recognized by Olano and Marcos (1993) despite Annobón being its type locality. These authors also question the presence in the islands of *Sevenia boisduvalli insularis* (today considered a São Tomé endemic) and of *Dixeia piscicollis* reported by D'Abrera (1980) from Equatorial Guinea but later considered as a São Tomé endemic (D'Abrera 1997). These are the only data known on the Papilionoidea of the most remote and less diverse GGOI. An even lower diversity is known from the remote Saint Helena that, while not part of the Cameroon Volcanic Line, lies eastwards of the Mid-Atlantic chain (Ashmole and Ashmole 2000): *Lampides boeticus*, *Danaus chrysippus*, *Vanessa cardui* and *Hypolimnas misippus*, all widely ranged migratory species.

The scientific knowledge of butterfly and skipper diversity of the GGOI has increased intermittently since Cramer (1775–1776). It (almost) stabilized during the eighteenth century (1850–1870) but suddenly increased from the turn of the nineteenth until the twentieth century with the contributions of Aurivillius, Joicey and Talbot, Sharpe and Snellen. After another hiatus, several additional phases of discovery followed, firstly due to the work of Amélia Bacelar (Bacelar 1948, 1958) in the mid-twentieth century, and then, toward the end of the century the contributions of Libert (2004, 2011), Pycrz (1991a–c) and our work in São Tomé and Príncipe (Mendes et al. 1988, 2018; Mendes and Bivar-de-Sousa 2006, 2012a, b).

Some large collections, which are mostly currently housed in the Museu Nacional de História Natural e da Ciência (MUHNAC), in Lisbon, Portugal, were studied by Mendes and Bivar-de-Sousa 2006, 2012a, b; Mendes et al. 2018, but the revised checklist (Appendix) takes into account bibliographic records that have been reviewed and confirmed by newly collected data. The bibliographic data considered for assembling this checklist originated from the following references: Cramer (1775–76—who reports the first species for São Tomé and for the GGOI: *Acraea medea*), Snellen (1873), Sharpe (1893), Holland (1896), Aurivillius (1898, 1910), Rothschild and Jordan (1900), Eltringham (1912), Le Cerf (1924), Joicey and Talbot (1926, 1927), Hawker-Smith (1928), Riley (1928), Evans (1937), Bacelar (1948), Someren (1971a, b, 1972, 1974, 1975), Pinhey (1972), D'Abrera (1980, 1997, 2004, 2009), Plantrou (1983), Hancock (1984), Henning (1988), Pycrz (1991a, b, c, 1992a, b), Canu (1994), Wojtusiak and Pycrz (1995, 1997), Pierre et al. (2002), Hecq (2003a, b), Turlin (2005a, b, 2007a, b, c), Anonymous (2007), Bonfim and Carvalho (2009), Koçak and Kemal (2009), Williams (2008, 2015), Velzen et al.

(2009), Libert (2011), Oremans (2012), Pierre and Bernaud (2013, 2014), Collins and Larsen (2013), Wikipedia (2014), Collins (2015) and Awanao et al. (2018).

Specimens deposited in the Museu Bocage (MB), a precursor institution of present-day MUHNAC, were also partially studied by the authors. However, all of MB specimens were destroyed in the fire that engulfed the collections, library, and associated structures on March 28, 1978. Among the destroyed collections were Sharpe (1893) São Tomé type specimens, as had been recorded by Fernandes (1958), the holotype of *Pyrrhiades bocagei* (sub *Rhopalocampta*), three specimens of *Leptotes sanctithomae* (as *Catochrysops sancti-thomae*), comprising holotype and allotype, as well as the holotypes of *Acraea niobe*, *Telchinia insularis* (sub *Acraea*) and *Telchinia newtoni* (sub *Acraea*).

Most of the information concerning newly identified and re-examined specimens is based on the analysis of specimens from São Tomé and Príncipe collected by the zoological expeditions held in 1954–1955 by the Centro de Zoologia (CZ) of the Junta de Investigações do Ultramar and a mission to São Tomé Island in 1984 by MB and the Faculty of Sciences of the Lisbon University (Mendes et al. 1988). These studies were followed by Mendes and Bivar-de-Sousa (2006, 2012a, b) and Mendes et al. (2018) contributions, all based on newly collected specimens between 2004 and 2019. Some of these specimens were collected during a 2015 California Academy of Sciences funded expedition, to which the senior author was invited by Dr. Robert (Bob) Drewes to participate. Some other material was studied, namely that available in the collections of the Centro de Investigação Agronómica e Tecnológica de São Tomé e Príncipe (CIAT) in Potó, São Tomé Island. This collection was established by members of the CZ before the country gained independence in 1975. Data available from the private collections of the second co-author of this study, as well as those of António Figueira (1924–2017; now housed in the collections of the Museu de História Natural e da Ciência da Universidade do Porto, Porto, Portugal) and Carlos da Silva were also used. Information from local collaborators, especially those of Rato Cabinda, are also included in this revised checklist.

