Butterflies and Skippers of the South East Aegean Island of Hálki, Dhodhekánisa (= Dodecanese) Island Complex, Greece, representing 16 first records for the island. First record of *Cacyreus marshalli* from the Greek Island of Símí. An update of the Butterfly and Skipper Fauna of the Greek Island of Rhodos (Lepidoptera: Papilionoidea & Hesperioidea)

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Abstract. Sixteen records of butterflies and skippers from Hálki Island are now being presented for the first time ever. *Cacyreus marshalli* is being reported as new to Símí Island, and an update of the butterflies and skippers of Rhodos Island is being given together with a comparative study of the butterfly and skipper fauna for the lepidopterologically better known islands of the Dhodhekánisa-group.

Samenvatting. De waarnemingen van 16 soorten dagvlinders en dikkopjes van het Griekse eiland Hálki (Dodekanesos) worden voor het eerst vermeld. *Cacyreus marshalli* wordt voor het eerst vermeld van het eiland Símí en de dagvlinderfauna van het eiland Ródos wordt bijgewerkt gevolgd door een vergelijkende studie van de beter bestudeerde eilanden van de Dodekanesos eilandengroep.

Résumé. Seize espèces de papillons de jour sont mentionnées ici pour la première fois de l'île grecque de Hálki (Dodecanèse). *Cacyreus marshalli* est mentionné pour la première fois de l'île de Símí. La faune lépidopoptérologique de l'île de Rhodes est mise à jour, suivie par une étude des papillons des îles du Dodécanèse mieux étudiées en ce qui concerne les papillons.

Key words: Greece – Dhodhekánisa (= Dodecanese) Islands – Hálki Island – Símí Island – Rhodos Island – Lepidoptera – Papilionoidea – Hesperioidea – *Cacyreus marshalli* – Faunistics.

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Introduction

The butterfly and skipper fauna of most Dhodhekánisa islands is well documented (Albrecht & Kissling 2013, Bender 1963, Bretherton 1971; Coutsis 2005, Coutsis & Anastassíu 2011, Coutsis & Ghavalas 2013, Cuvelier & Mølgaard 2012, Galanos 2014, Ghigi 1929, Koutsaftikis 1974, Olivier 1987, 1990a, 1990b, 1991, 1992, 1993a, 1993b, 1994, 1996, 1997a, 1997b, Olivier & Riemis 1987, Rebel 1936, Riemis 1986, Thomson 1985, Turati 1929, van der Poorten 1985), but there are still some exceptions requiring investigation, one of which is the small island of Hálki, that is totally unknown lepidopterologically. In view of this the present author decided to visit the island in different seasons, specifically in late autumn 2015 and in early summer 2016, in order to carry out a more complete overview of the island's total butterfly and skipper fauna.

The need for a better understanding of the astonishing dispersal capabilities of the recently and accidentally introduced to Europe South African invader, *C. marshalli*, gave ample good reason for including in this paper its first recorded appearance on Símí Island, another member of the Dhodhekánisa island-group.

Finally it was also deemed necessary from a faunistic point of view to produce an update of the butterflies and skippers of the largest and most important of the Dhodhekánisa, the island of Rhodos, and to conclude with comparative data on the faunal diversity of those islands in the group whose butterfly and skipper fauna is well documented in literature.

Hálki Island: its geography, geology, climate and habitats

Hálki (= Chalki) is the 12th in size island of the 21 inhabited islands belonging to the Dhodhekánisa Complex, and is located in the SE Aegean Sea, to the SE of Tílos Island and just 5 nautical miles W of the promontory of Monólithos, Rhodos Island (fig.1, 1.1). Its geographic coordinates are N 36°14', E 027°34', its total area 28 km², its length 10 km from west to east, its maximum width 3 km from north to south and the expanded length of its coastline 34 km. Its principal town is Embórios, located in the south-eastern part of the island and having a population of about 480 inhabitants. The island's highest peaks are Merovíghli (593 m) and Profítis Ilías (578 m). Its climate is semi-arid Mediterranean, with short, mild and wet winters, followed by long, hot and dry summers. Both vegetation and habitat diversity are now degraded because the island has been deforested to a great extent, and its original vegetation consists mainly of Phrygana (Fríghana), while the main type of habitat at present consists essentially of calcareous, exposed rock formations (Carlström 1987, Kagiampaki 2011) (figs. 18, 19, 20).

