

Additional notes on butterflies of the Cape Verde Islands

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Abstract: Following the authors' previously published research on Cape Verde butterflies based on fieldwork conducted in 2013, this paper presents additional data on Cape Verde butterflies as a result of further visits to the islands between 16th June and 17th July 2017, and again from 10th November to 14th December 2017. It reports three new island records (São Nicolau, Santiago and Maio) for *Euchrysops osiris* (Höppfer, 1855), and one new record (São Nicolau) for *Junonia oenone* (Linnaeus, 1758), discovered for the first time on the Cape Verde Islands (Santiago) by the authors in 2013. Occurrence of *Colias croceus* (Geoffroy, 1785) on Sal is discussed and a number of records for the island of Raso in the years 2015–2017 made by the Cambridge University Raso Lark survey team are presented. An updated table of Cape Verde butterflies is also presented, together with an outline map of the islands.

Key words: Lepidoptera, butterflies, Cape Verde Islands, new island records.

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INTRODUCTION

In a previous paper (Tennent & Russell, 2015a) the authors presented a comprehensive account of butterfly species recorded from the Cape Verde Islands (Fig. 1) in 2013, in addition to historical records from the islands. We also resolved some long-standing issues of identification and distribution. We recorded a number of butterfly species previously unrecorded from the islands and provided many new island records for species recorded previously. Now, in 2019, with the benefit of hindsight, we acknowledge that our choice of dates in 2013 was fortuitous – butterflies were widespread and plentiful, perhaps unusually so in view of subsequent weather patterns.

Results of our 2013 fieldwork identified some issues still to be resolved, in particular the occurrence of *Leptotes pirithous* (Linnaeus, 1767) in both pale/dark and tailed/not-tailed phenotypes. Also, we wanted to rear the endemic *Chilades evorae* Libert, Baliteau & Baliteau, 2011 (Baliteau & Baliteau, 2016; Russell & Tennent, 2018). We visited the islands of Santiago, Brava, Fogo, Santo Antão, São Vicente and Sal from 16th June to 17th July (the end of the dry season) to ascertain seasonal variability, if any, and São Vicente, Santo Antão, São Nicolau, Santiago, Sal, Boa Vista and Maio from 10th November to the 15th December 2017; the latter dates almost mirrored our first visit in 2013. The interesting – and to a degree still enigmatic – situation with *L. pirithous*

phenotypes has been resolved so far as it can be with available data, and will be published separately (Tennent & Russell, in prep.).

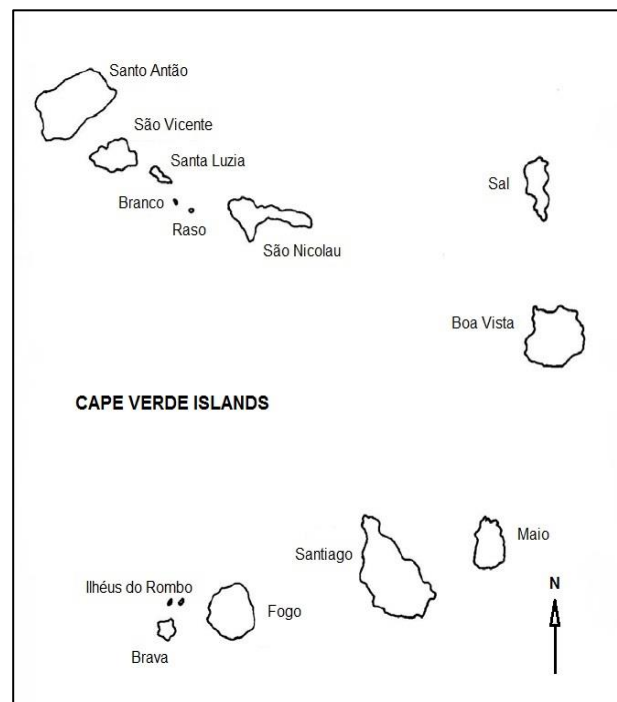


Figure 1 – Cape Verde Islands.

Predictably, conditions in the dry season (June, July) in 2017 were less productive than during our visit in 2013, but butterflies were still in evidence and we were able to make significant observations. Our second period of fieldwork in 2017 was mostly unsuccessful. Drought conditions in November and December, when butterflies should have been flourishing, were notably more dismal than in June and July. Vegetation was in poor condition or

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non-existent, many areas were parched (most of Maio as little more than a dust bowl) and, with the exception of *Danaus chrysippus* (Linnaeus, 1758), *Lampides boeticus* (Linnaeus, 1767) and species of *Azonus* (with the exception of the occasional *A. jesous*, presumed to be all *A. moriqua*: see Tennent & Russell, 2015a), butterflies were present in small numbers or completely absent. The islands had experienced little rain during what should have been the intervening “rainy season”, and some (e.g. Maio) were said to have had no rain at all. Dry conditions were not confined to naturally drier islands in the east (Sal, Boa Vista, Maio), but also affected higher elevations of, for example, Santiago, where the proprietor of the Quinta da Montanha on Santiago claimed to have experienced drier conditions in the mountains there than he had ever seen previously.

Success under such generally poor conditions of the three species noted as being locally relatively common, is probably due to the following factors:

- the host-plant of *Danaus chrysippus*: *Calotropis procera*, has succulent properties and is able to exist – sometimes flourish – in very dry conditions;
- *Lampides boeticus* will always flourish year-round because a primary host-plant on the Cape Verde Islands is a commercial crop (*Cajanus cajan* (pigeon pea) (Fabaceae)) which is artificially watered in dry conditions;
- *Azonus moriqua* is closely associated with various species of *Acacia*, often the only sign of green in near desert conditions.

Irregular periods of drought on the Cape Verde Islands have, over time, necessitated butterfly species evolving their own ways of dealing with it. Elsewhere, some eremic pierid species are known to be able to remain in a pupal stage for many years (Benyamini, 2008) and all species occupying dry habitats are subject to fluctuations in overall numbers and in local expansion and contraction of areas of distribution.