## Incorrectly Recorded Taxa

Despite most of the known references being scientifically trustworthy, several reported taxa are based on misidentified or mislabelled specimens of species and subspecies that are mostly typical from savanna and Sahel-biotopes (see Appendix):

**Hesperiidae** *Sarangesa phidyle*, *Spialia diomus*, *S. spio*, *Gomalia elma*, *Borbo gemella* and *Pelopidas mathias* were recorded for the islands but do not occur there (Appendix). Evans (1937) and Chiba (2009) consider *Coeliades hanno* as present in São Tomé, but the only brown *Coeliades* confirmed in São Tomé and Príncipe is the morphologically similar *C. forestan*.

**Papilionidae** *Papilio dardanus sulfurea* is a Bioko endemic whose type locality was wrongly considered to be Príncipe (Palisot de Beauvois 1805–1821). Its occurrence on Príncipe Island was also recorded by Canu (1994) and by Koçak and Kemal (2009—sub *princeps*), but all the recent authors consider it a Bioko endemic. *Graphium angolanus baronis*, *G. latreillianus theorini* and *G. ridleyanus*, which are large and unmistakable taxa occurring in continental Africa have also been recorded from São Tomé based on some specimens in the collections of the Natural History Museum (NHM) of London (Smith and Vane-Wright 2001); however, the location of these specimens is likely mislabelled, as no other records of these taxa exist for the island.

**Pieridae** Larsen (2005) considers *Colotis doubledayi*, noted for instance by Ackery et al. (1995) and D’Abrera (1997) as occurring in São Tomé, as a misidentification. Berger (1981) is the only record of *Belenois gidica* for São Tomé. The single reference of *Appias phaola* to the island of São Tomé (Bacelar 1948) refers to three males and one female that were subsequently destroyed during the MB fire. These likely represented records of *A. epaphia aequatorialis*, later described from the island (Mendes and Bivar-de-Sousa 2006). *Leptosia medusa*, reported also by Bacelar (1948, four males, one female) from São Tomé corresponds to a misidentified *L. alcesta* (Mendes and Bivar-de-Sousa 2012a, b). All the São Tomé records of species of the genus *Mylothris*, except those of *M. rembina*, are putative misidentifications and were partially rectified: *M. asphodelus* by Bacelar (1948); *M. bernice* by Sharpe (1893); *M. nubila* by Schultze (1917); *M. poppea* by Viejo (1984); *M. rhodope* and *M. spica* by Berger (1979); and *M. sulphurea* by Pycrz (1992a, who stresses the muddled knowledge of the genus in São Tomé).

**Lycaenidae** *Hypolycaena philippus*, *Anthene amarah*, *Azonus moriqua*, *Azonus ubaldus*, *Leptotes brevidentatus*, *L. jeannelli*, and *Zizula hylax* were recorded for the islands but do not occur there (Appendix). *Liptena evanescens* f. *xanthis* reported by Stempffer et al. (1974) from São Tomé either represents a mislabeled specimen or a locally extirpated population. Libert (2004) reports the presence of *Hypomyrina fourrieri* either in São Tomé or in Príncipe (material not seen, occurrence not mapped), but the species is not mentioned as occurring in the GGOI by Ackery et al. (1995) nor by D’Abrera (2009). Sharpe (1893) reports *Rubropelates aruma* in São Tomé, but this record may represent a non-established population or a misidentified specimen of *Deudorix lorisona*. In addition, Sharpe (1893) registers *Leptotes pulchra* in São Tomé but does not consider the quite common *L. pirithous*.

**Nymphalidae** *Bicyclus dorothea concolor*, *B. funebris* and *B. martius sanaos* were recorded for the islands but do not occur there (Appendix). Furthermore, *B. italus* was mapped in São Tomé by Condamin (1973), but all these records may have been based on a misidentified *B. medontias*, a similar forest species whose presence on the island was unknown until recently (Larsen 2005). *Precis hierta*, *Precis orithya*, *Salamis anacardii* (currently a species of *Protogoniomorpha*), *Byblia ilithyia* and *Hamanumida daedalus* are certainly not present in São Tomé and Príncipe. *Neptis serena* is listed by Koçak and Kemal (2009) for São Tomé and Príncipe, but these