Identification methods

Species identifications are based on field observations of live material, as well as on at least one voucher photograph for each species observed. No collecting of specimens was carried out. Of all species recorded perhaps the only one whose identification carries with it a degree of doubt is *Gegenes pumilio*, which, because of its external similarities to the closely

allied *Gegenes nostrodamus* (Fabricius, 1793), may very often be confused with the latter. The problem would have been solved by an examination of the genitalia. The included colour slide, however, does give good hints that the specimen is indeed *G. pumilio* rather than *G. nostrodamus* by its darker colour, less pointed forewings, faint yellowish spots on hindwing underside, and apparent lack of a hair tuft near base of hindwing costa. In addition to this all confirmed by genitalia records of *Gegenes* specimens in the Dhodhekánisa area have invariably proved to be *G. pumilio*.

Fig. 1. Geographical position of the Dhodhekánisa Islands of Hálki, Símí and Rhodos in the SE Aegean Sea. Also shown are the Islands of Kastellórizo, Astipálea and Kássos.

Fig. 1.1. Map of Hálki Island as taken from Google Earth, showing all investigated sites.

Fig. 1.2. Map of Símí Island as taken from Google Earth, showing all investigated sites.

List of Butterflies and Skippers recorded on Halki island

All 16 of the butterfly and skipper records from Hálki Island that are now being presented are based on fieldwork carried out by the author in mid-November 2015, as well as in early June 2016, and are new to the island, as there are no past publications on the lepidopterous fauna of Hálki. The area covered is a triangle in the extreme eastern part of the island formed between the port of Embórios and the vicinities of Zies, Kaniá, Pondamos, Horió and Agios Ioannis Castle. All localities visited, in which observations and photographing took place, unless otherwise stated, were open, rocky habitats with garrigue vegetation, and were

located at altitudes ranging from about sea level to about 350 m above sea level.

1. ***Pieris brassicae*** (Linnaeus, 1758). Many fresh males and females were observed feeding on *Bougainvillea* sp. flowers (fig. 8), in locations that include also grasslands.

2. ***Pieris rapae*** (Linnaeus, 1758). Few fresh individuals were observed (fig. 9), feeding and resting on flowers of *Dittrichia* sp. and *Lantana camara* L., as well as resting on dry grasses.

3. ***Colias crocea*** (Geoffroy, 1785). A lot of fresh males and females were observed (fig. 4), feeding on flowers, such as *Dittrichia* sp. and *Heliotropium* subsp. *hirsutissimum* Grauer.

4. ***Cacyreus marshalli*** (Butler, 1898). Few individuals (3–4) were observed (fig. 2), in the vicinity of *Geranium* and *Pelargonium* plants, usually restricted to gardens in the settlement. *Cacyreus marshalli* is recorded for the first time as a new species for Rhodos and Tílos, as well as the Dhodhekánisa and the Aegean region as a whole, in Galanos (2014). This particular species has since been recorded in Rhodos from 12 different localities that include areas that are far away of the vicinity of its known larval host-plants, suggesting that it is now well established and widespread on the island.

5. ***Lampides boeticus*** (Linnaeus, 1767). Few individuals were observed flying in localities that include dry grasslands, feeding especially on the flowers of *Dittrichia* sp. (fig. 6) and other plants belonging to the Poaceae.

6. ***Leptotes pirithous*** (Linnaeus, 1767). Few individuals were observed, feeding on flowering shrubs (fig. 7).

7. ***Vanessa atalanta*** (Linnaeus, 1758). Several individuals were observed flying and resting around the settlement of Emborios (fig. 10).

8. ***Vanessa cardui*** (Linnaeus, 1758). Few individuals were observed (fig. 11) in locations that include grasslands, feeding on flowers and resting on the ground and stones.

9. ***Carcharodus alceae*** (Esper, 1780). More than 10 individuals were observed. The butterflies were found in locations that include dry as well as green grasslands (fig. 3).

Fig. 2. *Cacyreus marshalli*, Hálki, NW of Embórios, 20 m, 17.xi.2015.

Fig. 3. *Carcharodus alceae*, Hálki, N of Embórios, 30 m, 17.xi.2015.

Fig. 4. *Colias crocea*, Hálki, N of Embórios on the way to Kaniá, 40 m, 17.xi.2015.

Fig. 5. *Gegenes pumilio*, Hálki, N of Embórios, on the way to Kaniá, 45 m, 17.xi.2015.

