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Vanessa virginiensis (Drury, 1773) in the Azores islands (Lepidoptera: Nymphalidae)

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Abstract

Vanessa virginiensis (Drury, 1773) was recorded on five Azorean islands: São Miguel, Pico, Faial, São Jorge, and Corvo. These records mandate the species' first documented occurrence on São Jorge island, on 21-VIII-2015, and the evidence of their reproduction in the Azores, probably with small and temporary populations, namely in São Jorge and São Miguel islands. The species' distribution in the Macaronesian islands is briefly discussed, as well as the possible origin (source) of the Azorean specimens.
KEY WORDS: Lepidoptera, Nymphalidae, migration, Azores, island, Portugal.

Vanessa virginiensis **(Drury, 1773) en las islas Azores (Lepidoptera: Nymphalidae)**

Resumen

Vanessa virginiensis (Drury, 1773) está citada de cinco islas de las Açores: São Miguel, Pico, Faial, São Jorge y Corvo. Se indica primer registro de la especie en la isla de São Jorge, sobre el 21-VIII-2015 y la evidencia de su reproducción en las Açores, probablemente con poblaciones pequeñas y temporales, es decir, en São Jorge y São Miguel. Se discute brevemente la distribución de la especie en las islas de la Macaronesia y el posible origen de los especímenes de las Azores.
PALABRAS CLAVE: Lepidoptera, Nymphalidae, migración, Azores, Portugal.

Vanessa virginiensis **(Drury, 1773) nas ilhas dos Açores (Lepidoptera: Nymphalidae)**

Resumo

Vanessa virginiensis (Drury, 1773) é citada para cinco ilhas dos Açores: São Miguel, Pico, Faial, São Jorge e Corvo. A espécie foi registada pela primeira vez para a ilha de São Jorge, a 21-VIII-2015, pondo em evidência a sua reprodução nos Açores, mas tendo provavelmente populações pequenas e temporárias, nomeadamente nas ilhas de São Jorge e São Miguel. A distribuição da espécie nas ilhas da Macaronésia e a possível origem dos espécimes dos Açores são discutidas brevemente.
PALAVRAS CHAVE: Lepidoptera, Nymphalidae, migração, Açores, Portugal.

Introduction

The Azores is a volcanic archipelago situated in the North Atlantic Ocean (37º-40º N, 25º-31º

W) at approximately 1600 km from mainland Portugal (Europe), 1450 km from Africa, and 3900 km from North America. The archipelago is composed of nine islands (Santa Maria, São Miguel, Terceira, Graciosa, São Jorge, Pico, Faial, Flores and Corvo). They belong to the Macaronesia biogeographical region, which also incorporates Madeira (including the inhabited Selvagens), the Canary Islands, and the Cape Verde Islands. These archipelagos share similar evergreen forest, known as «Laurisilva», and are among the richest regions concerning fungi, plant and animal diversity in Europe (BORGES *et al*., 2010).

In comparison to other Atlantic islands and European countries' systematic field mapping the Azorean arthropod fauna, including the Nymphalidae family of Lepidoptera, is still relatively poor (see BORGES *et al*., 2010; REGO *et al*., 2015). Currently, eight nymphalid species are known from the Azores, but possess different biogeographic origins and colonization status (e.g., MEYER, 1991, 1993; BÍVAR DE SOUSA, 1999; VIEIRA, 1997, 2002, 2006; KARSHOLT & VIEIRA, 2005; VIEIRA & KARSHOLT, 2010): *Danaus plexippus* (Linnaeus, 1758) (Nearctic; migrant with indigenous populations), *Hipparchia azorina azorina* (Strecker, 1899), *H. azorina occidentalis* (Sousa, 1985), *Hipparchia miguelensis* (Le Cerf, 1935) (all three endemics), *Hypolimnas misippus* (Linnaeus, 1764) (Paleotropical; occasional immigrant), *Vanessa atalanta* (Linnaeus, 1758) (Holarctic with Palearctic origin; migrant with indigenous populations), *Vanessa cardui* (Linnaeus, 1758) (Cosmopolitan with Nearctic origin; migrant with indigenous populations), and *Vanessa virginiensis* (Drury, 1773) (Nearctic; migrant).