authors do not report the endemic *Neptis larseni* from Príncipe; indeed, *N. serena* is only assigned to Príncipe when that endemic was described (Wojtusiak and Pycrz 1997). Pycrz (1992a) reports an undetermined red *Cymothoe* that Canu (1994) assigned to São Tomé, but was unable to find the specimens later; several species of the *C. sangaris* group are known from Central and West Africa and thus this information is insufficient to consider its presence in the GGOI. The same must be stated about the references of several “*acraea*” species (currently *Acraea* and *Telchinia*) reported by Bacelar (1958), Mendes and Bivar-de-Sousa (2012a, b), Pierre and Bernaud (1999, 2009a, b), Pierre et al. (2002), Pycrz (1992a), Snellen (1873) and Viejo (1984), namely *Acraea pseudogina*, *Telchinia e. encedon*, *T. esebria*, *T. pentapolis*, and *T. vesperalis*. *Telchinia jodutta* was reported from São Tomé and Príncipe by several authors—first reference by Aurivillius (1910)—though Oremans (2012) describes its insular vicariant, *A. severina*, with one subspecies in São Tomé and another in Príncipe. Bacelar (1958) refers *A. eponina latifasciata* but she did not have access to new specimens, while Pycrz (1992a) questioned its presence in São Tomé and Príncipe and Pierre et al. (2002) did not report the species as occurring in the GGOI despite its huge African range. Bacelar (1948) reports *Acraea monteironis* from São Tomé based upon one male whose identification we could not confirm—if the specimen was in MB it was certainly destroyed in 1978; this species, described from Angola, was never recorded again from the island. Viejo (1984), based in Bacelar (1948), was the only subsequent author who considers *Acraea monteironis* to occur in São Tomé, without providing further comments. According to Bacelar (1948), the reference of Aurivillius (1928, Figs. 57d–e) of an *A. esebria* form shall represent *T. severina* instead, a taxon that has been until recently considered a synonym of *T. esebria* (Eltringham 1912; Ackery et al. 1995; Williams 2008; Pierre and Bernaud 2014). This is, however, certainly not true in the GGOI—it may, indeed, belong to *T. s. severina* synonymy in the case of its reference to São Tomé. Reports of *Phalanta phalantha aethiopica* in the GGOI must represent the morphologically similar forest dweller *P. eurytis*, known from Príncipe, São Tomé, and Rio Muni (Viejo 1984).

## Composition, Diversity, and Endemism of the GGOI Papilionoidea

Isolation, geological age, area, catching-area, relief, climate, and diversity of biotopes are fundamental to the potential biodiversity and endemism of an island (Whittaker et al. 2017). Among the families of Papilionoidea known in Sub-Saharan Africa, only Riodinidae has not been recorded in the GGOI. Most of the subfamilies assigned from the region occur both in Príncipe and in São Tomé (the scant diversity of Annobón was already discussed). The currently known number of species (in parentheses) per family and respective subfamily is as follows: HesperIIDae (nine): Coeliadinae (two), Pyrginae (one), and Hesperinae (six);

Papilionidae (four): Papilioninae (four); Pieridae (12): Coliadinae (five) and Pierinae (seven); Lycaenidae (21): Miletinae (one), Aphnaeinae (five) and Polyommatinae (15); and Nymphalidae (45): Libytheinae (one), Danainae (one), Satyrinae (two), Charaxinae (eight), Nymphalinae (10), Cyrestinae (one), Biblidinae (two), Limenitidinae (four) and Heliconiinae (16). There are no Papilionoidea genera that are endemic from the GGOI. The Nymphalidae is the most diverse family (ca. 45% of the Papilionoidea) and the Heliconiinae (ca. 35%) its most diverse subfamily.

According to Gascoigne (1995), the Lepidoptera endemicity for São Tomé is 38.3% (47 taxa: 11 endemic species, 7 endemic subspecies) and 21.4% for Príncipe (42 taxa: six endemic species, three endemic subspecies). These estimates, based on Pycz (1991a, b), did not include the Hesperidae, lumped the São Tomé and Príncipe species of the genus *Neptis* to a single species (*N. eltringhami*), and considered *Leptotes terrenus* and *Chilades sanctithomae* as independent taxa.

Currently, based on the specimens we have examined and bibliographic references, 91 species and subspecies are considered to occur in the GGOI: 46 are known for Príncipe, 64 (though three in need of revision) for São Tomé, and eight for Annobón (Appendix). All the taxa known for Annobón also occur in São Tomé and Príncipe, with the exception of *Telchinia pharsalus*, identified as *T. p. carmen*, but putatively referring to a still undescribed Annobón subspecies (Kheil 1910; Viejo 1984). The subspecies *Acraea zetes annobona* is the single taxon that is endemic to the three islands. The species that occur both in São Tomé and Príncipe are mostly those with the largest distributions. Regarding endemics (Fig. 13.1), 17 taxa are endemic for Príncipe (almost 37%), 23 for São Tomé (ca. 36%), and five are endemic to more than one island. These estimates approach those of Pycz (1991a, b), especially after considering that he did not consider skippers.