Fig. 6. *Lampides boeticus*, Hálki, on the way to Kania, 40 m, 17.xi.2015.

Fig. 7. *Leptotes pirithous*, Hálki, NW of Embórios, 25 m, 17.xi.2015.

Fig. 8. *Pieris brassicae*, Hálki, Embórios port, 5 m, 17.xi.2015.

Fig. 9. *Pieris rapae*, Hálki, NW of Embórios, 20 m, 17.xi.2015.

Fig. 10. *Vanessa atalanta*, Hálki, Embórios port, 5 m, 17.xi.2015.

Fig. 11. *Vanessa cardui*, Hálki, NW of Embórios, 20 m, 17.xi.2015.

Fig. 12. *Carcharodus stauderi*, Hálki, NW of Embórios, 50 m, 05.vi.2016.

Fig. 13. *Aricia agestis*, Hálki, W of Embórios, 40 m, 05.vi.2016.

Fig. 14. *Lycaena phlaeas*, Hálki, NW of Embórios, 30 m, 05.vi.2016.

Fig. 15. *Polyommatus icarus*, Hálki, Zies, 60 m, 05.vi.2016.

Fig. 16. *Lasiommata megera*, Hálki, W of Embórios, 70 m, 05.vi.2016.

Fig. 17. *Pontia edusa*, Hálki, NW of Embórios, 80 m, 05.vi.2016.

10. ***Gegenes pumilio*** (Hoffmannsegg, 1804). For reasons already explained above, the identification of this species is made with a degree of reservation. Two individuals were observed flying and resting, one in an open, very hot and dry field with grass and flowers, the other in a shrubby locality with plants such as *Anagyris foetida* L., *Capparis spinosa* L. and other species of Asteraceae. The species has been confirmed as such by its genitalia for most of the other Dhodhekánisa islands, such as Rhodos, Kos, Sími, Kálimnos, Léros, Pátmos and Kastellórizo, while the presence of *Gegenes nostrodamus*, has never been reported so far from any of these islands (Pamperis 2009, Cuvelier & Mølgaard 2014).

11. ***Carcharodus stauderi*** (Reverdin, 1913). Fresh individuals were observed (fig. 12), feeding on *Teucrium capitatum* ssp. *capitatum* L. and resting on dry grasses.

12. ***Aricia agestis*** (Denis & Schiffermuller, 1775). Several fresh individuals were observed in open, rocky habitats with flowers, such as *Calendula arvensis* (Vaill.) L. (fig. 13).

13. ***Lycaena phlaeas*** (Linnaeus, 1761). Few individuals were observed resting on the ground and feeding on flowers, such as *Hypericum triquetrifolium* Turra (fig. 14).

14. ***Polyommatus icarus*** (Rottemburg, 1775). Few individuals were observed in open, stony habitat, feeding on flowers, such as *Convolvulus althaeoides* L. (fig. 15).

15. ***Lasiommata megera*** (Linnaeus, 1767). Few individuals were observed (fig. 16), resting on shady parts of limestone cliffs.

16. ***Pontia edusa*** (Fabricius, 1777). Several fresh males and females were observed in dry and hot, rocky habitats, feeding on flowers, such as *Coridothymus capitatus* (L.) Reichenb. f. (fig. 17).

Fig. 18. Hálki. Habitat type, where butterflies were observed and photographed.

Fig. 19. Hálki. Habitat type, where butterflies were observed and photographed.

Fig. 20. Hálki. Habitat type, where butterflies were observed and photographed.

First record of *Cacyreus marshalli* from Símí island

The presence of *Cacyreus marshalli* on the island of Símí has never been recorded in literature in the past, and therefore the present record is the first-ever for the island. On 14 November 2015 and 23 April 2016 a small number of *Cacyreus marshalli* were observed respectively and photographed near the harbour (fig. 21), on the rocky and steep coastal slopes of Gialós and Haráni settlements (Fig. 22, 23), in the vicinity of *Geranium* plants and at altitudes ranging from sea level to about 30 m. The butterflies flew close to the ground for short distances, and often rested on dry flowers. During the particular visits to the island the following other locations were also investigated: Horió and Xísos, both along road leading to Panormitis and the forested

areas on the way to Kurkuniótis and Nánu, as well as on the way to Marathúnda and Panormítis (fig. 1.2).

Fig. 21. *Cacyreus marshalli*, Símí, Gialós, 20 m, 14.xi.2015.

