

## Some phenotypic variation in *Leptotes pirithous* on the Cape Verde Islands, in a wider geographical context (Lepidoptera: Lycaenidae)

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W. John Tennent<sup>1</sup> and Peter J.C. Russell<sup>2</sup>

<sup>1</sup>Department of Life Sciences, Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom (corresponding author).

Email: [johnntennent@hotmail.co.uk](mailto:johnntennent@hotmail.co.uk)

<sup>2</sup> Oakmeadow, Wessex Avenue, East Wittering, West Sussex PO20 8NP, United Kingdom.

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**Abstract:** Unusual phenotypes of *Leptotes pirithous* (Linnaeus, 1767) were encountered on islands of the Cape Verde Archipelago in 2013 and 2017. Dark/pale and tailed/tailless forms of this polyommata lycaenid species are illustrated and discussed. The name *capverti* Libert, Baliteau & Baliteau, 2011, is considered and the phenotype compared with dark forms elsewhere. It is concluded that many individuals are indistinguishable from the Indian Ocean f. *insulana* Aurivillius, 1909, and from other dark forms that occur in many localities. *L. pirithous* host-plants on eight different islands, and observations regarding phenotypes, are tabulated. The three specimens of Aurivillius' *insulana* and the holotype and both paratypes of *capverti* are illustrated for the first time, together with a sample of specimens of *L. pirithous* from the African mainland, the Cape Verde Islands and other islands in the Atlantic and Indian Oceans

**Key words:** Lepidoptera, butterflies, Cape Verde Islands, Lycaenidae, *Leptotes pirithous*

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### INTRODUCTION

This paper arises from fieldwork conducted in the Cape Verde Islands, first undertaken in 2013 (Tennent & Russell, 2015) and continued in 2017 (Tennent & Russell, 2019). During a cumulative total of four months, 12 islands were visited (Brava, Cima [Ilhês do Rombo], Fogo, Santiago, Maio, Boa Vista, Sal, São Nicolau, Raso, Santa Luzia, São Vicente and Santo Antão), many more than once. The aims of the first visit, from 29 October to 18 December 2013, were to make an inventory of butterflies on each of the islands, investigate the veracity of what seemed some unlikely historical records, and resolve some issues of taxonomy and distribution. This was successful in 2013, insofar as six butterfly species not previously known from the islands were recorded for the first time, known distribution of others was extended and some historical records were effectively discounted.

In order to investigate some specific loose ends, the islands were visited twice in 2017: from 16 June to 17 July (dates selected to observe butterflies during the dry season) and again from 10 November to 13 December in the hope of rearing two lycaenid species (*Chilades evorae* Libert, Baliteau & Baliteau, 2011 and *Leptotes pirithous* (Linnaeus, 1767)) in what should have been the most productive time at the end of the usual rainy season.

Establishing host-plant(s) of and rearing *C. evorae*, the only endemic butterfly to occur on the islands, was

straightforward (Russell & Tennent, 2018; see also Baliteau & Baliteau, 2016). A primary interest in returning in 2017 was to investigate unusual phenotypes of *L. pirithous* on the islands – the subject of this paper. Failure of the rains on the Cape Verde Islands in 2017 considerably hampered this study, and plans to collect and rear substantial numbers of *L. pirithous* from every island became unrealistic.

However, adequate data were obtained to establish host-plants on each of the islands where *pirithous* is known to occur, and to rear small numbers from most islands.

The intriguing situation regarding phenotypic variability of *Leptotes pirithous* on the islands only became apparent upon returning home in 2017. Not only does the species occur there in pale and dark forms (not unusual in the Lycaenidae and presumed at first to be seasonal) but also, as we discovered, in both tailed and non-tailed forms. This latter phenomenon is regarded as highly unusual.

The genus *Leptotes* Scudder, 1876 (synonym: *Syntarucus* Butler, [1901], under which *L. pirithous* was previously widely known), is widely distributed throughout Africa, Asia and the neotropics. Fric *et al.* (2019) recognised some 30 *Leptotes* species (including species previously included in the genus *Cyclus* Butler) and of these *L. pirithous* is the most widespread. In addition to southern Europe and as far eastwards at least to the Arabian Peninsula, *pirithous* occurs throughout most of Africa, including Madagascar and many other islands in the Indian Ocean, also the Cape Verde Islands, Madeira and the Canary Islands in the Atlantic (reported first on Madeira by Hall & Russell, 2001 and on Lanzarote by Gascoigne-Pees, Hall & Russell, 2002). Our observations relate to the Cape Verde Islands, included briefly in a wider taxonomic and biogeographic work on *Leptotes* by

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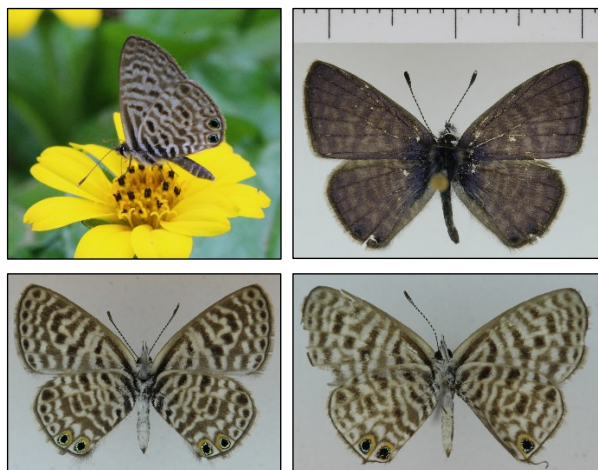
Fric *et al.* (2019), published as this paper was being finalised.