## Conservation

Modifications of the natural environment associated with human expansion and climatic change have impacted the diversity of butterflies and skippers around the globe. Activities with detrimental impacts range from deforestation, fires, charcoal production, introduction of invasive weeds or of animal pests, use of chemicals, water, air and soil pollution, expanse of cultivated fields and of monocultures (agriculture or forestry) and human expansion in its strict sense. The considerable taxonomic knowledge and data available for lepidopteran distributions and ecological requirements make them important indicators for environmental change and for monitoring the health of ecosystems (Parmesan 2019).

In the GGOI, population sizes of species with high sensitivity to ecological changes may be important to monitor, especially under current climate change. Some of the GGOI species are very common while others seem to be restricted to





**Fig. 13.1** Some endemic Papilionoidea of the Gulf of Guinea oceanic islands. R: recto (dorsal), V: verso (ventral): (1) *Pyrrhiades bocagei*, ♂R; (2) *Ibid.*, V. (3) *Papilio nerminae*, ♂R; (4) *Graphium leonidas santamarthae*, ♂R; (5) *Dixeia piscicollis*, ♂R; (6) *Deudorix (Virachola) odana chalybeate*, ♂R; (7) *Charaxes antiquus*, ♂R; (8) *Ibid.*, V; (9) *Pseudacraea gamae*, ♀R; (10) *Acraea zetes annobona*, ♂R; (11) *Ibid.*, V; (12) *Acraea medea*, ♂R; (13) *Ibid.*, V. Photo credits: (1–3, 5, 10–13) António Bivar-de-Sousa and Luís Mendes, (4, 6–9) Carlos da Silva. Photos not to scale



small areas or associated to specific biotopes (Mendes et al. [in prep.](#)). As noted elsewhere, most of these more rare and poorly distributed taxa are endemics and strictly associated with natural biotopes, although some exceptions are remarkable: we frequently found images of the São Tomé endemic *Acraea niobe* pollinating cultivated introduced coffee plants *Coffea* sp. (Rubiaceae) or, as firstly noted Pierre et al. (2002), feeding on the nectar of the introduced Mexican sunflower, *Tithonia diversifolia* (Asteraceae). These observations suggest that some endemic species may be resilient to some ecological changes.

The observation that some species are known from only a small number of individuals may be the consequence of two fundamental and unrelated mechanisms. First, some species are considered rare when they occur in quite localized areas, they fly during a short period, or they are restricted to particular biotopes, and thus challenging to locate. However, these species with patchy distributions may be geographically widespread and common in other parts of their range. Second, insect abundance is known to fluctuate from year to year according to annual ecological conditions and in the GGOI some areas are quite complicated to access. Thus, temporal and geographic biases in survey effort may partly explain why some taxa appear to be rare. However, some species may be considered threatened because they are truly rare and at real risk of extirpation or extinction due to environmental pressures. We note that these concepts apply to both endemic and non-endemic species.

One good example of a rare endemic species is *Dixeia piscicollis*, which is restricted to the São Tomé dry forest and known from a small number of specimens. However, at the end of the dry season, locally known as *gravana*, it may be quite abundant, even becoming the dominant or the only butterfly in the area—although it is restricted to this area. Some endemic *Charaxes* restricted to the São Tomé or Príncipe highland forests also fit this description. Likewise, the insular subspecies of *Graphium leonidas* are both rare and limited to precise biotopes and seem to fly during a short period only.

A certain number of threatened species in São Tomé and Príncipe were reported by Gascoigne (1995). However, this list included taxa that even if rare, may not be threatened, as is the case of *Pyrrhades bocagei* (sub *Coeliades*) which is noted as vulnerable, and despite being present on both islands, is reported only for São Tomé. Both *Graphium leonidas* subspecies are listed as endangered; *Leptotes terrenus* and *Chilades sanctithomae*, *Pseudacraea gamae* are “undetermined,” while *Epamera bellina maris* and *Charaxes defulvata* are said to be extinct, despite Pycz (1992a) recording live specimens of both. The threatened community of Lagoa Azul in São Tomé is discussed, with special attention on *Coeliades bocagei*, the “endemic *Charaxes*” (species not discriminated), and *Neptis eltringhami* that occur there. *Dixeia piscicollis* was also considered to be threatened though it is common along the northwestern dry forest.

The statuses of species considered endemic or almost endemic are in dire need of new data to update assessments, as several of them may be threatened or even extinct. This is the case for *Andronymus thomasi*, treated as a subspecies from

*Andronymus neander* by Gascoigne (1995) and possibly others. *Iolaus bellina maris* and *Charaxes defulvata* if not extinct, likely occur only in very small numbers.