The authors published notes on species of sphingid moths recorded in 2013 (Tennent & Russell, 2015b) and it was intended to augment this list with further data in 2017. However, not one sphingid moth was seen flying in the very dry conditions prevailing, despite local profusion of flowers of *Impatiens* [cultivar] (Balsaminaceae) which had proved so attractive to the moths in 2013.

This paper should be considered in association with Tennent & Russell (2015a). Not all species we reported in 2013 are included here; the following notes concern species we did see and about which there is something noteworthy to say, and the occasional species which we were surprised not to see at all. We have included islands distribution in the following accounts, and emboldened records that report a species from an island for the first time.

SPECIES NOTES

Pieridae: Coliadinae

Colias croceus (Geoffroy, 1785)

Papilio croceus Geoffroy, in Fourcroy, 1785,
Entomologia Parisiensis, 2: 250, TL: Paris.

Cape Verde Islands’ distribution: Recorded from the islands of Santiago, Maio, São Nicolau, Boa Vista (Aistleitner, 2017: in 2000), Sal (Aistleitner, 2017: in 2001), Santa Luzia, Raso, São Vicente, and Santo Antão.

The authors expressed a belief (Tennent & Russell, 2015a: 72) that the salt pans inside the Pedra de Lume on Sal (Fig. 2) included habitat typical of that which supported a *croceus* colony on Maio, and – since there was plenty of a potential host-plant, *Lotus brunneri*, and large swathes of *Sesuvium portulacastrum* providing nectar – we were surprised not to see the species there in 2013.



Figure 2 – Pedra de Lume, salt pan inside the crater on Sal.

On 10th March 2017, David Parnaby, Warden at the Fair Isle Bird Observatory, Shetland, Scotland, reported having seen a ‘clouded yellow’ butterfly at the botanical gardens, north of Santa Maria, Sal, on a recent holiday (David Parnaby, in litt. to Tennent, 2017). This solitary sighting might have been registered as “requires confirmation”; the authors saw no sign of *croceus* on Sal in July 2017, although *Lotus* present was in good condition. But on 11th December 2017, a dozen or so males and one female *croceus* were present feeding on the abundant flowers of *S. portulacastrum* on the edge of the salt pan directly opposite the entrance to the caldera. Conditions were extremely windy; butterflies flew fast, close to the ground, and rarely stopped other than to take nectar. Behaviour and habitat closely paralleled our observations on Maio in 2013. The following day, several males and another fresh female were seen in the same locality.

Interestingly, due we believe to severe drought on Maio, no *croceus* were observed on our daily visits to the salt pans there in mid-November 2017. The area was very dry and, although the succulent nectar source that had attracted adults on our visit in 2013 was present, plants there bore few buds or flowers.

C. croceus was relatively common (some 30 males and one female seen over a period of *ca* two hours) in the planted Aloe fields west of Spongeiro on Santo Antão about a month earlier than we had seen it there in 2013. Other than that, a solitary (very early?) male *C. croceus* was seen near the top of Monte Verde, São Vicente, on 14th July 2017. A further solitary male was seen on the road to Hortelão, below Monte Gordo, São Nicolau, on the last day of November 2017 – the first time we had seen it on that island, although others had recorded it there. Post-submission of this paper, we learned from Tomasz Pyrcz,

who visited Sal between 28th October and 2nd November 2018, that he had observed several freshly emerged *C. croceus* between Espargos and Murdeira, particularly in a recently dried wadi with abundant flowering plants, including *Heliotropium ramosissimum* (Boraginaceae), to which the butterflies were attracted.

We acknowledged (Tennent & Russell, 2015a: 71) a solitary *C. croceus* on Raso (Davies, in Brooke & Davies, 2009) and suggested that since *Lotus* host-plant on the island was common and well established, temporary residence on the island was probable when conditions were suitable. Since then, the Cambridge University Raso Lark team noted “a yellow butterfly, presumably a clouded yellow *Colias croceus* ... in Ribeira da Ladrão on 20 November [2015]” (Brooke & Mainwaring, 2016). The following year, between 12th November and 2nd December, *C. croceus* was seen on Raso “... virtually daily in modest numbers, usually <10” (Brooke & Gregory, 2017), together with four other butterfly species. In 2017 solitary *croceus* were reported from Raso on the 21st and 25th of November (Brooke & Moss, 2018) but it was not seen at all between 11th November and 1st December 2018 (Brooke & Penn, 2019).

Collectively, new records support our belief that several ‘migratory’ butterfly species on the Cape Verde Islands, including *C. croceus*, are able to quickly take advantage when suitable conditions allow.

Pieridae: Pierinae

Pontia glauconome (Klug, 1829)

Papilio glauconome Klug, 1829, *Symbolae Physicae, seu Icones et descriptiones Corporum Naturalium novorum aut minus cognitorum*, fol. H, 12, pl. 7, figs 18, 19, TL: Egypt.

Cape Verde Islands’ distribution: Reliably recorded from the islands of Fogo, Maio, Boa Vista (Fig. 3) and Sal. The authors questioned reports from Santiago and Santo Antão (Tennent & Russell, 2015a: 76), which we continue to regard as misidentification of *P. daplidice*, requiring confirmation.

In June *P. glauconome* was seen only on Sal, occasionally at the roadside, and then commonly on the dual carriageway near Murdeira, north of Santa Maria. It was emerging in quite large numbers on a well-vegetated perimeter road near a holiday hotel complex on 15th May but was absent from the Pedra de Lume saltpan. It might have been expected to be more frequent later in the year but was apparently absent from the Murdeira locality in December, although by that time it was quite common in Pedra de Lume.