The results of the 2017 fieldwork are presented below. Nomenclature applicable to phenotypes of *L. pirithous* found on the Cape Verde Islands is discussed, and similar phenotypes from various localities in Europe, Continental Africa and both Atlantic and Indian Ocean islands, are illustrated.

## RESULTS

### Brava (19–23 June 2017)

In 2013 *L. pirithous* adults were observed regularly visiting the yellow flowers of *Wedelia trilobata* (Asteraceae) outside the petrol station in Nova Sintra town, together with *Zizeeria knysna* (Trimen, 1862) (Fig. 1). From memory, all these *pirithous* individuals lacked tails, and this was confirmed in 2017 (Figs 2 & 3). However, *L. pirithous* was also quite common in the hills to the north and west of the town in 2013, and although the ‘tail issue’ was not a focus then, one female with inconspicuous tails was collected at that time (Fig. 4).



(Figures numbered from top left to right and then bottom left to right) **Figure 1** – ♂ *pirithous* nectaring on *Wedelia trilobata*. Brava, 30.10.2013. **Figure 2** – ♂ *pirithous* narrow brown border, no tails. Brava 21.06.2017. **Figure 3** – ♀ *pirithous* strong dark markings, no tails. Brava 22.06.2017. **Figure 4** – ♀ *pirithous* with inconspicuous tails (broken on one wing). Brava 01.11.2013.

In 2017 all of several dozen individuals examined lacked tails. The species was present in smaller numbers in the town than had been the case in 2013, when it was assumed that adults had travelled from an undetected “nearby” host-plant in search of nectar sources. However, caged females showed no interest in oviposition when provided with apparently suitable leguminous potential host-plants. The species was almost entirely absent from other Brava localities where it had been seen in 2013 and searches for both adults and a potential host-plant were initially unsuccessful.

Eventually, in very small area on a bend of the steep road leading down to Fajã d’Água, where small (presumably due to the prevalent very dry conditions) adults were closely associated with a small, dusty stand of *Indigofera*

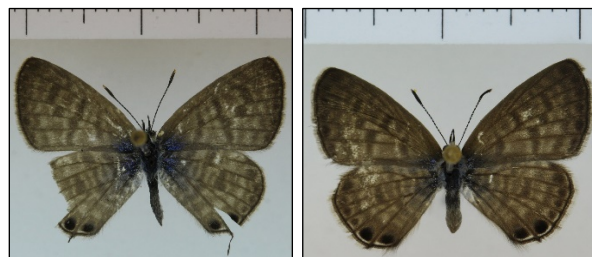
*tinctoria*, and after a careful search larvae were found feeding on the buds. *L. pirithous* was not common anywhere, but on the last day on the island several fresh specimens were found flying and obtaining nectar from planted flowers in the municipal gardens in the centre of Nova Sintra. Of these, a fresh male (unfortunately subsequently lost to pests) with undamaged filamentous tails and a female with one short, wispy tail (Fig. 5), were secured. All other individuals in this locality lacked tails.

Males seen had a narrow brown marginal border (Fig. 2). Adult female phenotypes were usually dark brown on the upperside, occasionally with spots showing through from the underside; undersides varied in the extent and intensity of dark markings (Figs 3 & 4).

### Fogo (24–28 June 2017)

Following the Brava experience, close attention was paid to *I. tinctoria* plants on Fogo but success in finding *L. pirithous* was limited. The crater, where the butterfly and many leguminous plants were present in 2013, was inundated as a result of a major volcanic eruption in 2014, leaving little or no vegetation over a very wide area. Eventually very small specimens associated with *I. tinctoria* were found on a roadside on the southwest of the island, from which larvae were collected on 27 June. A reared tailless female is illustrated in Fig. 6. Despite a thorough daily search of a wide variety of localities and habitats, this was the only sign of *L. pirithous* found on Fogo in 2017.

No specimen with tails was noted, although it is acknowledged that the Brava and Fogo phenotypes are very similar indeed, but we suggest that tailed specimens also occasionally occur on Fogo.



**Figure 5** (left) – ♀ *pirithous* with filamentous tail (other is broken). Brava 22.06.2017. **Figure 6** – Tailless ♀ *pirithous* reared from larva. Fogo 11.07.2017 (emerged).

### Santiago (16–18 June; 29 June–2 July; 15–16 November; 2–3 December 2017)

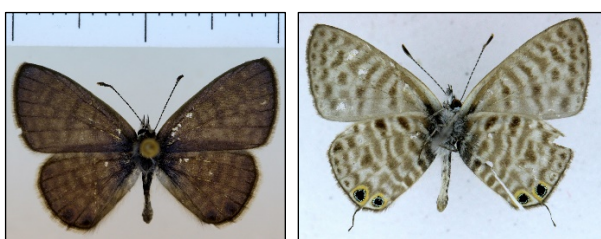
*L. pirithous* was not seen during early visits to Santiago in June/July 2017, and later in the year no early stages were found on *I. tinctoria* in the many localities searched, although small numbers of adults were found flying around the plant at low elevation near the northeast coast. A careful search of localities where the butterfly had been seen in 2013 resulted in the discovery of adults associated with *Lotus jacobaeus* (a rather unusual looking shrubby *Lotus* species) just below Rui Vaz (Fig. 7); oviposition was observed and larvae collected and reared on flowers of the plant; a reared tailless male is illustrated (Fig. 8).