## Potential Future Discoveries and Research

Given the current knowledge of the GGOI Papilionoidea, the intermittent increase in the number of recognized species over time, and the considerable bias of knowledge toward São Tomé and Príncipe when compared with Annobón, several areas of future research are needed. Fieldwork in Annobón is essential, as the known taxonomic diversity is likely incomplete. São Tomé and Príncipe have been more extensively surveyed, but large areas of their most pristine forest, where endemics are expected to have evolved, have been little explored due to the difficult access, high rainfall, and dense vegetation. As such, new species for the islands (and even for science) are expected to be found, and populations of some of the species considered as (almost) extinct may be rediscovered. Information on the range and abundance of each species is essential to establish their conservation status. This is especially urgent for the rare island endemics. Although some information already exists about the activity periods of caterpillars and imagoes, more data are needed to allow the implementation of effective protection measures. For instance, the morphology of the caterpillar life stage is unknown for most of the tropical species, particularly the endemics. Likewise, knowledge of caterpillar host-plants is also incomplete. In the non-endemic taxa, the caterpillar food-plants may be different from those of populations in mainland Africa, while for some of the insular endemics they simply remain unknown. Genetic studies on GGOI Papilionoidea are virtually inexistent. They are fundamental to taxonomical and phylogeographic studies and are key to investigating the biogeographic history of this unique island fauna.

## Appendix

Commented checklist of Papilionoidea recorded from the Gulf of Guinea oceanic islands. Names of the 91 species and subspecies considered correctly assigned to Príncipe (**P**), São Tomé (**ST**) and Annobón (**A**) are numbered. Taxa considered incorrectly assigned to the GGOI, as justified in the text, are not numbered. K&K (2009): Koçak and Kemal; M&BS: Mendes and Bivar-de-Sousa. Endemic taxa (**E**), if shared by P and ST and/or A, respectively as **E-1**, **E-2** and **E-3** according to their topotypical island. Samples examined by the authors are marked in the **SS** column (studied specimens) with a ●; 17 species are known only from reliable bibliographic references. Preferred habitats (**H**): **A**—Humid lowland forest; **B**—Humid highland forest; **C**—Dry forest, forest margins, and somewhat degraded biotopes; **D**—Several types of forest; **U**—Ubiquitous or almost ubiquitous; **?**—Doubtful

Families and species/subspecies	First reference	SS	P	ST	A	H
<b>Fam. HESPERIIDAE</b>						
1. <i>Pyrrhiades bocagei</i> (Sharpe, 1893)	Sharpe (1893)	●	E	E-2		D
2. <i>Coeliades forestan</i> (Stoll, 1784)	Sharpe (1893)	●	X	X		C, D
<i>Coeliades hanno</i> (Plötz, 1879)	Riley (1928)					
3. <i>Tagiades flesus</i> (Fabricius, 1871)	Sharpe (1893)	●	X	X		A, C
<i>Sarangesa phydile</i> (Walker, 1870)	K&K (2009)					
<i>Spialia diomus</i> (Hopffer, 1855)	K&K (2009)					
<i>Spialia spio</i> (Linnaeus, 1764)	K&K (2009)					
<i>Gomalia elma</i> (Trimen, 1862)	K&K (2009)					
4. <i>Andronymus thomasi</i> Riley, 1928	Riley (1928)	●	E	E-2		A
5. <i>Artitropa principetome</i> Collins and Larsen 2013	(Collins and Larsen 2013)		E-1	E		A
<i>Pelopidas mathias</i> (Fabricius, 1798)	K&K (2009)					
6. <i>Borbo borbonica</i> (Boisduval, 1833)	Aurivillius (1910)	●	X	X		C
7. <i>Borbo detecta</i> (Trimen, 1893)	Riley (1928)	●	X	X		C
8. <i>Borbo f. fatuellus</i> (Hopffer, 1855)	Aurivillius (1910)	●	X	X	X	C
<i>Borbo gemella</i> (Mabille, 1884)	K&K (2009)					
9. <i>Afrogegenes letterstedti</i> (Wallengren, 1857)	Sharpe (1893)	●	X	X		C
<b>Fam. PAPILIONIDAE</b>						
10. <i>Papilio nerminae</i> Koçak, 1983	Sharpe (1893)	●		E		A, B
<i>Papilio dardanus sulfurea</i> Palisot de Beauvois 1806	Palisot de Beauvois (1806)					

(continued)