Surprisingly, the species was not seen on Maio at all in mid-November. It was expected that *P. glauconome* would be one of the species least affected by dry conditions, since its habitat is usually rather dry, although it is noted that some ‘eremic’ pierids (e.g. *Euchloe falloui* (Allcard, 1867): see Benyamini, 2008) are able to remain in the pupa for many years if conditions are not optimal.

Aistleitner (2017) reported *Pontia daplidice* from both Maio and Boa Vista; we believe these records may refer to *P. glauconome* and that occurrence of *P. daplidice* on

these islands requires confirmation. They are not incorporated in our updated distribution table.



Figure 3 – *Pontia glauconome*, Boa Vista.

Lycaenidae: Polyommatae

Euchrysops osiris (Höppfer, 1855)

Lycaena osiris Höpffer, 1855, *Bericht über die zur Bekanntmachung geeigneten Verhandlungen der Königlichen Preufs. Akademie der Wissenschaften zu Berlin*, 1855: 642, TL: Mozambique.

Cape Verde Islands’ distribution: Recorded from the islands of Brava, Fogo (Aistleitner, 2017: in 1998), **Santiago, Maio**, Boa Vista (Aistleitner, 2017: in 2001), **São Nicolau**, São Vicente and Santo Antão.

We only saw one specimen of *E. osiris*, high on Monte Verde, São Vicente, during our visits to almost every Cape Verde island in 2013 and assumed it to be either uncommon or overwhelmed by the presence of other lycaenids, in particular *Lampides boeticus*. However, in June 2017, it was present on Santiago – a new island record for this species – outside the Jardin Botanique de Sao Jorge (botanical gardens) flying on dry rough ground with a few *L. boeticus*; later (18th June) we found it at the Barragem de Poilão, below the dam, also flying with *L. boeticus*; finally, it was present in several places on the road east from Assomada to Calheta de Sao Miguel. It was never encountered in large numbers, and it is possible to confuse it with *boeticus*: the two species are about the same size and the hindwing markings of *osiris* may look like the white underside band of *boeticus* in lightly marked specimens whilst at rest (although the *osiris* underside is usually paler). The blue of male *osiris* appears subtly different from that of *boeticus* in flight.

E. osiris was not seen on any other island in June or July. On 12th November several specimens were taken on the Seladao de Alto Mira on Santo Antão and another seen near the higher of the two radio stations above the road, all with huge numbers of *L. boeticus*; two days later none was found, although their presence may have been masked by the presence of *boeticus* which was then emerging in formidable numbers everywhere. On the 16th of November it was common below the dam at Barragem de

Poilão. On 23rd November it was seen on the ridge (Denga Denga [216m]) north of Ribeira dos Flamengos, on the roadside from Assomada to Calheta de Sao Miguel, and in the Ribeira itself.

On Maio, on 18th November, several specimens were seen flying around *Indigofera* bushes in extremely dry conditions, together with a very few *L. boeticus*, and on the 1st of December, at least two specimens were seen among larger numbers of *L. boeticus* on the track leading to the summit of Monte Gordo, São Nicolau, above the upper forestry office. These records for Santiago, Maio and São Nicolau represent new island records. It may seem remarkable that it should be so widespread in 2017, any yet barely seen in 2013; we believe it probable *E. osiris* thrives in dry conditions – these new island records were made either in the dry season, or in what should have been the end of the wet season in a year when there was little or no rain.

Chilades evorae Libert, Baliteau & Baliteau, 2011

Chilades evorae Libert, Baliteau & Baliteau, 2011, *Bulletin de la Société entomologique de France*, **116** (1): 64, figs1-4 (p. 65), TL: environs of Mesa, Porto Novo, Santo Antão.

Cape Verde Islands' distribution: Recorded from the islands of Santa Luzia, **Raso**, São Vicente and Santo Antão.

Our secondary aim in returning to the islands in 2017 was to photograph the life history of this species, which we achieved, observing ovipositing on *Lotus*, rearing larvae through to adults, and observing two tachinid fly parasite larvae emerge from two pupae; the parasitoid is yet to be identified to species level (Russell & Tennent, 2018).

The butterfly was occasional on Santo Antão on the road up to Alto Mira in early July (Fig. 4), and abundant on a commercial Aloe Vera plantation at Lagoa, west of Espungeiro in mid-November. It was recorded for the first time on Raso by the Cambridge Raso Lark team in November 2017 and identified by the authors from good quality colour photographs (Moss, in litt. to Tennent, 2018; Brooke & Moss, 2018).

It is noted that Baliteau & Baliteau (2016) reported the presence of *C. evorae* on the southern island of Fogo, based on identification of a solitary larvae in the crater of that island. We regard this record as requiring confirmation.

Lampides boeticus (Linnaeus, 1767)

Papilio boeticus Linnaeus, 1767, *Systema Naturae*, edn. 12, 1 (2): 789, TL: Algeria.

L. boeticus is without doubt the most widespread and abundant butterfly on the Cape Verde Islands. The reason for this seems to be the proliferation of cultivated beans (*Cajanus cajan* (pigeon pea)), which occupy swathes of land on some islands, and every ribeira and suitable patch of free space on others (Fig. 5).

Cape Verde Islands' distribution: Recorded from the islands of Brava, Fogo, Santiago, Maio, Boa Vista, Sal, São Nicolau, **Raso**, São Vicente, and Santo Antão.



Figure 4 – *Chilades evorae*, Santo Antão – the only endemic Cape Verde butterfly.

The nett result is that there are healthy beans available throughout the year and, although *boeticus* also utilises other host-plants (*Lotus* species, *Indigofera tinctoria*), *Cajanus* beans seem to be a reliable and plentiful first choice. *L. boeticus* and *Leptotes pirithous* may be in competition in some localities, although our own research suggests that *pirithous* favours species of *Lotus* at high elevations, and *Indigofera* at low levels.