**Figure 7** – Habitat of *L. pirithous* alongside road from São Domingos to Rui Vaz, Santiago.

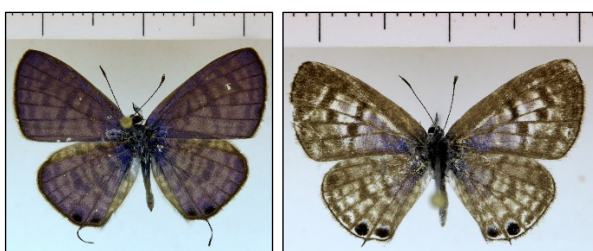
Most adults were tailless, but one male with a pale underside and long, slender tails was found below Rui Vaz (Fig. 9). These flimsy tails might easily be lost, but nevertheless most tailless specimens seen appeared on inspection never to have had them.



**Figure 8** (left) – Tailless ♂ *pirithous*, reared on flowers of *L. jacobaeus*. Santiago 12.07.2017 (emerged). **Figure 9** (right) – ♀ *pirithous* with filamentous tails. Below Rui Vaz, Santiago 02.07.2017.

#### Maio (18–21 November 2017)

In 2013 *L. pirithous* was quite frequent, especially in a sheltered valley east of Vila do Maio and near the southeast coast. Adults were tailed (those apparently without tails had broken tails or were worn, making assessment problematic, although one worn female with intact tornal area of the hindwings had no suggestion of ever having had tails). Males were brighter purple-blue and females paler than specimens from western islands. In view of the few individuals we found elsewhere that went ‘against the trend’ (e.g. three tailed specimens from Brava, where most specimens lack tails) we consider it possible that occasional tailless individuals may occur on Maio. It is unfortunate that we were unable to rear the species on either Maio or Boa Vista.



**Figure 10** (left) – Brightly coloured ♂ *pirithous* with long filamentous tails. Figueira da Horta, Maio 50m 14.11.2013.

**Figure 11** (right) – Brightly coloured ♀ *pirithous* with short stumpy tails [right tail broken]. (*idem* Figure 10).

In 2017 we looked exhaustively in all the localities where we had seen *pirithous* in 2013, but the island had received no rain and all localities were dry and very dusty. Very few butterflies were seen and there were no butterflies at all in the valley where *L. pirithous* and other species had been common four years earlier. A male with prominent tails (Fig. 10) and a female with short, stumpy tails (Fig. 11) captured in 2013 are illustrated.

#### Boa Vista (4–9 December 2017)

In 2013 a small number of *pirithous* adults were observed, invariably associated with *I. tinctoria*. Adults had long filamentous tails; the upperside of males was purple-blue (Fig. 12) and females had a pale ground colour on the upper surface with bright purple-blue scales on the proximal areas of all four wings (Fig. 13). The few adults seen in 2013 resembled those on Maio, pale and well-marked, very similar to the typical form in Europe.



**Figure 12** (left) – Bright purple ♂ *pirithous* with long filamentous tails. Baía das Gatas, Boa Vista, SL 18.11.2013. **Figure 13** (right) – ♀ *pirithous* with pale ground colour and long, filamentous tails [left tail lost]. (*idem* Figure 12).

#### São Nicolau (25 November–1 December 2017)

No adults were seen on a stony path leading from the upper forestry office to the summit of Monte Gordo, where a dark form of *pirithous* had been particularly common in 2013. Flowers and buds of *Lotus arborescens* taken away for examination yielded small numbers of larvae which were reared to adults; adults and larvae were found on the same *Lotus* species on the road to Tarrafal.



**Figure 14** (left) – ♂ *pirithous* with broad marginal brown border, dark but with hint of purple sheen, ex larva. São Nicolau, Monte Gordo, 1000–1100m. 14.12.2017 (emerged). **Figure 15** (right) – Aberrant ♂ *pirithous* with unusual pale grey border and less purple sheen. (*idem* Figure 14).

Most specimens collected or reared had tails of varying length and thickness; some specimens had vestigial tails,

but we did not see a specimen that could be said to completely lack tails. The upper surface of males from São Nicolau (Fig. 14) usually have a broad brown marginal border in comparison to specimens from the eastern and southwestern islands, especially on the hindwing. In fresh specimens this border can be quite striking (see São Vicente, below); one aberrant male was seen with the outer edge of this band pale grey-brown (Fig. 15). Undersides tended to appear paler than some of the adjacent islands as the dark markings are less conspicuous (Fig. 16).



**Figure 16** (left) – ♂ *pirithous* with brighter underside. near Hortelão (Monte Gordo, south slope) 800m, São Vicente, 25.11.2013. **Figure 17** (right) – ♂ *pirithous* with filamentous tails. Monte Verde 650m, São Vicente, 10.07.2017.

