

About the recently published records of *Papilio saharae* from Sicily and Malta (Lepidoptera: Papilionidae)

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Abstract. Recently published records of *Papilio saharae* Oberthür, 1879 from the Mediterranean islands of Sicily and Malta, based on external wing characters, could not be supported by the authors on genitalic grounds. Male specimens from both these islands that appeared by wing characters *saharae*-like proved instead to have genitalia identical to those of *P. machaon* Linnaeus, 1758, clearly suggesting that *P. saharae* ought to be excluded from the butterfly fauna of both Sicily and Malta and in both instances substituted instead by *P. machaon*.

Samenvatting. Recent gepubliceerde vermeldingen van *Papilio saharae* Oberthür, 1879 van de Midderraanse eilanden Sicilië en Malta, gebaseerd op uiterlijk kenmerken van de vleugels, werden niet ondersteund door onderzoek van de genitalia. Mannelijke exemplaren uit beide eilanden die kenmerken van *P. saharae* vertoonden, bleken genitalia te hebben identiek aan die van *P. machaon* Linnaeus, 1758, duidelijk aantonend dat *P. saharae* moet geschrapt worden van de vlinderfauna van zowel Sicilië als Malta en dat het telkens gaat om *P. machaon*.

Résumé. Des mentions récentes de *Papilio saharae* Oberthür, 1879 des îles méditerranéennes Sicile et Malte, basées sur des caractères externes des ailes, ne sont pas confirmées par des caractères des génitalia. Des exemplaires males provenant des deux îles qui montraient des caractères des ailes comme dans *P. saharae*, avaient les génitalia identiques à ceux de *P. machaon* Linnaeus, 1758, ce qui montre clairement que *P. saharae* doit être exclus de la faune de Sicile et Malte parce qu'il s'agit toujours de *P. machaon*.

Key words: *Papilio machaon* – *Papilio saharae* – Hybrids *P. machaon* × *P. saharae* – Male genitalic appendages – Israel – Malta – Sicily – Greece – Misidentification.

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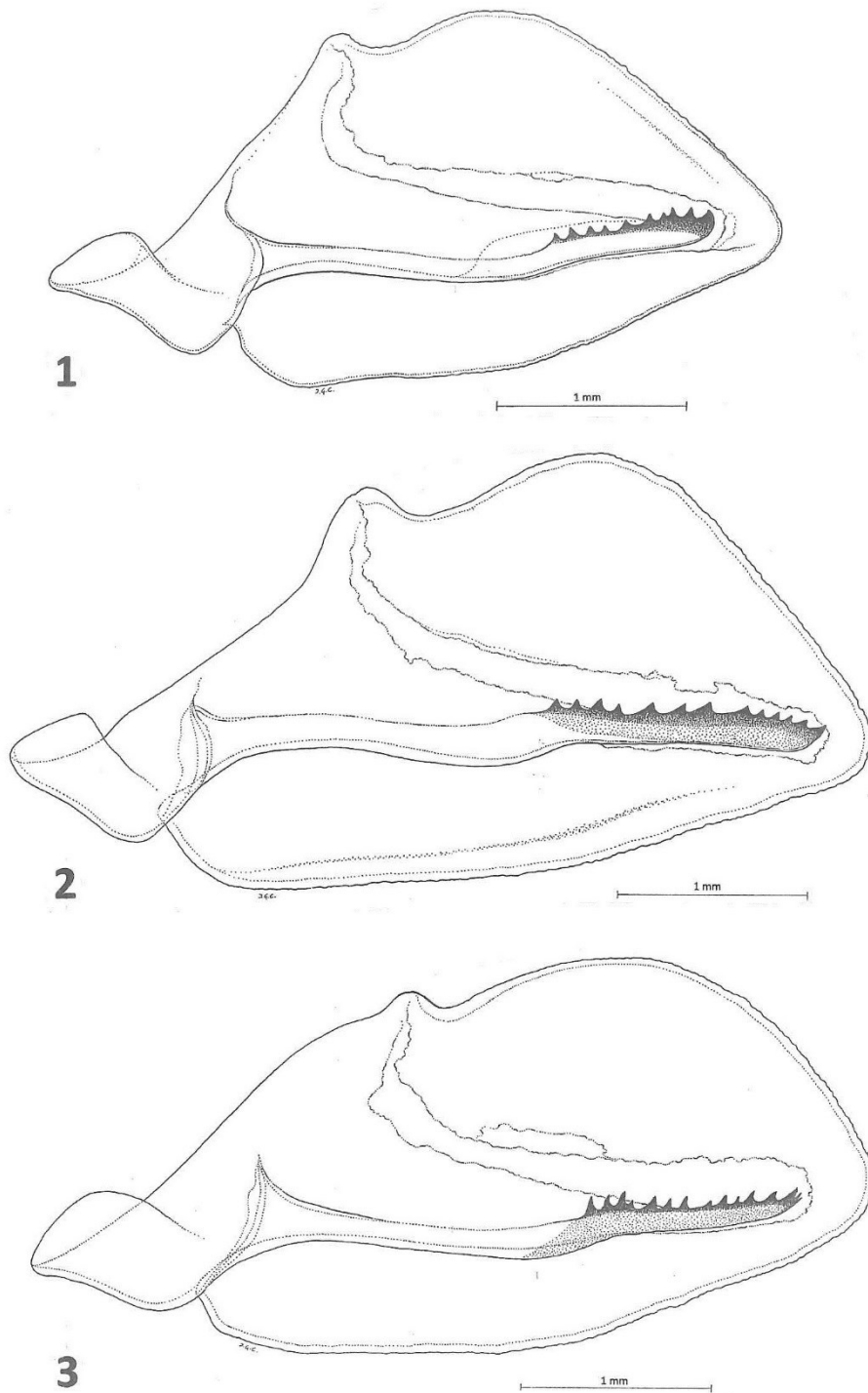
Introduction