In achieving our primary goals during 2017 fieldwork: rearing and photographing the early stages of *Chilades evorae* (Russell & Tennent, 2018) and resolving the host-plants and butterfly phenotypes of *Leptotes pirithous* (Tennent & Russell, in prep.), a very large number of *Lotus* plants and flowers were examined on each of the islands visited. It was noted that although it is usual elsewhere for lycaenid ova to be laid singly on a flower head, and for ovipositing females to avoid plants where flowers already have ova present, we found many localities on the Cape Verde Islands where numerous ova had been laid on the same flower head, even where there was a plentiful supply of “ovum-free” flowers. We wonder if this “saturation oviposition” by *boeticus* is a strategy to ensure that if anything is going to survive cannibalism, it is highly likely to be *L. boeticus*.

We also observed that where *L. boeticus* was abundant, potential competitors (*L. pirithous*, possibly also *Euchrysops osiris*) were scarce or almost absent and that *pirithous* and *osiris* were usually to be found in numbers where there was significant quantities of *Cajanus cajan* host-plant, which *boeticus* on the Cape Verde Islands prefers. We were unable to easily tell apart the ova of these lycaenid species, but of those reared, in the hope of obtaining *pirithous*, all the ova from any heavily infested flower head turned out to be *boeticus*. *C. evorae* completely avoids competition with *boeticus* and *pirithous* by feeding on the leaves of *Lotus* rather than the flowers (Russell & Tennent, 2018). Obregón *et al.* (2012) presented fascinating evidence relating to the larvae of *L. boeticus* proactively killing and eating the cocoons of the braconid parasitoid *Cotesia specularis* (Hymenoptera) in southern Spain.

Brooke & Gregory (2017) reported “small numbers recorded from mid-November [2016] with an ovipositing female witnessed on one occasion” on Raso island. This is the first record of the species from that island and illustrates both the value of regular visits to remote uninhabited islands, and the ability of butterfly species to take advantage of suitable local conditions.



Figure 5 – Cajan beans with Pico de Fogo in background (2013).

Leptotes pirithous (Linnaeus, 1767)

Papilio pirithous Linnaeus, 1767, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.*, 1 (2), 12th edition, p. 790, TL: Algeria.

Leptotes pirithous capverti Libert, Baliteau & Baliteau, 2011, *Bulletin de la Société entomologique de France*, **116** (1): 66, figs 5, 6 (p. 65), TL: Água das Caldeiras, Lombo de Figueira, Porto Novo, Santo Antão.

Cape Verde Islands’ distribution: Recorded from the islands of Brava, Fogo, Santiago, Maio, Boa Vista, São Nicolau, São Vicente, and Santo Antão. We acknowledge a mistake in our earlier paper (Tennent & Russell, 2015a) where we reported *L. pirithous* on the island of Sal. This was not the case. We searched apparently suitable *pirithous* habitats and potential host-plants diligently on each of four visits but found no evidence of adults or early stages. We have no explanation for the species’ apparent absence on Sal.

The realisation that there were pale/dark and tailed/not tailed populations of *L. pirithous* on the Cape Verde Islands was a primary reason for our return to the islands

in 2017. We reared adults from several different islands, and collated data regarding host-plants and prevalence of butterfly phenotypes. The results will be published separately (Tennent & Russell, in prep.).

Nymphalidae: Danainae

Danaus chrysippus (Linnaeus, 1758)

Papilio (Danaus) chrysippus Linnaeus, 1758, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.*, 1 (Animalia), 10th edition, p. 471, TL: Canton, China.

Cape Verde Islands’ distribution: Recorded from all the islands for which records are available; Brava, Ilhéus do Rombo (Ilhéu de Cima), Fogo, Santiago, Maio, Boa Vista, Sal, São Nicolau, Raso, Santa Luzia, São Vicente, and Santo Antão.

In 2017, towards the end of the dry season, we noted that many *Calotropis procera* plants had shed all their remaining leaves, which lay scattered and dead at the foot of each plant; many plants were completely bereft of leaves and consisted of bare stems; others had vigorous new growth, but with no leaves showing signs of being eaten. A total absence of leaves, combined with a low population density of *D. chrysippus* early in the season (only one adult was seen on both Santiago and Brava in June/July 2017), must give plants a head start on development, before *D. chrysippus* numbers build up to the huge numbers seen in 2013. Whether this is a reaction to heavy predation by *D. chrysippus* is not known, but it is a fact that there were areas where a significant presence of *Calotropis* plants had barely sufficient growth on them collectively to support even very small numbers of *D. chrysippus* larvae.

Such a cycle may account for the fact that remote and isolated *Calotropis* plants some distance from large stands of the plant apparently avoid the attention of *D. chrysippus* adults. If *D. chrysippus* favours large agglomerations of *Calotropis* plants, resulting in major or in many cases overwhelming infestation, it may be that these isolated plants have a high probability of successfully avoiding unwelcome attention. *D. chrysippus* was a very common butterfly in 2013, and we found that some populations were very heavily parasitized by *Cotesia* parasitoids, up to 100% in many cases. The primary host-plant for *D. chrysippus* on the Cape Verde Islands – possibly the only host-plant in most situations – is *Calotropis procera* (Fig. 6). In June/July 2017 very few *D. chrysippus* were on the wing.

In November/December 2017, *D. chrysippus* became gradually more common, and *Calotropis* plants healthier, with considerable new growth of flowers and leaves. The remarkably high rate of parasitism of *D. chrysippus* early stages collected in 2013 was commented upon (Tennent & Russell, 2015a: 87-88) and it was suggested that this level of mortality must have had major effect on *D. chrysippus* populations and possibly also phenotypes, with phenotypic changes brought about by founder individuals from an outside source on occasions when a local population is severely reduced in numbers or actually wiped out.



Figure 6 – Maio Acacia scrub with *Danaus chrysippus* host-plant, *Calotropis procera*.