#### São Vicente (8–13 July 2017)

A strong wind made observations difficult, but small numbers of *L. pirithous* were associated with *Lotus purpureus* growing at the base of steep cliffs on the road up to Monte Verde; 17 specimens were secured over several days; others were seen but were either flying very close to the ground, or almost flush with a rock face, or were whisked away by the wind, all of which made collection problematic. It was impossible to establish whether specimens seen but not collected were tailed or not. Of the adults collected, seven males and one female were tailed, seven males and one female were tailless, and one male was too badly damaged to make an assessment (giving an approximate 50/50 tailed/tailless population); a small number of specimens subsequently reared also comprised both forms. Some tails were of ‘medium’ length and filamentous (Fig. 17) others were short and quite stubby (Fig. 18). Taking 2013 and 2017 voucher specimens together, a significant percentage of tailless specimens of both sexes appear never to have had tails (Fig. 19).



**Figure 18** (left) – ♂ *pirithous* with stubby tails. (*idem* Figure 17, but 13.07.2017). **Figure 19** (right) – ♀ *pirithous* with proximal blue flush and no tails. (*idem* Figure 18).

The broad marginal borders of São Nicolau males are also present on many individuals on São Vicente. But individuals with the narrow border typical of *L. pirithous*

elsewhere, and intermediates, also occur. For example, two males, both fresh, were collected on the same day (13 July 2017) on São Vicente, at either end of the border width extremes.

#### Santo Antão (3–7 July; 11–14 November 2017)

Adults were infrequent in 2017, mostly closely associated with *Lotus latifolius*. Of lycaenid larvae found and reared to adults on this plant, the majority turned out to be *Lampides boeticus* (Linnaeus, 1757). Santa Antão *pirithous* males share the general phenotype of São Nicolau, with broad dark brown borders on the upper surface, although it is noted that this feature seems variable on São Vicente, the island that lies between them. Both sexes of all three of the northwestern islands from where *pirithous* is reported share the dark upper and under surfaces of both sexes elsewhere, but this is not constant; fresh males tend to have a purple sheen but this is hard to determine in worn specimens.

All individuals examined were tailed. The tails of *L. pirithous* from Santa Antão are variable, ranging from short (Fig. 20) to medium length (Figs 21 & 22), but rarely as long as those from the southeastern islands of Maio and Boa Vista (*cf* Figs 12 & 13).



**Figure 20** (left) – Dark ♂ *pirithous* with broad marginal border, indistinct violet sheen and short tails. Lagoa (west of Espungeiro), Santo Antão, 1150-1250m 09.12.2013. **Figure 21** (right) – ♂ *pirithous* with violet sheen and medium tails. South of Lombo de Figueira, Santo Antão, 850-950m. 09.12.2013.



**Figure 22** (left) – Very dark ♀ *pirithous*, typically almost entirely devoid of violet scales, Caldeira de Patas, Santo Antão, 800m 07.12.2013. **Figure 23** (right) – Tailed ♀ *pirithous* ovipositing on fresh seedpod of *I. tinctoria*, São Nicolau, above Fajã de Baixo, 700m. 26.11.2013.

#### Sal (10–13 December 2017)

Due to misinterpretation of Aurivillius (1910), *L. pirithous* was previously recorded from Sal (Tennent & Russell, 2015: 82). This was an error. Notes and voucher specimens confirm that it was not seen there in either 2013 or 2017 and there is no explanation for its apparent absence from the island. Sal is a dry island,

**Table 1** – Notes regarding *L. pirithous* phenotypes on eight Cape Verde Islands.

Island	Dates (2017)	Adult phenotype (wing markings)	Adult phenotype (tails)
Brava	19–23.VI	Males with narrow brown marginal border, dark but with obvious purple sheen. Females dark with basal purple sheen and underside spots clearly visible	Most adults lacked tails; a pair with filamentous tails found in 2017 - a tailed female also found in 2013
Fogo	24–28.VI	Similar to those from Brava: males dark with purple sheen, females dark with proximal purple colour and underside markings visible	Small series obtained, none with tails
Santiago	16–18.VI 29.VI–2.VII 15–16.XI 2–3.XII	Males dark with very narrow brown border, often with barely perceptible purple sheen; females variably dark but underside pattern never totally obscured, proximal purple sometimes barely perceptible	Adults mostly tailless, one male with long and slender tails below Rui Vaz
Maio	18–21.XI	Males with bright purple sheen and narrow black border; females with extensive white background on both fore- and hindwings, proximal purple colour and black underside markings clearly visible from above	Most with filamentous tails; some without tails but mainly worn specimens, so possibly lost; some fresh specimens apparently tailless, but with rudimentary tails which may or may not have been broken; no convincingly tailless specimens seen
Boa Vista	4–9.XII	Males bright purple, almost no dark border and underside markings barely visible from upper surface; females bright, distinctly purple proximally, undersides often with widely spaced dark markings, giving overall paler impression, heavy dark underside discal and postdiscal markings clearly visible from upper surface	The few specimens found in 2013 were tailed and, like those of Maio, tails were long and filamentous; not seen in 2017
São Nicolau	25.XI–1.XII	Males dark with broad marginal border (occasionally almost one third of wing), purple sheen invariably present but sometimes not obvious; females dark with only slight proximal purple colour, underside markings often pale and invisible from above	All specimens examined were tailed, of varying length and breadth; no convincingly tailless specimen seen
São Vicente	8.VII–13.VII	Males dark with purple sheen barely visible, underside markings widely spaced; females dark, occasionally pale brown, sometimes without proximal purple, underside markings not obscured	The only island where tailed/tailless specimens occurred in almost equal numbers
Santo Antão	3–7.VII 11–14.XI	Males dark but with purple haze and broad marginal hindwing border, sometimes including the forewing, underside pattern visible from above; females dark often without proximal purple sheen, underside pattern usually visible from above	All specimens encountered had tails, which were usually of medium length and fairly substantial

**Table 2** – *L. pirithous* localities, habitats, host-plants and presence/absence of larvae on eight Cape Verde islands in 2017; *Lotus* identification follows Sandral *et al.*, 2006.