Papilio saharae Oberthür, 1879, for years considered a subspecies of *Papilio machaon* Linnaeus, 1758 on account of pronounced similarities to the latter in external characters, was first specifically separated from it by Larsen (1990), who based his decision for doing so on “1) ... constant differences in genitalia; 2) ... constant differences in the shape of the hindwing tornal area; 3) ... [The fact that] the early stages differ, as well as the larval food plant choice; 4) ... [That] there is at least some evidence of interspecific sterility in North Africa (Clarke & Sheppard, 1956); and 5) ... [That there is a] differing choice of habitat which makes it unlikely that hybrids could survive (Larsen 1983, Clarke & Larsen 1986).” The same reasoning for this separation was also later followed by Pittaway *et al.* (1994), who also treated taxonomically the totality of the then known taxa of the *P. machaon/saharae*-complex inhabiting eremic or semi-eremic localities in North Africa, the Near East and the Arabian Peninsula, and provided at the same time taxonomic information about the closely related *Papilio hospiton* Géné, 1839, endemic to Corsica and Sardinia.

Lately it has been stated by Leraut (2016) that *P. saharae* is also an inhabitant of the Mediterranean islands of Sicily and Malta, neither of which can be characterized as being either eremic or semi-eremic. In the former island it is recorded by him as being sympatric with *P. machaon*, and in the latter as being the only *Papilio* present there. His action in respect of Sicily followed Moonen (2012), who first recorded *P. saharae* from this island on the basis of the external characters of a single male specimen housed in the former collection of ZMA (Zoological

Museum of Amsterdam), and presently transferred to NCB Naturalis in Leiden. The diagnostic characters referred to by Moonen are as follows: spring- and summer-brood specimens of *P. saharae* indistinguishable from one another by external characters and both characterized by their equally small overall size; spring- and summer-brood specimens of Sicilian *P. machaon* distinguished from one another by the former's small size and broadly blackened veins on FW upper side, and the latter's large size and more narrowly blackened veins on FW upper side; HW tails of *P. saharae* longer than in *P. machaon*, and antennal segments in the former numbering 30–31, while in the latter, 33–36. These diagnostic characters most probably refer to the two species as a whole, thus including the specimens the author was dealing with; the accompanying colour slides of these specimens, however, don't seem to fully support his views. Curiously absolutely no reference is made by Moonen to the diagnostically important male genitalia.

Leraut (2016) accepted Moonen's record of *P. saharae* from Sicily and added to the diagnostic characters of it the proximity of the HW upper side blue-studded black postdiscal band to the cell, often even touching it. Insofar as the Maltese *P. saharae* is concerned he states: “Illustrations on the Internet of *melitensis* Eller from Malta convinced me that it is indeed *P. saharae melitensis* Eller, 1936. Stat. rev.”. Genitalic information for *P. saharae* as well as *P. machaon* is provided by the statement “See also genitalia (p. 888 – 1, 2).”, and by two scale-less and very small colour slides of a mounted and thus distorted set of male genitalia that hardly show any discernible diagnostic characters.