But this was not borne out by our observations in 2017 – for example, *D. chrysippus* phenotypes on Santo Antão were fundamentally brown (*i.e.* lacking the ‘alcippus’ white hindwing), as they had been in 2013 – on every other island, forms referable to *alcippus* were prevalent (Fig. 7). Only a small number of larvae were observed on *Calotropis* in early November, before the *chrysippus* population had managed to gain a major foothold.

One specimen was reported from Raso on the 13th of November 2015 by Brooke & Mainwaring (2016) and it was subsequently “seen daily in small numbers, usually <10. Evidence of breeding with a pair witnessed copulating” on the island during the Cambridge visit from 12th November to 2nd December 2016 (Brooke & Gregory, 2017), a year when other butterfly species were seen on Raso in some numbers. In 2017 only a solitary individual was seen on Raso, on the 8th of November (Brooke & Moss, 2018). The species was not seen at all on Raso between 11th November and 1st December 2018 (Brooke & Penn, 2019).

Nymphalidae: Nymphalinae

Hypolimnas misippus (Linnaeus, 1764)

Papilio misippus Linnaeus, 1764, *Museum Ludovicae Ulricae Reginae*, p. 264, TL: “America” [erroneous – probably Java (*cf.* Honey & Scoble 2001: 350)].

Cape Verde Islands’ distribution: Recorded from the islands of Brava, Fogo, Santiago, Maio, Boa Vista, São Nicolau, **Raso**, São Vicente, and Santo Antão.

A solitary male *Hypolimnas misippus* (Linnaeus, 1764) seen on the summit of Mount Gamboa on Santiago on 1st July was the only example of this species seen on our early visit in 2017. Three males on São Nicolau towards the end of November, and a male seen on Santiago on 3rd December were the only individuals seen on our second visit. No females were encountered.

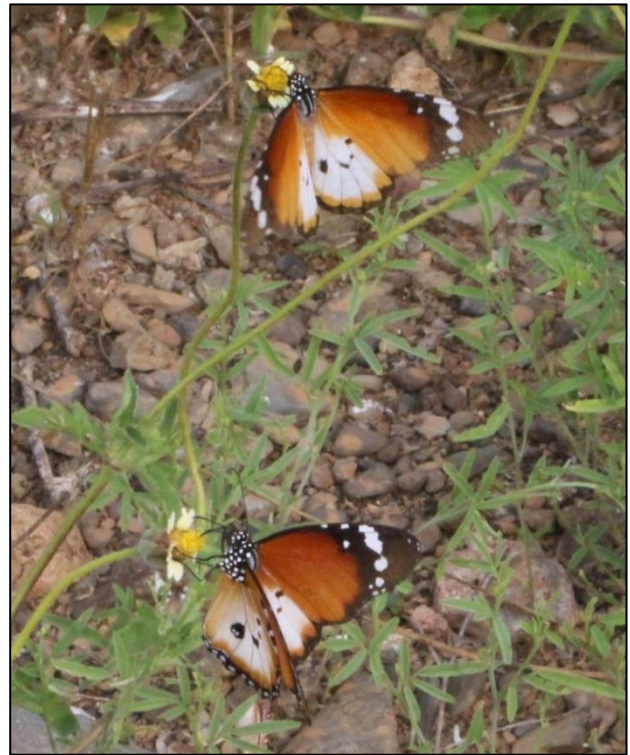


Figure 7 – *Danaus chrysippus f. alcippus*, Maio.

Brooke & Gregory’s (2017) report of a specimen of *H. misippus* from Raso on 1st December 2016 represents the first record of the species from that island.

Vanessa cardui (Linnaeus, 1758)

Papilio cardui Linnaeus, 1758, *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.*, 1 (Animalia), 10th edition, p. 475, TL: Europe, Africa.

Cape Verde Islands’ distribution: Recorded from the islands of Brava, Fogo, Santiago, Maio, Boa Vista, Sal, São Nicolau, Santa Luzia, Raso, São Vicente, and Santo Antão.

Although we knew June and July to be the dry season – and the main purpose of our visit then was to investigate phenotypes of host-plants and distribution of *Leptotes pirithous* – it was nevertheless remarkable that we did not see even one individual of *V. cardui* on any of the six islands visited in June and July 2017. The species is known to be multi-voltine throughout much of its range and, although numbers do fluctuate, we thought it very unusual not to see it at all.

In November and December, we did not see it on São Vicente; had one probable sighting on Santo Antão on 13th November; solitary sightings on Santiago on 17th November and 3rd December; and single specimens on São Nicolau and Boa Vista. On Maio several specimens were seen in different localities on 18th and 19th November (compared to the swarms seen on the island in 2013), but it was not until we reached Sal that we came across *V. cardui* in any numbers. It was quite common there 11th and 12th December at the opposite side from the entrance to the Pedra de Lume saltpan, feeding at the small purple-red flowers of the carpet of succulent *Sesuvium*

portulacastrum, together with smaller numbers of *Colias croceus*, *Pontia glauconome* and *Danaus chrysippus*. This same area, visited in July 2017, supported none of these species, but was instead frequented by very large numbers of *Azanus moriqua*, as it had been to a lesser degree early in 2013.

Tomasz Pyrcz reported *V. cardui* as the most common butterfly species on Sal in late October and early November 2018, observing many dozens in the shade during the hottest parts of the day, and nectaring sporadically on the flowers of *Heliotropium*.

Brooke & Mainwaring (2016) reported *V. cardui* as common on Raso in 2015 when they saw “several tens of painted ladies ... on the plain north of Monte Selado, feeding in particular on the yellow-flowered *Zygophyllum*. Their numbers diminished during the visit as the vegetation withered, and those that lingered were increasingly battered”. There was clearly a population explosion on Raso the following year, in 2016, when it was “present in the tens of thousands and especially seen flying over *Zygophyllum*” (Brooke & Gregory, 2017). In 2017 numbers had decreased dramatically, with only four individuals seen: “Two on 14, one on 19 and one on 23 November” (Brooke & Moss, 2018). This major fluctuation in numbers over a short period is quite typical of *cardui* throughout a good deal of its range and is further illustrated by Raso data for 2018, when *cardui* butterflies “were plentiful on ... arrival” but had virtually disappeared three weeks later. No other butterfly species were seen by the Cambridge Raso Lark team that year (Brooke & Penn, 2019).