Families and species/subspecies	First reference	SS	P	ST	A	H
11. <i>Papilio d. demodocus</i> Esper, 1798	Snellen (1873)	•	X	X		U
<i>Graphium angolanus baronis</i> (Ungemach, 1932)	Smith and Vane-Wright (2001)					
<i>Graphium latreillianus theorini</i> (Aurivillius, 1831)	Smith and Vane-Wright (2001)					
12. <i>Graphium leonidas santamarthae</i> Joicey and Talbot, 1927	Joicey and Talbot, (1927)	•	E			A, C
13. <i>Graphium leonidas thomasius</i> Le Cerf 1924	Le Cerf (1924)	•		E		A, C
<i>Graphium ridleyanus</i> (White, 1843)	Smith and Vane-Wright (2001)					
<b>Fam. PIERIDAE</b>						
14. <i>Catopsilia florella</i> (Faricius, 1775)	Bacelar (1958)	•	X	X		U
15. <i>Eurema b. brigitta</i> (Stoll, 1780)	K&K (2009)	•	X	X		C
16. <i>Eurema hecabe solifera</i> (Butler, 1875)	Snellen (1882)	•	X			C
17. <i>Eurema floricola leonis</i> (Butler, 1886)	Snellen (1882)	•	X			D
18. <i>Eurema senegalensis</i> (Boisual, 1836)	Sharpe (1893)	•	X	X		A
<i>Colotis doubledayi</i> (Hopffer, 1872)	Ackery et al. (1995)					
<i>Belenois gidica</i> Godart, 1819	Berger (1981)					
19. <i>Belenois c. creona</i> (Stoll, 1780)	M&BS (2012)	•		X		C
20. <i>Dixeia piscicollis</i> Pinhey, 1972	Pinhey (1972)	•		E		C
21. <i>Appias epaphia aequatorialis</i> Mendes & Bivar-de-Sousa, 2006	M&BS (2006)	•		E		C
22. <i>Appias epaphia piresi</i> Mendes & Bivar-de-Sousa, 2006	M&BS (2006)	•	E			C
<i>Appias phaola</i> (Doubleday, 1847)	Bacelar (1948)					
23. <i>Leptosia a. alcesta</i> (Stoll, 1781)	Snellen (1873)	•	X			A
<i>Leptosia medusa</i> (Cramer, 1777)	Bacelar (1948)					
24. <i>Leptosia n. nupta</i> (Butler, 1873)	Sharpe (1873)	•	X	X		A, B
<i>Mylothris asphodelus</i> Butler, 1888	Bacelar (1948)					
<i>Mylothris bernice</i> (Hewitson, 1862)	Sharpe (1893)					
<i>Mylothris nubila</i> (Möschler, 1884)	Schutze (1917)					
<i>Mylothris popea</i> (Cramer, 1777)	Viejo (1984)					
25. <i>Mylothris rembina</i> (Plötz, 1880)	Schutze (1917)	•	X	X		A
<i>Mylothris rhodope</i> (Fabricius, 1775)	Berger (1979)					
<i>Mylothris spica</i> (Möschler, 1884)	K&K (2009)					
<i>Mylothris sulphurea</i> (Aurivillius, 1895)	K&K (2009)					

(continued)

Families and species/subspecies	First reference	SS	P	ST	A	H
<b>Fam. LYCAENIDAE</b>						
26. <i>Spalgis l. lemolea</i> Druce, 1890	Pyrzcz (1992)	•	X			A, C
<i>Liptena evanescens xanthis</i> (Holland, 1890)	Stempffer (1974)					
27. <i>Iolais (Epamera) bellina maris</i> (Riley, 1928)	Riley (1928)			E		A?
<i>Hypomyrina fourrieri</i> Gabriel, 1939	Libert (2004)					
<i>Hypolycaena phillippus</i> (Fabricius, 1793)	K&K (2009)					
28. <i>Deudorix (Virachola) l. lorisona</i> (Hewitson, 1862)	Hawker-Smith (1928)	•	X	X?		A
29. <i>Deudorix (Virachola) a. antalus</i> (Hopffer, 1855)	Pyrzcz (1992)	•	X	X		C
30. <i>Deudorix (Virachola) caliginosa</i> Lathy, 1903	Libert (2004)			X		C?
31. <i>Deudorix (Virachola) odana chalybeata</i> (Joicey and Talbot, 1926)	Joicey and Talbot (1926)	•	E	E-2		A
<i>Rubropelates a. aruma</i> (Hewitson, 1873)	Sharpe (1893)					
<i>Anthene amarah</i> (Guérin-Méneville, 1849)	K&K (2009)					
32. <i>Anthene l. lunulata</i> (Trimen, 1894)	Viejo (1984)	•	X	X?		A, B
33. <i>Anthene princeps</i> (Butler, 1876)	Pyrzcz (1992)	•	X	X		A, B
34. <i>Pseudonacaduba s. sichela</i> (Wallengren, 1857)	Mendes et al. (ad.Prepr.)	•	X			C
35. <i>Lampides boeticus</i> (Linnaeus, 1767)	Bacelar (1958)	•	X	X		D
36. <i>Cacyreus lingeus</i> (Stoll, 1782)	Joicey and Talbot (1926)	•	X	X		A, C
37. <i>Leptotes p. pirithous</i> (Linnaeus, 1767)	Kheil (1910)	•	X	X	X	C, D
<i>Leptotes brevidentatus</i> (Tite, 1958)	K&K (2009)					
<i>Leptotes jeanneli</i> (Stempffer, 1935)	K&K (2009)					
<i>Leptotes pulchra</i> (Murray, 1874)	Sharpe (1893)					
38. <i>Leptotes pyrzi</i> Libert, 2011	Libert (2011)	•	E			A
39. <i>Leptotes sanctithomae</i> Sharpe, 1893 (= <i>L. terrenus</i> (Joicey and Talbot, 1926))	Sharpe (1893)			E		B?
40. <i>Zizeeria knysna</i> (Trimen, 1862)	Joicey and Talbot (1926)	•	X	X		A, C
41. <i>Zizina otis antanossa</i> (Mabille, 1877)	Pyrzcz (1992)	•	X	X		A, C
<i>Zizula hylax</i> (Fabricius, 1775)	K&K (2009)					
42. <i>Azonus mirzá</i> (Plötz, 1880)	Pyrzcz (1992)	•		X		C, D
<i>Azonus moriqua</i> (Wallengren, 1857)	K&K (2009)					
<i>Azonus ubaldus</i> (Stoll, 1782)	K&K (2009)					
43. <i>Eicochrysops hippocrates</i> (Fabricius, 1793)	Pyrzcz (1992)	•	X	X		D
44. <i>Euchrysops malathana</i> (Boisduval, 1833)	Aurivillius (1928)	•	X	X		C, D