It is known that *V. virginiensis* can be found outside of its reproduction area in the American continent, which is typically in the South of the United States, Mexico, and Central America (southern Colombia) (WILLIAMS, 1930; GARCÍA *et al*., 2015). The species has found its way to some islands in the Macaronesia region, and in the Atlantic coast of Europe where migrating individuals can be found on the Iberian Peninsula, France and Britain (e.g., LEESTMANS, 1975ab; MARAVALHAS, 2003; GARCÍA-BARROS *et al*., 2004; FERNÁNDEZ-VIDAL, 2013; GARCÍA *et al*., 2015). In the Azores archipelago, however, some records were known from São Miguel, Faial, Pico and Corvo islands (MEYER, 1991; VIEIRA, 1997, 2002; MARAVALHAS, 2003; RUSSEL, 2003, VIEIRA & KARSHOLT, 2010).

In this paper, the occurrence of the American Painted Lady *V. virginiensis* was recorded for the first time in the São Jorge island, on 21-VIII-2015, supporting the species' reproduction in the Azores.

Material and methods

The identification of *Vanessa virginiensis* was done with the key in VIVES MORENO (2014). The author re-examined all the Nymphalid species in the entomological collections of the Natural History Museum Carlos Machado of Ponta Delgada (Azores), and no specimens of *V. virginiensis* were found.

The sampling of eggs, larvae and adults of *V. virginiensis* was conducted by the author in various localities on the islands of São Miguel, Faial, Pico and São Jorge, during August from 2001 to 2015, as well as in São Miguel during the summer and fall seasons of 2016. It has proceeded to the direct observation of stems, leaves and flowers of the potential hostplants belonging to the Asteraceae family (e.g., for their Azorean distribution see SILVA *et al*., 2010): *Pseudognaphalium luteoalbum* (L.) Hilliard & B. L. Burtt (São Miguel, Faial, Pico, São Jorge), *P. gaudichaudianum* (DC.) Anderb. (São Miguel), *Carduus tenuiflorus* Curtis (São Miguel, Faial, Pico, São Jorge), *Gnaphalium uliginosum* L. (Pico), *Filago gallica* L. (São Miguel, Faial, Pico, São Jorge), *F. minima* (Sm.) Pers. (Pico), and *F. pyramidata* L. (São Miguel).

Published data (MEYER, 1991; VIEIRA, 1997, 2002; RUSSELL, 2003; OTTVALL, 2013; WAGNER, 2016) and personal information provided by Bosse Carlsson and Wolfgang Wagner were also considered. The presence of *V. virginiensis* species was annotated, and the localizations

georeferenced with a GPS (the coordinates for the sites mentioned in the literature were estimated).

Results

Vanessa virginiensis was recorded from several locations over the last three decades, namely in São Miguel, Faial, Pico, São Jorge and Corvo islands (Table 1). Some few new records of adults from São Miguel, São Jorge and Pico islands are also given (Table 1). The presence on Pico island was confirmed. A single female was observed laying five viable eggs on leaves of *P. luteoalbum* at Fajã dos Cubres, São Jorge island, on 21th August 2015. The larvae were also found on the same plant species at Furnas (São Miguel island) by both W. Wagner and the author (VV), on fall 2013 and 2016, respectively (Table 1). All records or sightings of this species were done during summer and fall seasons.

Table 1.– *Vanessa virginiensis* from several localities of the Azorean islands (São Miguel, Faial, Pico, São Jorge, and Corvo), including some new records to São Miguel, São Jorge and Pico islands. [1]Coordenates UTM (latitude, - longitude) are all located in the 26S area of the Geodetic System WGS84, and were estimated for the places indicated in the literature. [2]The references are those where the species was cited by the first time.