Junonia oenone (Linnaeus, 1758)

Papilio (Nymphalis) oenone Linnaeus, 1758, *Systema Naturae*, edn. 10: 474, TL: “Asia” [Africa] (see Honey & Scoble, 2001: 355-6).

Cape Verde Islands’ distribution: Santiago and **São Nicolau**.

This widespread African species was recorded by the authors for the first time on the Cape Verde Islands on the summit of Monte Gamboa, Santiago in 2013 (Tennent & Russell, 2015a: 93) (Fig. 8). Its presence, in a flourishing colony on the northwest coast was confirmed on Santiago in 2017, and a solitary specimen was seen on São Nicolau.

We visited the summit of Monte Gamboa on at least four occasions in 2017. The summit was much drier than it had been in 2013, with only a few stunted *Lantana* plants (none in flower) on the ridge, and no other vegetation to speak of apart from *Eucalyptus* trees. On two occasions we remained on the summit for a cumulative hour and a half when weather conditions seemed ideal, no *J. oenone* were seen there.

However, on 30th June, in our intensive search for *Leptotes pirithous* (Linnaeus, 1767) we stopped arbitrarily in a roadside ribeira some two kilometres west of Calheta de Sao Miguel (east of Assomada) and discovered that we had inadvertently stumbled across a thriving colony of *J. oenone*. This was a dry habitat across the road from a deep, cultivated area (Ribeira dos Flamengos) with a ridge behind it; we did not have the opportunity then to fully investigate the area, but returned on 16th November, when



Figure 8 – *Junonia oenone*, Santiago – first record from the Cape Verde islands.

J. oenone was relatively frequent in the Ribeira. There was nothing flying on the summit of Gamboa the following day. On the 23rd of November, the first author climbed to the ridge (the high point seems to be ‘Denga Denga’ at 216m) to find some 40-50 males hilltopping along the length of the ridge, settling frequently on the goat track or nearby vegetation and careering around chasing anything that moved, from locusts to wisps of straw. We did not look much further afield but suspect that since dry ribeiras and ridges are widespread in this area, *J. oenone* is almost certainly also widespread and common in the area.

On 30th of November, on the track leading to Hortelão on São Nicolau, we were surprised to see a fresh solitary male (not captured) which settled on the path in front of our vehicle. It flew around the area for several minutes, before flying down the hill. The habitat here was quite similar to that on Santiago – beans, and grass/straw closely cropped by goats – and since the track is on the southern slope of Monte Gordo, the first author walked to the top the following day; unfortunately, the wind was almost gale force on the summit, and no butterflies were observed.

These combined observations suggest that *J. oenone* is more widespread on the islands than was at first appreciated.

Nymphalidae: Biblidinae

Byblia ilithyia (Drury, 1773)

Hypanis ilithyia Drury, 1770, *Illustrations of natural history; wherein are exhibited upwards of two hundred and twenty figures of exotic insects ... to which is added a translation into French*, 2, pl. 17, figs 1, 2, TL: Africa, Arabia, India.

Cape Verde Islands’ distribution: Recorded from the islands of Brava, Fogo, Santiago, Maio, Boa Vista, São Nicolau, São Vicente, and Santo Antão.

In 2013, we only saw this species in any numbers at one locality on Fogo, apparently aestivating under a road bridge. In July 2017 we found the same place had been used as a dumping ground for household and commercial

rubbish including broken glass. The habitat was severely degraded and close investigation was imprudent.

In 2017, none was seen on Fogo, but a fresh specimen was seen by the roadside on Brava at Fajã de Água in June and in mid-November several specimens were seen in different localities on Santiago (west of Calheta de Sao Miguel on open rough ground; on the ridge Denga Denga [216m] north of Ribeira dos Flamengos and the road from Assomada to Calheta de Sao Miguel; below the dam at Barragem de Poilão). The three specimens seen at the Barragem were behaving in similar fashion to the large population under the road bridge on Fogo in 2013, spending long periods at rest on grass and woody stems in *Indigofera* shrubbery.

It is probable that *B. ilithyia*, a "...species of the driest savannah types" (Larsen, 2005: 344) is more likely to be encountered (*i.e.* may be more widespread) in dry periods (see discussion).

DISCUSSION

So far as other species are concerned, data from 2017 were disappointing. For example, the two hesperiids, *Coeliades forestan* (Stoll, 1782) (Fig. 9) and *Borbo borbonica* (Boisduval, 1833) (Fig. 10) were hardly seen at all. Two larval folds of the former were seen in the same *Terminalia* tree at Mosteiros on Fogo mentioned in our earlier paper (Tennent & Russell, 2015a: 67) on 30th of June; one adult was also seen flying around the tree, which had been severely cut back. An individual was also seen flying around a *Terminalia* tree in the centre of Mindelo on São Vicente on 8th of July. The species was not seen at all during our second visit in November and December. *B. borbonica* was not seen at all in June/July, and was seen only singly or in small numbers on Santo Antão, Santiago and São Nicolau in November.

Papilio demodocus Esper, [1798] was irregularly seen on all the islands visited, with the exception of Sal and Boa Vista, but never in any numbers.