(continued)

Families and species/subspecies	First reference	SS	P	ST	A	H
45. <i>Euchrysops</i> cf. <i>osiris</i> (Hopffer, 1855)	Aurivillius (1928)	•	X	X?	X	C, D
46. <i>Chilades trochylus</i> (Freyer, 1844)	K& K (2009)	•		X		D
<b>Fam. NYMPHALIDAE</b>						
47. <i>Libythea l. labdacca</i> Westwood, 1851	Sharpe (1893)	•	X	X		A, C
48. <i>Danaus c. chrysippus</i> (Linnaeus, 1758)	Snellen (1873)	•	X	X	X	U
49. <i>Melanitis leda</i> (Linnaeus, 1758)	Sharpe (1893)	•	X	X	X	C, D
<i>Bicyclus dorothea concolor</i> Condamin and Fox, 1964	Condamin and Fox (1964)					
<i>Bicyclus funebris</i> (Guérin-Méneville, 1844)	Condamin (1973)					
<i>Bicyclus italus</i> (Hewitson, 1865)	Condamin (1973)					
50. <i>Bicyclus medontias</i> (Hewitson, 1873)	Larsen (2005)			X		B?
<i>Bicyclus martius sanaos</i> (Hewitson, 1866)	Condamin (1973)					
51. <i>Bicyclus vulgaris</i> (Butler, 1868)	Aurivillius (1910)	•	X			C
52. <i>Charaxes defulvata</i> (Joicey and Talbot, 1926)	Joicey and Talbot (1926)			E		A?
53. <i>Charaxes c. candiope</i> (Godart, 1824)	Plantrou (1983)		X	X		A, C
54. <i>Charaxes thomasius</i> Staudinger, 1886	Staudinger (1886)	•		E		B
55. <i>Charaxes lemosi</i> (Joicey and Talbot, 1927)	Aurivillius (1910) as <i>C. lucretius</i>	•	E			B
56. <i>Charaxes odysseus</i> Staudinger 1892	Staudinger (1892)			E		A?, B
57. <i>Charaxes antiquus</i> Joicey and Talbot 1926	Joicey and Talbot (1926)			E		B
58. <i>Charaxes barnsi</i> Joicey and Talbot, 1927	Joicey and Talbot (1927)		E			A
59. <i>Charaxes monteiri</i> Staudinger 1886	Staudinger (1886)			E		B
60. <i>Vanessa cardui</i> (Linnaeus, 1758)	Pyrcz (1992)	•	X	X		C
<i>Precis hierta crebrene</i> (Trimen, 1870)	K&K (2009)					
<i>Precis orythia madagascariensis</i> (Guenée, 1865)	K&K (2009)					
61. <i>Precis pelarga</i> (Fabricius, 1775)	Aurivillius (1910)	•	X	X		B, C
62. <i>Precis s. sinuta</i> Plötz, 1880	Sharpe (1893)	•		X		C, D
63. <i>Hypolimnas a. anhedon</i> (Doubleday, 1845)	Sharpe (1893)	•	X	X		C, D

(continued)