Figs 1–3. Lateral aspect of inner face of right valva.

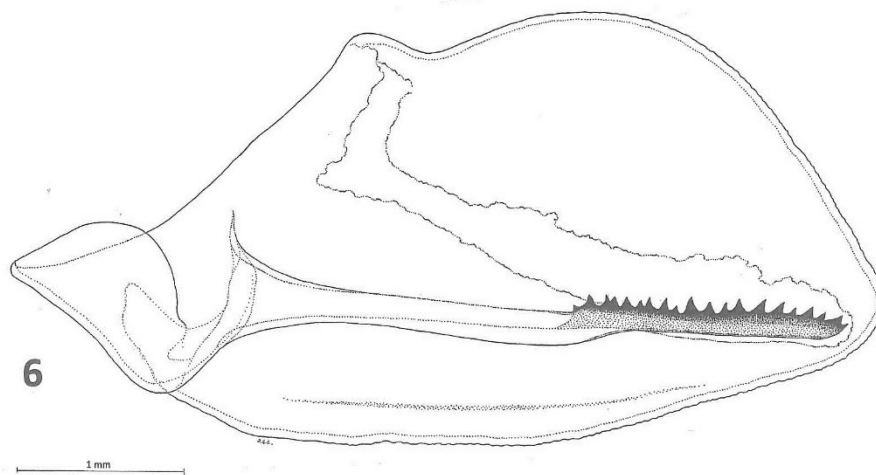
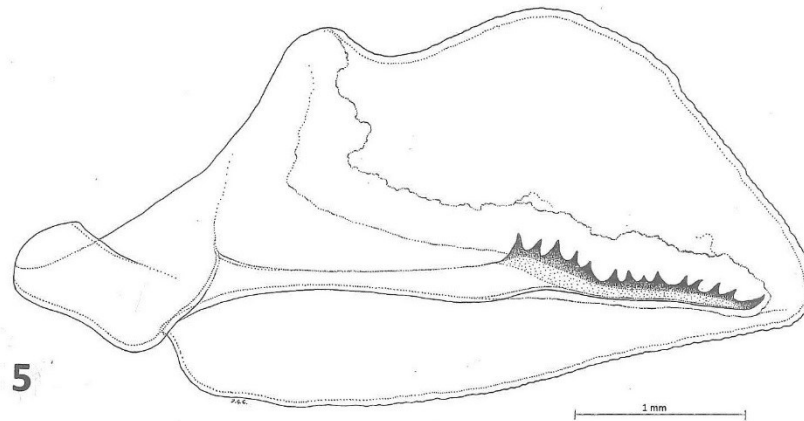
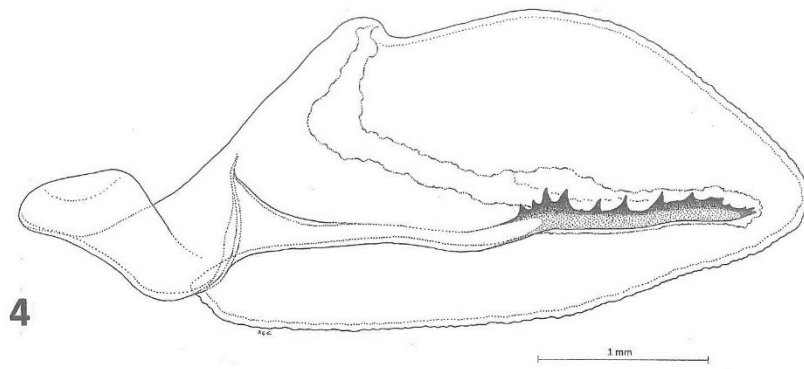
1. *Papilio saharae*, Israel, Mt. Negev, Nahal Eliav, 840 m, 26.iv.2014, leg. Dubi Benyamini, prep. no. 5828 (adult fig. 7).

2. *Papilio machaon*, Israel, N. Negev, Nahal Ashan, 230 m, 22.v.2014, leg. Dubi Benyamini, prep. no. 5832.