Catopsilia florella (Fabricius, 1775) was seen on Santiago, Brava and Fogo in June; on the last island two specimens were 'wandering' on the most recent (2014) exposed larva flow in the Chã das Caldeiras. Later in the year it was seen singly on Santa Antao, São Vicente and Maio, and commonly on Santiago and São Nicolau. Few specimens of *Eurema hecabe* (Linnaeus, 1758) were seen on Santiago, Brava and Fogo in June; in November and December on Santiago, it became quite common on the road leading from Rui Vaz to the summit of Mount Gambia, and also at both the Barragem de Poilão and the Ribeira dos Flamengos, north of the road from Assomada to Calheta de Sao Miguel. *E. brigitta* Stoll, 1780 (found for the first time on Cape Verde (Fogo) in 2013), was not seen. *P. daplidice* was a common and widespread species in 2013. Its appearance was rather sporadic in 2017, in June only one specimen was seen on the road to Rui Vaz on Santiago; in July it was occasional in the same place, and it was quite common in November and became common there later in November and early in December. On Fogo, two *Pontia* species seen in June on the edge of the most recent (2014) larva flow in the Chã das Caldeiras were almost certainly *P. daplidice*.

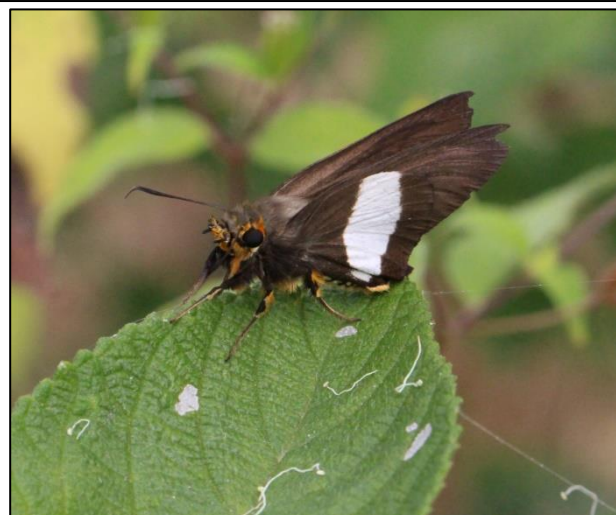


Figure 9 – *Coeliades forestan*, São Nicolau.



Figure 10 – *Borbo borbonica* on Lantana, Fogo Island.

It was also quite frequent on the road to Monte Verde on São Vicente. On Santo Antão it was common on the roads around Alto Mira early in July; it was also common on Santo Antão in November.

We did not see *Vanessa vulcania* Godart, 1819, in 2017. The only *Vanessa atalanta* (Linnaeus, 1758) seen in 2017 was one specimen on the summit of Monte Gamboa, Santiago in June (Fig. 11) (we had seen the species there in 2013). We note that Aistleitner (2017) attributed a record of *V. atalanta* from São Nicolau to Tennent & Russell (2015a), which was not the case. The authors merely reported comments made by Baliteau & Baliteau (2011).

The genus *Azonus* was in evidence everywhere there was *Acacia*, in particular when the plant was in flower. One of our aims in 2013 was to investigate whether both *A. moriqua* (Wallengren, 1857) and *A. mirza* (Plötz, 1880) occurred on the Cape Verde Islands, and in so doing we collected voucher specimens from a large number of sites on all the islands we visited. We found no evidence in 2017 to suggest that our earlier conclusion – that *moriqua* occurred on the islands, but that *mirza* did not, and that published evidence to the contrary was due to misidentification of *moriqua* – was faulty.

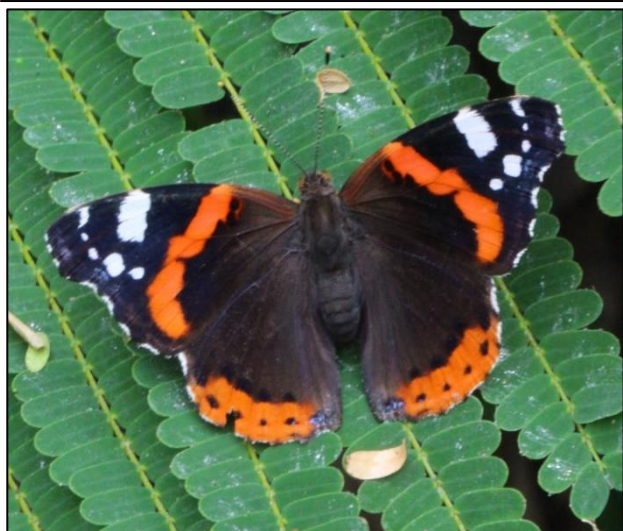


Figure 11 – *Vanessa atalanta*, Santiago.

In June and July *A. moriqua* was rather uncommon on most islands. For example, very few were seen at all on São Vicente, despite a proliferation of *Acacia* flowers; the same was true on Santo Antão, and on Sal, none at all were seen until our last day on the island. Conversely, it was swarming in very large numbers on the numerous *Acacia* trees that border the long road to Cachaço (Fig. 12). *Acacia* trees planted to resist the effects of soil erosion are of little nutritional value to the island's goats but provide perfect conditions for *A. moriqua*. A number of individuals were caught and released, in the hope of finding the other *Azanus* species that occur on Cape Verde, but all those examined were *A. moriqua*.

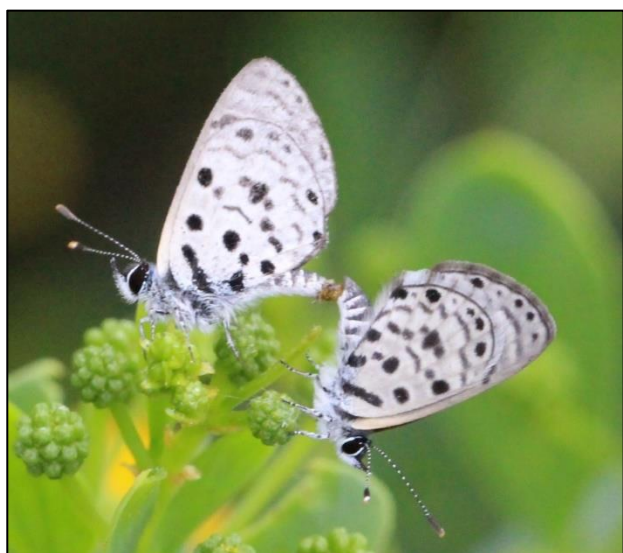


Figure 12 – *Azanus moriqua*, pair in copula on golden ball *Acacia*, Santa Antão.