Island	Locality	Habitat	Altitude	Established host-plant	Larvae	Adults
Brava	Road to Fajã d'Água	Road verge	350m	<i>Indigofera tinctoria</i>	Yes	Yes
Fogo	Near São Jorge	Road verge	500m	<i>Indigofera tinctoria</i>	Yes	Yes
Santiago	Road to Rui Vaz;	Road verge	800m	<i>Lotus jacobaeus</i>	Yes	Yes
Santiago	Calheta de São Miguel	Dry ribeira	10m	<i>Indigofera tinctoria</i>	No	Yes
Maio	West of Figueira da Horta	Dry ribeira	45m	<i>Indigofera tinctoria</i>	No	Yes
Boa Vista	Baia de Gatas	Beach scrub	sea level	<i>Indigofera tinctoria</i>	No	Yes
Boa Vista	João Galego	Dry ribeira	30m	<i>Indigofera tinctoria</i>	No	Yes
São Nicolau	Northern slopes of Monte Gordo	Stony tracks	960m	<i>Lotus arborescens</i>	Yes	No
São Nicolau	Mirador on road to Tarrafal	Rocky road verge	680m	<i>Lotus arborescens</i>	Yes	Yes
São Vicente	Monte Verde	Track and verge	600-650m	<i>Lotus purpureus</i>	Yes	Yes
Santo Antão	Road Lagoinha to Lagoa	Field of <i>Aloe vera</i>	1,200m	<i>Lotus latifolius</i>	Yes	Yes
Santo Antão	Selada de Alto Mira	Rocky edge to field	1,050m	<i>Lotus latifolius</i>	Yes	Yes



but there are extensive stands of potential host-plants – *Lotus brunneri* and *Indigofera tinctoria* – available, and both Boa Vista and Maio can be as dry as Sal. An exhaustive search was made of *Lotus* and *Indigofera* plants around the island in 2017, but with negative results.

#### *L. pirithous* host-plants on the Cape Verde Islands

*L. pirithous* was first observed ovipositing on *I. tinctoria* on São Nicolau in November 2013 (Fig. 23). Although local in some areas, the plant is common on all the Cape Verde islands. It was often found in very dry habitats, including steep rocky hillsides and dry ribeiras (Fig. 24). Larvae grew rapidly (Fig. 25) on *tinctoria* inflorescences which form in the leaf axils, and on young seed pods.



**Figure 24** (left) – Flowering plant of *Indigofera tinctoria*. Developing inflorescences can be seen in the leaf axils. Brava, dry road verge near Cova Rodela, 600m. 21.06.2017. **Figure 25** (centre) – *pirithous* larva, almost fully grown, reared on *I. tinctoria*. (*idem* Figure 24 but 23.06.2017). **Figure 26** (right) – Pupa (ex larva reared on *I. tinctoria*) (*idem* Figure 24 but 28.06.2017).

The pupa (Fig. 26) was pale brown mottled with darker brown markings. *L. pirithous* was also observed ovipositing on the flower buds of *Lotus jacobaeus* (Fig. 27) on Santiago and on *I. tinctoria* on Brava (Fig. 28) in 2017. Larvae from six of the islands were reared to adults (see Table 2).



**Figure 27** (left) – Badly damaged ♀ *pirithous* ovipositing on flower bud of *Lotus jacobaeus*. Below Rui Vaz, Santiago, 600m. 30.06.2017. **Figure 28** (right) – ♀ *pirithous* about to oviposit on *I. tinctoria*. Brava, 21.06. 2017.

Libert, Baliteau & Baliteau (2011) reported the habitat of *L. pirithous capverti* as clearings in woodland with fabaceous plants, mainly *Lotus brunneri*, the reasonable implication being that this was probably the host-plant. From our observations *L. brunneri* is confined to the eastern islands of Sal, Boa Vista and Maio, whilst Santo Antão supports only two *Lotus* species: the endemic *L. latifolius* at relatively high elevations, and the

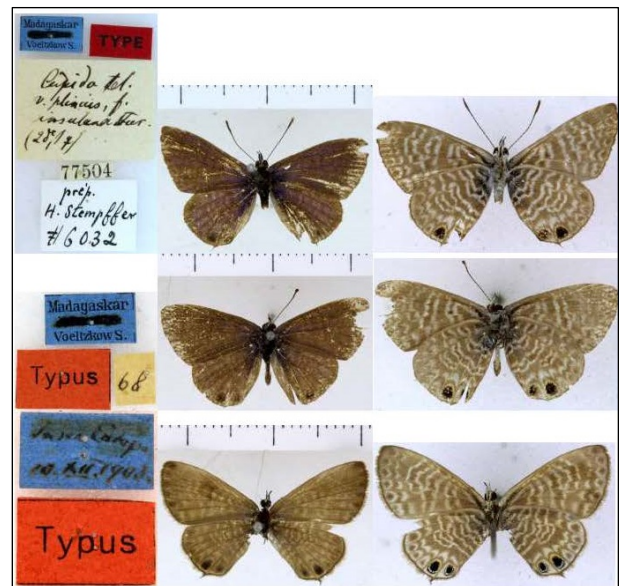
widespread *L. purpureus* lower down (Sandal et al., 2006).