Azores	Locality	Coordenates UTM[1]	Altitude (m)	Date	Status	Reference[2]
São Miguel	Slopes of Barrosa/ Serra de Água de Pau	37.762008, -25.495150	850-900	26-VII-1990	Adult	Meyer, 1991
	Ponta Delgada (University garden)	37.747388, -25.663527	46	8-VIII-1996	Adult	V. Sbordoni (*in* Vieira, 1997)
	Ponta Delgada (University garden)	37.747501, -25.663010	45	15-X-2008	Adult	This study
	Sete Cidades	37.865958, -25.793203	263	5-XI-2008	Adult	B. Carlsson (pers. comm.)
	Sete Cidades	37.865958, -25.793203	263	23-IX-2013	Adult	Ottvall, 2013
	Sete Cidades	37.880812, -25.782251	476	XI-2013	Adult	W. Wagner (pers. comm.)
	Furnas (Lagoa das)	37.750739, -25.328867	282	XI-2013	Larvae	W. Wagner (pers. comm.)
	Furnas (Pomar das Caldeiras)	37.770035, -25.332099	300	15-X - 15-XI-2016	Adult, larvae	This study
	Furnas (Viveiros Florestais)	37.777958, - 25314129	220	28-X- 15-XI-2016	Larvae	This study
Faial	Pico Verde	38.591831, -28.796775	458	29-VIII-2001	Adult	Vieira, 2002
	Pico Verde	38.591831, -28.796775	458	7-VIII-2002	Adult	Vieira, 2002
Pico	Lagoa do Capitão (slopes of)	38.487520, -28.320152	780	26-VIII-2015	Adult	This study
São Jorge	Fajã dos Cubres	38.638054, -27.961941	12	21-VIII-2015	Adult, egg	This study
		38.638622, -27.962831	16	21-VIII-2015	Adult	This study
Corvo	Southern slopes of the crater	39.694819, -31.118489	460	13-VIII-2003	Adult	Russel, 2003

Discussion

Vanessa virginiensis is a species with Nearctic origin, well-known migrant and widely distributed throughout North and Central America (southern Colombia) (WILLIAMS, 1930; GARCÍA *et al*., 2015). The species has formed small and possible temporary populations in the Iberian Peninsula, mainly in coastal mainland Portugal, and southern areas of Spain, but remains an occasional migrant in central and western parts of Europe, including France and Britain (e.g., LEESTMANS, 1975ab; MORENO & MARTÍNEZ, 1984; MARAVALHAS, 2003; GARCÍA-BARROS *et al*., 2004; FERNÁNDEZ-VIDAL, 2013; GARCÍA *et al*., 2015).

The American Painted Lady is also a known migrant in the Macaronesian islands, mainly to the Canary Islands (GARCÍA *et al*., 2015) and the Azores (RUSSEL, 2003; VIEIRA & KARSHOLT, 2010). Currently, no previous records of this species could be found in Cape Verdean

literature (e.g., BÁEZ & GARCÍA, 2005; VIEIRA, 2008; MENDES & BÍVAR DE SOUSA, 2010; TENNENT & RUSSELL, 2015).

According to MEYER (1991, 1993), *V. virginiensis* is possibly considered an errant species from Madeira. However, AGUIAR & KARSHOLT (2006) found several references to its occurrence in the island, but all are based on a single record by GODMAN (1870). Therefore, they have removed the species from the list of Madeiran Lepidoptera (AGUIAR & KARSHOLT, 2006, 2008).