The species that were also observed are the following: *Pieris brassicae*, *P. rapae*, *Colias crocea*, *Lycaena phlaeas* (Linnaeus, 1761), *Lampides boeticus*, *Leptotes pirithous*, *Lasiommata maera* (Linnaeus, 1758), *Maniola telmessia* (Zeller, 1847), *Vanessa atalanta*, *V. cardui*, *Carcharodus alceae*, *Iphiclides podalirius* (Linnaeus, 1758), *Ypthima asterope* (Klug, 1832), *Thymelicus hyrax* (Lederer, 1861), *T. sylvestris* (Poda, 1761), *T. acteon* (Rottemburg, 1775) and *Gegenes pumilio*.

An update of the total butterfly fauna of Rhodos island

According to Galanos (2014) the total number of combined butterflies and skippers for the island of Rhodos amounts to 52 species, two of which however, those of *Anthocharis cardamines* (Linnaeus, 1758) and *Favonius quercus* (Linnaeus, 1758), have never as yet been confirmed in literature (Pamperis pers. comm. 2013, Anastassíu pers. com. 2013), and therefore should at present at least be excluded from the list, diminishing the total of combined Rhodian butterflies and skippers to 50 species.

Fig. 22. Símí. Habitat type, where butterflies were observed and photographed.

Fig. 23. Símí. Habitat type, where butterflies were observed and photographed.

Conclusions

On the basis of the above data the total number of species recorded so far from Hálki amounts to 16, from Símí to 38 and from Rhodos to 50. All the species found in Hálki as well as in Símí occur also in Rhodos, while 16 of the ones found in Rhodos have not as yet been recorded from Símí, these being: *Aporia crataegi* (Linnaeus, 1758), *Gonepteryx cleopatra* (Linnaeus, 1767), *Callophrys rubi* (Linnaeus, 1758), *Lycaena thersamon* (Esper, 1784), *Glaucopsyche alexis* (Poda, 1761), *Celastrina argiolus* (Linnaeus, 1758), *Freyeria trochylus* (Freyer, 1845), *Plebejus loewii* (Zeller, 1847), *Polyommatus thersites* (Cantener, 1835), *Danaus chrysippus* (Linnaeus, 1758), *Pararge aegeria* (Linnaeus, 1758), *Hipparchia syriaca* (Staudinger, 1871), *Pseudochazara anthelea* (Hübner, 1824), *Charaxes jasius* (Linnaeus, 1767), *Limenitis reducta* Staudinger, 1901 and *Pelopidas thrax* (Hübner, 1821). Species recorded from Símí but not yet from Rhodos include: *Melitaea syriaca* Rebel, 1905, *Polygonia egea* (Cramer, 1775), *Muschampia tessellum* (Hübner, 1803), and *Thymelicus sylvestris*.

In the case of Hálki, the interaction of certain factors, such as the degraded vegetation, the absence of habitat diversity, the paucity of water sources, the negative effect of strong winds, the overgrazing, as well as the long distance from the nearest mainland mass, play an important role in determining the faunal population dynamics and degree of faunal diversity of the given island. In this framework, the case of the islands of Kastellórizo and Símí, which are relatively rather rich in species diversity, is given in view to be highlighted their extreme proximity to the Asia Minor land mass, although their restricted small area. In particular, the butterfly fauna of Símí with an area of 58 km², which corresponds to 4,7% of Rhodos area, and a distance of about 5 nautical miles from the Turkish coast, comprises 38 species (Cuvelier & Mølgaard 2012, 2014, Pamperis 2009, present study), namely 60,3% of the butterfly fauna of Dodecanese as a whole (63 species). Similarly, the island

of Kastellórizo (= Megisti), with an area of 9,2 km², which corresponds to 0,65% of Rhodos area, and a distance of 2 km from the Turkish coast, comprises 36 species (Cuvelier & Mølgaard 2012, 2014, Pamperis 2009), namely 57% of the butterfly fauna of Dodecanese as a whole. More details are being included in Charts 1 and 2 of the present paper, the first one of which shows the total combined number of butterfly and skipper species per island and its percentage to the total number of such species for the whole area, while the second one shows the islands' areas.