3. Hybrid *P. machaon* × *P. saharae*, Israel, hybrid no. 12, 19.x.2016, bred by Dubi Benyamini, prep. no. 5833.

As the above mentioned HW postdiscal band character is quite often also found in practically all *P. machaon* populations as well, being particularly frequent in *P. machaon britannicus* Seitz, 1907, we felt that a comparative examination between the male genitalia of Sicilian and Maltese “*saharae*” on the one hand and those

of proven *P. machaon* and *P. saharae* on the other was necessary in order to fully resolve the true identity of the former. All *P. machaon* specimens chosen for this procedure, with the exception of the one from Israel, had the blue-studded black band of HW upper side in close proximity to, or even touching the cell.



Figs 4–6. Lateral aspect of inner face of right valva of *Papilio machaon*.

4. Sicily, Ficuzza, 800 m, 17.v.1982, leg. Saveri, prep. no. 5839.

5. Malta, Rabat, 12.v.1994, leg. Paul Samut, prep. no. 5829 (adult fig. 8).

6. Greece, Kríti Island (Crete), Iráklío Prefecture, near Roghdhiá, 350–400 m, 22.vi.1995, prep. no. 5865 (adult fig. 9).

Differences between the male genitalia of *P. saharae* and *P. machaon*

One of the main differences is in the length of the harpe; in *P. saharae* (fig. 1) the harpe is short. In *P. machaon* (fig. 2), even though the length of the harpe varies from one population to another, this component is always decidedly longer than in *P. saharae*. Hybrids between the two species bred in the lab were found to have intermediate genitalia, the harpe having a length equal to the combined lengths of the harpes of *P. saharae* and *P. machaon* divided by two (fig. 3). The same situation has also been observed in natural hybrid populations (Benyamini 2017).

The male genitalia of Sicilian and Maltese *P. "saharae"*

These (figs 4 & 5 respectively), both belonging to specimens having the blue-studded black band of HW upper side in close proximity to the cell, thus resembling *P. saharae* (only the Maltese butterfly shown; fig. 8), were found to have the harpe similar instead to that of Israeli *P. machaon* (fig. 2). Greek specimens (fig. 9), with the blue-studded black band of HW upper side even touching the cell, likewise turned out to have *machaon*-like male appendages (genitalia fig. 6), clearly suggesting that this wing character is of no diagnostic value.



Fig. 7. *Papilio saharae*, male. Israel, Mt. Negev, Nahal Eliav, 840 m, 26.iv.2014, leg. Dubi Benyamini (genitalia fig. 1).

Fig. 8. *Papilio machaon*, male. Malta, Rabat, 12.v.1994, leg. Paul Samut (genitalia fig. 5).

Fig. 9. *Papilio machaon*, male. Greece, Kríti Island (Crete), Iráklío Prefecture, near Roghdhiá, 350–400 m, 22.vi.1995, leg. John G. Coutsis (genitalia fig. 6).

Conclusion

On the basis of the above mentioned genitalic evidence the species-group taxon *P. saharae* should be excluded from the butterfly fauna of Malta and replaced instead by *P. machaon*. The former's supposed existence in Sicily in sympatry with *P. machaon* can only be substantiated on the basis of its male genitalia, its early stages and larval host-plants, all of which differ constantly from those of *P. machaon*. With lack of any such

information and evidence at hand we are likewise presently excluding *P. saharae* from the butterfly fauna of Sicily.

Acknowledgments

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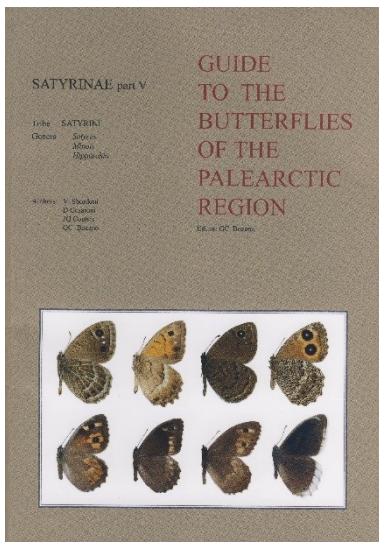
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Boekbespreking

Sbordoni V., Cesaroni D., Coutsis J. G. & Bozano G. C.: Guide to the butterflies of the Palearctic Region. Satyrinae Part V. Tribe Satyrini, Genera Satyrus, Minois, Hipparchia.

21 × 30 cm, 134 pagina's, talrijke figuren in zwart-wit (genitaaltekeningen) en kleur (vlinders en verspreidingskaartjes), Omnes Artes s.a.s., via Torquato Tasso 22, 24047 Treviglio (BG) Italië, www.omnesartes.com, paperback, 32,00 € (ISBN 978-88-87989-22-9).