The species is nevertheless recorded in the Canary Islands since the 19th century, namely in El Hierro, La Palma, La Gomera, Tenerife, and Gran Canaria (BORY DE SAINT VICENT, 1803, *in* LESTMANS, 1975b; FERNÁNDEZ-RUBIO, 1991; HALL & RUSSEL, 2000; BÁEZ & OROMÍ, 2010; GARCÍA *et al*., 2015), being resident during all year at least in La Palma, La Gomera and Tenerife, where larvae were recently found (e.g., HALL & RUSSEL, 2000; GARCÍA *et al*., 2015). Despite the controversy about the origin of immigrant specimens of *V. virginiensis*, strays from the Canaries can probably reach the Atlantic coast of European countries, mainly Portugal and Spain mainland (LEESTMANS, 1975a, 1975b; FERNÁNDEZ-VIDAL, 2013), and other Macaronesian islands, including the Selvagens, in which the species has been frequently found (FERNÁNDEZ-VIDAL, 2013).

In the Azores, the species has been considered an occasional immigrant and has only been recorded in the islands of the São Miguel, Pico, Faial and Corvo (MEYER, 1991, 1993; VIEIRA, 1997; RUSSEL, 2003; VIEIRA, 2002; MARAVALHAS, 2003). However, this study expands its area of distribution to the island of São Jorge confirming, therefore, both the adult's presence on the island of Pico as well the reproduction of the species in the Azores, particularly in São Jorge and São Miguel islands. Given that the records are in low number and were only reported in the last three decades, it is likely that the American Painted Lady has probably small and temporary populations in the Azorean islands.

The origin of the Azorean specimens is uncertain. The dispersion of winged species could be due to active flight or passive transport by strong winds or favorable seasonal air currents, possibly alongside other animals, boats, and/or airplanes. In the reviewed literature, there are some examples of other Lepidoptera species that have certainly reached the northern Macaronesian islands by wind-borne migration, namely the nocturnal species *Pseudaletia unipuncta* (Haworth, 1809) (VIEIRA *et al*., 2003), *Ophiusa tirhaca* (Cramer, 1977) (VIEIRA, 2001) and *Utetheisa pulchella* (Linnaeus, 1758) (VIEIRA, 2012), and for the diurnal species *Danaus plexippus* (NEVES *et al*., 2001) and *Hypolimnas misippus* (Linnaeus, 1764) (TENNENT & RUSSEL, 2015).

Like the migration pattern inferred or demonstrated for those other Lepidoptera species, there is little doubt that migrating *V. virginiensis* butterflies are affected by dynamic weather systems with attendant winds (specially, northwestern winds; RUSSEL, 2003), which could force some American Painted Lady butterflies to fly over the Atlantic Ocean, and then colonize the new habitats found, for instance in the Azores islands. RUSSEL (2003) considered that the specimens found on the island of Corvo had probably been carried by wind from the American continent. However, this has been under-recorded, due to its possible resemblance to *Vanessa cardui* (that inhabit in all islands of the archipelago excepting São Jorge; VIEIRA & KARSHOLT, 2010), but more probably because it is a less frequent visitor to the eastern side of the Atlantic Ocean (LEESTMANS, 1975a, 1975b), including eventually strays from the Canary Islands (FERNÁNDEZ-VIDAL, 2013).

On the other hand, RUSSEL (2003) suggests the phenology and abundance of the larval hostplant *P. luteoalbum* on Corvo island as a major determinant of *V. virginiensis*' life history strategy. In fact, larval hostplants never cover large areas (partially due to farmers who cut pastures' grass often leading to reduced quality and abundance), and their availability might be a limiting factor for the increasing population of American Painted Lady in the Azorean islands.

The world distribution of *V. virginiensis* is rather large, but it is remarkable their propensity to

expand its range, including in the Macaronesia region. This trend is probably related to climatic changes and fragmentation of habitats.

Thus it might be presumed that the Azorean *V. virginiensis* specimens migrated from areas situated as far as the Iberian Peninsula, the Canary Islands, or even America (although less likely). The species was recorded for the first time from the São Jorge island, and its presence on the Pico island was confirmed. The reproduction occurs in the Azorean archipelago, originating small and temporary summer/fall populations, which have been confirmed in the São Miguel and São Jorge islands.

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