However, we found small numbers of *Azanus jesous* (Guérin-Menneville, 1849) on Fogo, apparently nectaring on the small pink flowers of *Indigofera* on the road to Mosteiros where we had found adults in 2013 on *Heliotrope*. We saw no sign of *Azanus ubaldus* (Stoll, 1782) in 2017. *Zizeeria knysna* Trimen, 1862 was seen in smaller numbers than observed in 2013.

Melanitis leda (Linnaeus, 1758) was seen only once in 2017, on 23rd November, in the shade of an *Acacia* on a

steep stony hillside on the way down from the ridge (Denga Denga (216m)) north of Ribeira dos Flamengos and the road from Assomada to Calheta de Sao Miguel on Santiago.

A distribution list of Cape Verde Islands butterflies is presented in Table 1, updated from Tennent & Russell (2015a) and incorporating significant additional records from Aistleitner (2017).

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Lindorfo Olivio Marques Ortet, Quinta da Montanha, Santiago, provided useful data regarding recent unusual weather patterns on Santiago; David Parnaby, Warden, Fair Isle bird Observatory, Scotland, shared his observation of *Colias croceus* on Sal. Mike Brooke and his colleagues at Cambridge very kindly allowed us to include their Raso data once again. Tomasz Pycrz, Entomology Department, Institute of Zoology and Biomedical Research, Kraków, Poland, generously allowed us to include observations from his visit to Sal in 2018. Finally, we are very grateful to the editor of *Metamorphosis*, Dave Edge, for allowing us to incorporate additional data whilst this was in press.

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Table 1 – Butterfly distribution on the Cape Verde Islands, updated from Tennent & Russell (2015a) (“x”), incorporating records from Aistleitner (2017) (“o”).

Species	Brava	Ilhéu de Cima	Fogo	Santiago	Maio	Boa Vista	Sal	São Nicolau	Santa Luzia	Raso	São Vicente	Santo Antão	Status in the Cape Verde Islands	Worldwide distribution
Hesperiidae														
<i>Coeliades forestan</i>			x	x				x			x	x	Resident	Africa (sub-sahara)
<i>Borbo borbonica</i>	x		x	x	x			x			x	x	Resident	Africa + Mediterranean
Papilionidae														
<i>Papilio demodocus</i>	x		x	x	x	x		x	x		x	x	Resident	Africa + SW Arabia
Pieridae														
<i>Catopsilia florella</i>	x		x	x	x	x	x	x	x		x	x	Resident	Africa + regular migrant
<i>Belenois creona</i>													Erroneous record	Africa
<i>Colotis euippe</i>													Erroneous record	Africa
<i>Colotis amata</i>													Erroneous record	Africa
<i>Colias croceus</i>				x	x	o	x	x	x	x	x	x	Resident	Palaearctic
<i>Eurema hecabe</i>	x		x	x	x	x	o	x				o	Resident	Africa + Old World tropics
<i>Eurema senegalensis</i>													Misidentification of hecabe	Africa
<i>Eurema floricola</i>													Misidentification of hecabe	Africa
<i>Eurema brigitta</i>			x										Resident	Africa + Oriental + Indo-Pacific
<i>Pontia daplidice</i>	x		x	x				x			x	x	Resident	Palaearctic
<i>Pontia glauconome</i>			x	x?	x	x	x					x?	Resident	Africa + Asia
Lycaenidae													Resident	
<i>Euchrysops osiris</i>	x		o	x	x	o		x			x	x	Resident	Africa + S Arabia
<i>Azanus jesus</i>			x	x	x								Resident	Africa + Middle East
<i>Azanus moriqua</i>	x		x	x	x	x	x	x	x		x	x	Resident	Africa

<i>Azanus mirza</i>													Not known - possible confusion with <i>Azanus moriqua</i>	Africa
<i>Azanus ubaldus</i>					x								Resident	Canary Islands, Africa, including North + Middle East + India
<i>Chilades evorae</i>			?						x	x	x	x	Endemic	Cape Verde Islands
<i>Lampides boeticus</i>	x		x	x	x	x	x	x		x	x	x	Resident	almost cosmopolitan
<i>Leptotes pirthous</i>	x		x	x	x	x		x	x	x	x	x	Resident	Africa + S Europe + Arabia
<i>Zizeeria knysna</i>	x		x	x	x	x	x	x				x	Resident	Africa + S Europe + Arabia
<i>Deudorix dinomenes</i>				x									Not known - apparently temporarily resident in 1984	Africa (possible misidentification of <i>Deudorix livia</i> - also Africa)
Nymphalidae														
<i>Danaus chrysippus</i>	x	x	x	x	x	x	x	x	x	x	x	x	Resident	Africa + Old World tropics and subtropics
<i>Danaus plexippus</i>											x		Probably rare visitor	Most of the world (absent from South America)
<i>Hypolimnas misippus</i>	x		x	x	x	x		x		x	x	x	Resident	Africa + tropics elsewhere
<i>Vanessa cardui</i>	x		x	x	x	x	x	x	x	x	x	x	Resident	almost cosmopolitan
<i>Vanessa atalanta</i>				x							x	x	Resident	Palearctic
<i>Vanessa vulcania</i>							x	?					Not known	Macaronesian
<i>Nymphalis polychloros</i>				?									Not known	Palearctic
<i>Junonia oenone</i>				x				x					Resident	Africa
<i>Byblia ilithiya</i>	x		x	x	x	x		x	x		x	x	Resident	Africa + S Arabia + India
<i>Melanitis leda</i>	x			x				x				x	Resident	Afrotropics + Oriental + Indo Pacific