Predictably, *L. pirithous* is known from a wide range of fabaceous plants throughout its range; whilst noting that our rearing programme was hampered by very dry conditions and an accompanying paucity of specimens, *pirithous* were found and reared on both *Indigofera tinctoria* and a variety of *Lotus* species (see Table 2). It is acknowledged that our host-plant list is unlikely to be exhaustive.

## DISCUSSION

### Nomenclature of some *L. pirithous* phenotypes

Aurivillius (1909) described a dark form of *pirithous* - form *insulana* - from two males and a female from Europa Island, a tiny, low-lying atoll of fewer than 30 square kilometres in the southern Mozambique Channel, approximately mid-way between Mozambique and Madagascar. It lies several thousands of kilometres south east of the Cape Verde Islands, with the great bulk of continental Africa, supporting diverse populations of *pirithous*, including nominotypical forms, between them. The three worn, but distinctive, *insulana* specimens (one is labelled Europa Island; the other two are actually labelled Madagascar) are now in the Museum für Naturkunde, Berlin, and are reproduced here with their data labels (Fig. 29). It is noted that Fric et al. (2019) presented molecular data which they believed supported recognition of some eastern island phenotypes at species level but did not incorporate this form.



**Figure 29** – *L. pirithous insulana* syntypes: ♂♂♀.

*Leptotes pirithous capverti* Libert, Baliteau & Baliteau, 2011, was raised for some dark phenotypes of *L. pirithous* collected by Baliteau and Baliteau (2011) on the north-western island of Santo Antão in 2009. It was described from three worn females, of which only one was said to be in sufficiently good condition to provide a description (Libert, Baliteau & Baliteau, 2011). The three specimens are illustrated here (Fig. 30), courtesy of



**Figure 30** – The holotype and both paratypes of *L. pirithous caperti*

Michel Libert. Although any biogeographic connection between the Cape Verde Islands and the Mozambique Channel is clearly implausible, it is inescapable that *insulana* and many individuals of *caperti* are very similar in appearance and, in a wider sense, that *L. pirithous* is a very variable butterfly that renders separation into subspecies rather subjective.



**Figure 31** – Syntypes of *Leptotes pirithous tetrica*: ♂♀.

So far as “dark” forms in general are concerned, it can be said that they occur in many parts of the range of *L. pirithous*. Some have been named: for example *tetrica* de Sagarra, 1925 (as *Raywardia telicanus* ‘rassa’ *tetrica*) (TL: St. Pere de Vilamajor, Spain) (Fig. 31); *semitetrica* de Sagarra, 1926 (as *Raywardia telicanus* rassa *tetrica* gen. aest. *semitetrica*) (TL: Llinàs, Spain); *mayottensis* Tite, 1958 (TL: Comoro [Mayotte is the southeastern island of the Comoro Archipelago]; regarded as a distinct



**Figure 32** (left) – Dark ♀ form of *pirithous*, similar to *L. “mayottensis”* Tite, 1958, and other dark forms of *pirithous*, Indian Ocean, [Seychelles], Assumption Island. 12.03.1906, Meade-Waldo leg. **Figure 33** (right) – Dark ♂ form of *pirithous*, similar to *L. “mayottensis”* Tite, 1958, and other dark forms of *pirithous*, Natal, Durban, 1910, Geo-Leigh leg.

species) (Fig. 32). Similar forms are recorded from South Africa and the Seychelles (Fig. 33) and a melanic form of *L. pirithous* was recently reported from Madeira (Hères, 2016). In general these refer to dark female forms but many other, unnamed, African forms are as dark, and apparently occur sympatrically with ‘typical’ phenotypes. Furthermore, it was found that all these forms, or forms close to them in appearance, occur in the variable populations on the Cape Verde Islands. It could be argued that there is no really ‘typical’ form of *L. pirithous* in Africa, and whilst the typical female form in southern Europe has an upperside suffused with white and/or blue scales to the extent that the underlying forewing spots are prominent (Fig. 34), forms that are ‘European’ in appearance also occur at least on Maio and Boa Vista in the Cape Verde Islands. It is noted that of 10 variants of *L. pirithous* (as *Syntarucus pirithous*) briefly outlined by Verity (1943: 80) there is no mention of a lack of tails.



**Figure 34** (left) – ♀ similar to those on Santo Antão, dark, few violet scales, Prinkipo [Iles des Princes] Turkey, 50ft. 20.9.1959, leg. K.M. Guichard. (cf Fig. 21). **Figure 35** (right) - ♀ *pirithous* similar to those on Maio and Boa Vista, prominent pale ground colour, with violet sheen. Santa Isabel, Fernando Po [Bioko Island, off Cameroon]. July 19??, Leg. F. Escalera. (cf Fig. 10, Maio).

Aurivillius (1910), using the name ‘*Cupido telicanus* var. *plinii* Fabr.’, claimed the few worn Cape Verde specimens at his disposal (2 males and 4 females, taken by Leonardo Fea in May on the island of ‘St. Thiago’ [Santiago]) were, like his *insulana*, without white markings, but also lacked tails. Since it is relevant to the current observations and to subsequent description by Libert, Baliteau & Baliteau (2011) of a new subspecies of *L. pirithous* on the Cape Verde Islands, an (edited) English translation of Aurivillius’ description of *insulana* is given below:



“... on the other hand, [specimens] from the island of Europa are so unusual on the underside that they make a very strange impression; the gray lines are so extensive that the [ground?] colour appears the same as the fine border lines. The result is that the female above is all monochrome gray [brown] without bright markings. This island form may be called *insulana*”.