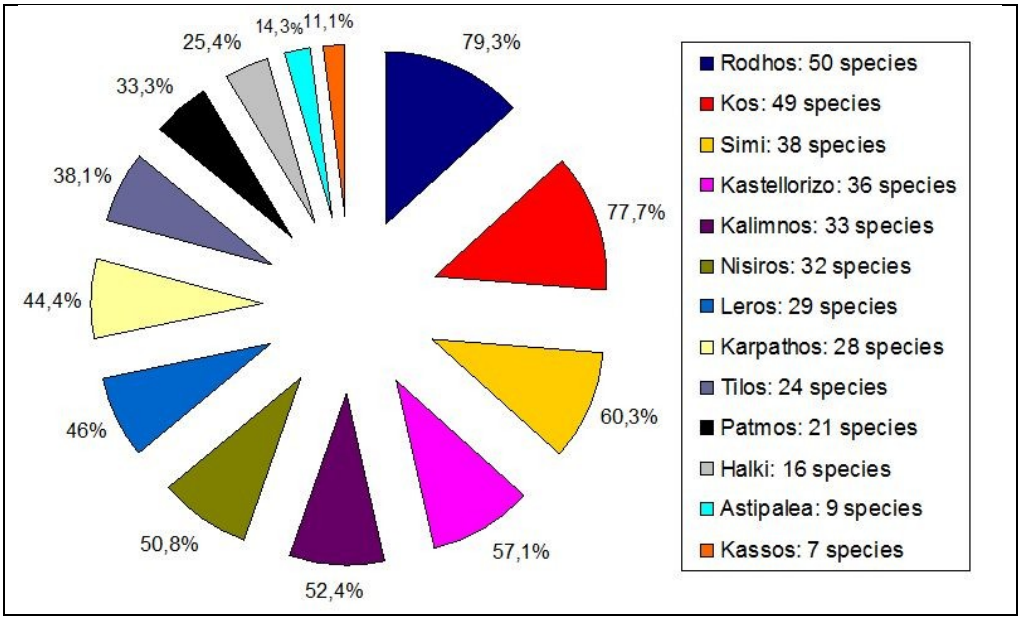

Chart 1. The number of species per island and its percentage to the total of 63 species for the butterfly fauna of the Dhodhekánisa Complex as a whole. [Remark: the butterfly fauna of Astipálea and Kássos has never been properly studied].

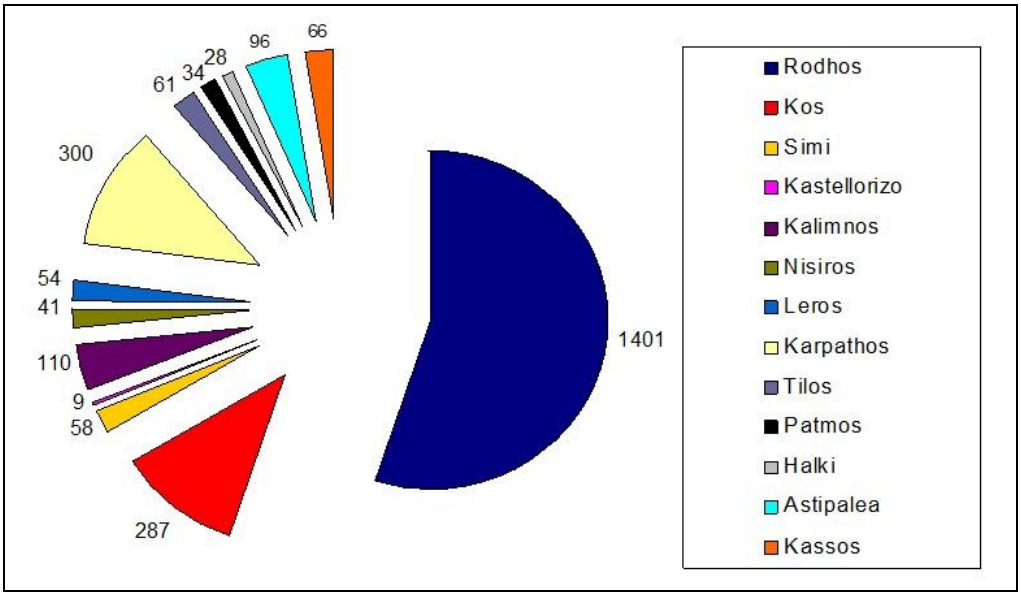

Chart 2. The area in km² of each of the Dhodhekánisa islands included in Chart 1. [Remark: the butterfly fauna of Astipálea and Kássos has never been properly studied].

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