Dit is ondertussen precies het twintigste deel in deze reeks over de Palaearctische dagvlinders. Voordien verschenen 2 delen over de familie Papilionidae, 3 over Pieridae (waarvan het 1^{ste} deel al aan een tweede uitgave toe is), 4 over Lycaenidae (waarvan het 2^{de} deel als tweede editie), 6 over Nymphalidae (Apaturinae, Limenitidinae en Nymphalinae) en 4 over Satyrinae. In het onderhavige deel over Satyrinae (tribus Satyrini) worden drie genera behandeld die reeds lange tijd voor taxonomische problemen hebben gezorgd: *Satyrus*, *Minois* en vooral *Hipparchia*.

In het genus *Satyrus* worden 13 soorten onderscheiden waarvan er 2 in Europa voorkomen: *S. actaea* (Esper, 1780) en *S. ferula* (Fabricius, 1793). De auteurs hanteren voor zover mogelijk het biologisch soortconcept en als een gevolg daarvan worden bij *S. actaea* niet minder dan 29 ondersoortnamen, vormen en aberraties als synoniem opgevat, met nog eens een 25-tal individuele vormen door Agenjo in 1963 beschreven, maar niet eens opgesomd. In de redenering heet het dat deze soort weliswaar zeer variabel is, maar dat alle beschreven geografische vormen met elkaar probleemloos paren, hetgeen ook blijkt uit moleculair onderzoek. Van *S. ferula* worden 22 synoniemen opgelijst, maar deze soort heeft een zeer uitgebreid areaal dat zich van in Spanje doorheen Centraal-Azië tot in China uitstrekt. Hier worden dan ook 7 ondersoorten onderscheiden, de meeste met hun eigen lijstje synoniemen.

In het genus *Satyrus* zitten ook enkele soorten met een erg beperkt verspreidingsgebied zoals *S. atlantea* (Verity, 1927) (Atlasgebergte, Marokko), *S. virbius* Herrich-Schäffer, 1844 (zuidelijke Krim) of *S. makmal* Higgins, 1965 (grensgebied Libanon, Noord-Israël en Zuidwest-Syrië).

Het genus *Minois* bevat slechts 4 Palaearctische soorten waarvan alleen *M. dryas* (Scopoli, 1763) in Europa voorkomt. Het meest problematische genus *Hipparchia* (onderverdeeld in 5 subgenera) is vertegenwoordigd door niet minder dan 35 soorten, waarvan er 22 in Europa voorkomen. Sommige van deze soorten zijn beperkt tot één enkel eiland in de Atlantische Oceaan of de Middellandse Zee, zoals b.v. *H. sbordonii* Kudrna, 1984 (Poza eilandjes, Italië) of *H. christenseni* Kudrna, 1977 (Karpathos, Griekenland).

Omdat er zoveel willekeur en verwarring heerst in deze drie genera worden er meer afbeeldingen voorzien van vlinders (boven- en onderkant) dan in de vorige delen in de reeks, zodat de lezer een duidelijk beeld krijgt van de variabiliteit binnen de verschillende soorten. Verder wordt er bijzonder veel aandacht besteed aan de mannelijke en vrouwelijke genitalia waarvan prachtige tekeningen door John Coutsis worden afgebeeld. De verspreiding van alle behandelde soorten wordt op duidelijke kaartjes grafisch voorgesteld. De moeilijkheden bij het genus *Hipparchia* komen trouwens goed tot uiting op de verspreiding van de *H. wyssii*-groep waar zich op elk van de 5 westelijke eilandjes van de Kanarische Eilanden een aparte soort heeft ontwikkeld.

Zoals steeds in deze reeks wordt er veel aandacht besteed aan de taxonomie en systematiek van de behandelde groepen en dit op alle niveaus (familie, subfamilie, tribus, genus, subgenus, soort), met telkens lijstjes van de onderliggende categorieën, met veel synoniemen en telkens met de bibliografische referenties. Het boek eindigt dan ook met een referentielijst en met een alfabetische index.

De publicatie is zeer verzorgd uitgegeven en mag uiteraard niet ontbreken in de boekenkast van iedereen die zich met de Europese, of bij uitbreiding, Palaearctische dagvlinders bezig houdt. Een aanrader!

Willy De Prins