*L. pirithous capverti* was described almost a century later with the three females available compared to a female from Cameroon (Libert, Baliteau & Baliteau, 2011: 65, Figs 5–8). An (edited) English translation of the original French description of *capverti* is reproduced here:

“The three females are small; of the 50 or so females of the nominative subspecies in the Libert collection, only three are of comparable size [including a female from Cameroon, illustrated]. Their upperside is black-brown, with no trace of white or blue, with a narrow margin still darker on the forewing; the base of the wings is also much darker, almost black. The markings are the same as in the nominative subspecies, but barely visible. The difference is considerable, even with respect to the darkest females in the nominate subspecies, as illustrated (Figs 7–8). On the underside, the markings are also similar, but the white lines are much narrower and the darker brown patterns on the underside are browner and more contrasted. Only the white antemarginal (or post-discal) line of the hindwing is clearly visible”.

Diminutive size noted by both Aurivillius and Libert, Baliteau & Baliteau is discounted – overall size of many butterfly species is often smaller in the dry season or under dry conditions, a phenomenon that was striking in our own observations of *L. pirithous* on the Cape Verde islands. It is interesting that although Aurivillius made particular mention of the fact his six rather worn Cape Verde specimens appeared to lack tails (Aurivillius 1910: 496), absence of tails was not mentioned at all by Libert, Baliteau & Baliteau for the simple reason that all three type specimens of *capverti* do have tails. Although this curious discrepancy was consciously not noted in the text of our previous paper (Tennent & Russell, 2015), the front cover of the journal issue in which the paper appeared carried a full page picture of a specimen from Brava with no tails! The topic played a significant part in our decision to revisit the islands in 2017 (Tennent & Russell, 2019).

Many lycaenid butterflies are tailed. The “false-head hypothesis” whereby hindwing tails, associated with a tornal lobe of some lycaenid butterflies confuse a potential predator, has long been widely accepted (Robbins, 1980). The feature is of particular value to butterflies in environments where, for example, there is a large population of lizards, for which butterflies nectaring on low growing plants probably provide a valuable food source. Many lycaenids rest on the outer leaves of shrubs and trees, facing ‘inwards’ and slowly move their hindwings giving the impression of a moving head and antenna – that this strategy works is evidenced by the large number of individuals losing sections of their hind wings to bird and lizard predation. In the Cape Verde Islands this is the case on some islands (e.g. Santa Luzia, Raso), but is not so evident on others.

There are examples of lycaenid butterfly species having both tailed and tailless subspecies: for example in the genera *Megisba* Moore [1881], and *Prosotas* Druce, 1891. Eliot & Kawazoé (1983: 55-56) recognised tailed and tailless subspecies of *Megisba malaya* (Horsfield, 1828) and *M. strongyle* (Felder, 1860) occurring in “defined geographical areas” (i.e. allopatrically) in the Indo-Pacific, but we cannot think of any lycaenid butterfly species that occurs sympatrically in tailed and tailless forms. Well aware that *L. pirithous* is ‘tailed’, the authors were surprised to find in 2013 that an apparently tailless form occurred on the island of Brava. Whilst it seemed highly unlikely, it was always possible that tailless adults seen might have lost their tails, but many individuals appeared to be freshly emerged, with perfect fringes, and such a specimen was illustrated on a front cover of *Zoologia Caboverdiana* when the results of Cape Verde fieldwork in 2013 were published (Tennent & Russell, 2015: see also Figs 1 & 19). Specimens reared in 2017 confirmed a lack of tails.

This ‘tails’ phenomenon was a primary reason returning to the islands in 2017. From an examination of all the *L. pirithous* taken on the islands, a remarkable discovery was made. On almost all the islands visited on which *L. pirithous* was present, both tailed and non-tailed forms occurred together. One form or the other was invariably predominant on an island, but on some islands each form represented a significant percentage of the whole mixed population. Further, tailed forms varied between having filamentous, often (but not always) long tails which appeared to be easily lost, whilst others had more substantial stumpy tails (cf Fig. 18)

As outlined, names have been provided for a number of *pirithous* subspecies and forms throughout its range, usually based on ‘dark’ female specimens. Although phenotypes do differ regionally to some extent, they also differ individually and probably seasonally, to a degree where allocation to subspecies is unconvincing. Ackery *et al.* (1995: 644), believed that *insulana* was “probably no more than an aberration”. However, the existence of a variety of widespread similar forms warrant consideration of *insulana* as a recurrent ‘form’ rather than a rare or unusual aberration; the authors consider that *capverti* can reasonably be included under this umbrella.

Descriptions of *insulana* and *capverti* represent very similar butterflies. *L. pirithous* is common, indeed locally abundant, throughout the Cape Verde Islands, with the exception of Sal, where it could not be found despite comprehensive searches on several visits. Elsewhere on the islands dark phenotypes were encountered, and these dark forms described by Aurivillius and Libert, Baliteau & Baliteau appear to be the most frequent (but not constant) form on the north-western islands of São Nicolau, São Vicente and Santo Antão. They are also common on the southwestern islands of Brava and Fogo, where paler forms occur slightly more frequently. No individual specimen was encountered from these western islands that approaches the pale/blue female forms found on Maio and Boa Vista



in the east, which is the typical form in Europe and parts of Africa. On Santiago, the species is quite variable, but with a preponderance of dark forms.