Families and species/subspecies	First reference	SS	P	ST	A	H
64. <i>Hypolimnas misippus</i> (Linnaeus, 1764)	Snellen (1873)	•	X	X	X	C
65. <i>Hypolimnas m. monteironis</i> (Druce, 1874)	Pyrzcz (1992) as <i>H. salmaccis</i>	•	X			A, B
66. <i>Hypolimnas salmaccis thomensis</i> Aurivillius, 1910	Aurivillius (1910)	•		E		A, B
<i>Protogoniomorpha anacardi</i> (Linnaeus, 1758)	K&K (2009)					
67. <i>Junonia cymodoce lugens</i> (Schultze, 1912)	Bacelar (1958)	•	X			A
68. <i>Junonia o. oenone</i> (Linnaeus, 1758)	Bacelar (1958)	•	X	X		C, D
69. <i>Junonia t. terea</i> (Drury, 1773)	Aurivillius (1910)	•	X			A, B
70. <i>Cyrestis c. camillus</i> (Fabricius, 1781)	Bacelar (1958)	•	X			A
<i>Byblia ilithyia</i> (Drury, 1773)	K&K (2009)					
71. <i>Sevenia amulia principensis</i> Mendes & Bivar-de-Sousa, 2018 <b>n.stat.</b>	Bacelar (1958)—no ssp	•	E			A, B
72. <i>Sevenia boisduvali insularis</i> (Joicey & Talbot 1926)	Sharpe (1893)	•		E		B
73. <i>Pseudacraea gamae</i>	Joicey and Talbo (1926)		E			A
<i>Neptis serena</i> Overlaet, 1955	K&K (2009)					
74. <i>Neptis eltringhami</i> Joicey and Talbot 1926	Joicey and Talbot (1926)			E		A?
75. <i>Neptis larseni</i> Wojtuziak and Pyrcz, 1997	Pyrzcz (1991) as <i>N. eltringhami</i>	•	E			A, C
76. <i>Cymothoe caenis</i> (Drury, 1773)	van Velzen et al. (2009)		X			A?
<i>Cymothoe</i> sp. (“sangaris-group”)	Pyrzcz (1992)—after Canu					
<i>Hamanumida daedalus</i> (Fabricius, 1775)	K&K (2009)					
77. <i>Acraea n. neobule</i> Doubleday, 1847	K&K (2009)	•		X		C, D
78. <i>Acraea q. quirina</i> (Fabricius, 1781)	Aurivillius (1910)	•	X	X		A
79. <i>Acraea zetes annobona</i> D’Abrera, 1980	Snellen (1873)—no ssp	•	E	E	E-3	A, C
80. <i>Acraea e. egina</i> (Cramer, 1775)	M&BS (2012)	•	X			A, B
81. <i>Acraea medea</i> (Cramer, 1775)	Cramer (1775)	•	E			A, B
82. <i>Acraea niobe</i> Sharpe, 1893	Sharpe (1893)	•		E		A, B
<i>Acraea pseudegina</i> Westwood, 1852	Pyrzcz (1992)					
83. <i>Acraea alcinoe racaji</i> Pyrcz, 1991	Snellen (1873) as <i>A. esebria</i>			E		A, B
84. <i>Telchinia alciope</i> (Hewitson, 1852)	Pierre (1985)		X	X		A
<i>Telchinia esebria</i> (Hewitson, 1861)	Snellen (1873)					

(continued)

Families and species/subspecies	First reference	SS	P	ST	A	H
<i>Telchinia encedon</i> (Linnaeus, 1758)	K&K (2009)					
85. <i>Telchinia insularis</i> (Sharpe 1893)	Sharpe (1893)	•		E		A
<i>Telchinia j. jodutta</i> (Fabricius, 1793)	Aurivillius (1910)					
86. <i>Telchinia lycoa</i> (Godart, 1819)	Aurivillius (1910)	•	X			A, C
<i>Telchinia p. pentapolis</i> (Ward, 1871)	Pierre and Bernaud (1999)					
87. <i>Telchinia pharsalus carmen</i> (Pyrzcz, 1991)	Aurivillius (1910)—no ssp	•	E		X?	A, B
<i>Telchinia serena</i> (Fabricius, 1775)	Snellen (1873) as <i>A. manjaca</i>					
88. <i>Telchinia severina severina</i> (Ouremans, 2012)	Berger (1986) as <i>A. jodutta</i>	•		E		A, B
89. <i>Telchinia severina terreirovelhoensis</i> (Ouremans, 2012)	Aurivillius (1910) as <i>A. jodutta</i>	•	E			A, B
<i>Telchinia vespertalis</i> (Grose-Smith, 1890)	Pyrzcz (1992)					
90. <i>Telchinia newtoni</i> (Sharpe 1893)	Sharpe (1893)	•		E		
<i>Acraea monteironis</i> Butler, 1874	Bacelar (1958)					
91. <i>Phalanta e. eurytis</i> (Doubleday, 1847)	Pyrzcz (1992)		X	X		A
<i>Phalanta phalantha</i> (Drury, 1773)	K&K (2009)					

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