Aistleitner (2017: 77) said of *L. pirithous* on the Cape Verde Islands: “Note. Libert *et al.* (2011) described from three(!) females ssp. *capverti* ... from Santo Antão. Further comparative material from Cape Verde is not cited by the authors. The populations of Sao Nicolau and ‘Boavista’ are ssp. *capverti* (de Freina, in litt.)” [translation]. In our experience, Boa Vista females (*capverti* was described only from females), are in fact the antithesis of the dark phenotype of Santo Antão. Females from the south-eastern islands of Maio and Boa Vista have similar forms on other islands and the African continent (*cf* Figs 35 & 36).



**Figure 36** (left) – ♀ *pirithous* similar to those from Maio and Boa Vista, prominent pale background with violet scales, long tails, Bitje, Ja River, Cameroon, 2000ft., dry season, leg. G. L. Bates. (*cf* Fig. 12, Boa Vista). **Figure 37** (right) – ♀ *pirithous* similar to those on Santo Antão, dark, no white, subdued proximal violet sheen, tails long. St. Príncipe (Democratic Republic of São Tomé and Príncipe), 2000ft. (= c. 620m), April–May [19]26, leg. T. A. Barnes. (*cf* Fig. 21, Santo Antão).



**Figure 38** (left) – ♂ *pirithous* similar to the ‘usual’ form from Santo Antão, dark, no blue sheen, short tails. Indian Ocean, [Seychelles] Aldabra Island, 15.03.1906, leg. Meade-Waldo. (*cf* Fig. 19). **Figure 39** (right) – ♂ *pirithous* similar to those from S. Antão, dark, no violet sheen, but with shorter stumpy tails. South Africa, Natal, Durban, 1910, leg. Geo-Leigh. (*cf* Fig. 20).

It is suggested with some confidence that although Cape Verde *pirithous* phenotypes are unusual, insofar as there is a preponderance of dark phenotypes on the western islands, and paler forms on eastern islands, similar dark forms occur occasionally (sometimes commonly) throughout the range of *L. pirithous*, including western Europe (*cf* forms *tetrica*; *semitetrica*), the African mainland and islands off the east and west coast of the continent (*cf* form *insulana* and Figs 34 & 37–39). The unusually broad upperside marginal border of the male also varies but seems to be almost constant on Santo Antão, São Vicente and perhaps to a lesser degree São Nicolau. However, a mixture of tailed and tailless forms,

which occur on most islands, with São Vicente having a population consisting of almost 50/50 tailed and tailless butterflies is thought by the authors to be unique. We have been unable to identify other populations of *L. pirithous* lacking any indication of tails.

The Natural History Museum (NHM), London, houses some 3,000 specimens of *L. pirithous* specimens covering a wide geographical range, from the Middle East and southern Europe, the Sahel and Africa, including many associated islands. Phenotypes vary almost everywhere in colour and shade. This widespread variation seems to be neither clinal, nor conveniently separable into discernible ‘species’ or ‘subspecies’. There are a number of drawer labels in the NHM indicating populations which previous researchers – in particular G. E. Tite, who curated these drawers, at least in part (Tite, 1958) – clearly believed represented undescribed species. It certainly is the case that there are some obvious differences between some of these populations, but variation, and the presence of similar phenotypes in places hundreds of kilometres apart, clouded the issue and undoubtedly contributed to evident curatorial indecision. Based on examination of several thousands of specimens of *L. pirithous* from localities throughout Europe, Africa and the Cape Verde Islands, variability is found throughout this wide geographical range and precludes – or at least inhibits – division of *pirithous* into separate taxa. The conclusion cannot be avoided that the name *capverti* is not supportable as a valid subspecies name for Cape Verde *L. pirithous*. The ICZN Code does not regulate infra-subspecific names, but if a name for the dark form on the Cape Verde Islands and elsewhere is judged necessary, it is appropriately referable to the earliest name for this dark phenotype: form *insulana* Aurivillius 1909 (= *capverti* *stat. rev.*).

It is further noted that in describing a new species, *Leptotes durrelli* Fric, Pyrcz and Wiemers, 2019 (Fric *et al.*, 2019: 662) the authors said “... hindwings of both sexes end with a long tail ...” that was missing in one of the illustrated specimens that had short stumpy tails, very similar to the figured example of *L. pirithous* from the Democratic Republic of Congo, and that “... wing pattern traits are generally not sufficient for differentiation from its sister species, *L. pirithous*, which is very variable throughout its range ...”.

At best, the situation with Cape Verde *pirithous* phenotypes remains muddled and, although we hoped to rear large numbers in 2017, failure of the rains earlier in the year made this task virtually impossible. In truth, it is difficult to even offer an opinion on the overall situation. Are there seasonal issues affecting phenotype which have been overlooked? Is more than one species involved? The authors think not – there are too many intermediate forms, and dissection of selected specimens suggests otherwise. Do the variety of different forms of tail, some of which would seem to be of little value to the butterfly, represent progress of an evolutionary change from one ‘form’ to another? A rearing programme on every island over a period of years may answer some of these questions, and the authors hope these observations are useful in preparing the ground for further study.

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