A re-evaluation of certain generic transfers of species-group taxa belonging to the subtribes Polyommatiti and Leptotiti (Lepidoptera: Lycaenidae, Polyommatini)

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Abstract. The validity of certain generic transfers of species-group taxa belonging to the subtribes Polyommatiti and Leptotiti (Lepidoptera: Lycaenidae) is reexamined on the basis of genitalic evidence, and a generic rearrangement is proposed where this is deemed necessary.

Samenvatting. De geldigheid van enkele transfers van sommige soortengroep-taxa naar andere genera in de subtribi Polyommatiti en Leptotiti (Lepidoptera: Lycaenidae) werd herbekeken op basis van kenmerken in de genitalia, en een nieuwe combinatie wordt voorgesteld in die gevallen waarbij het noodzakelijk bleek.

Résumé. La validité de quelques tranferts de certains taxa du groupe d'espèces appartenant aux sous-tribus Polyommatiti et Leptotiti (Lepidoptera: Lycaenidae) est réexaminée en se basant sur les critères dans les genitalia, et de nouvelles combinaisons génériques sont proposées dans les cas qui semblaient nécessaires.

Keywords: Taxonomy – Lepidoptera – Lycaenidae – Polyommatini – Polyommatiti – Leptotiti – *Polyommatus* (*Plebicula*) *amandus* – *Freyeria trochylus* – *Chilades lajus* – *Chilades eleusis* – *Leptotes pirithous* – *Leptotes cassius theonus* – Male genitalia – Female genitalia.

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Introduction

In the past, and for a good many years, they were universally known as *Freyeria trochylus* (Freyer, [1845]) (Figs. 14–17), *Syntarucus pirithous* (Linnaeus, 1767) (Figs. 26–29) and *Chilades eleusis* (Demaison, 1888) (Figs. 22–25). Now they have become *Chilades trochylus* (Freyer, [1845]), *Leptotes pirithous* (Linnaeus, 1767) and *Leptotes eleusis* (Demaison, 1888). The first two, as is usually the case, have now become established as such, and the third one, only recently having changed generic position, will undoubtedly follow suit. The purpose of the present paper is to examine the taxonomic validity of these generic transfers.

Freyeria vs. *Chilades trochylus*

The genus *Freyeria* was erected by Courvoisier (1920) who designated *Lycaena trochylus* Freyer, [1845] as its type species by monotypy.

The genus *Chilades* was erected by Moore ([1881]) who designated *Papilio lajus* Stoll, [1780] (Figs. 18–21) as its type species by original designation, and also included in the same genus *Lycaena putli* Kolar, 1848, which he arranged next to *Papilio lajus*. The species-group taxon *putli*, later considered by Courvoisier a form of *Freyeria trochylus*, is now regarded specifically distinct from it despite their many affinities and obvious close relationship. Thus it may be said that the first author to have placed *putli*, and by inference *trochylus*, in *Chilades* was Moore. This, however, was done prior to the erection by Courvoisier of the genus *Freyeria*, and we cannot tell what exactly would have been Moore's reaction towards this new genus.

The abolition of the genus *Freyeria* and ensuing transfer of *trochylus* to *Chilades* was carried out by Hesselbarth *et al*. 1995: p. 586, and the action registered by them as stat. nov. The argument used was that the absence in *Freyeria* and presence in *Chilades* of androconia, a fact used by Courvoisier for differentiating these two genera from one another, was not in itself convincing enough for genus diagnosis, and for maintaining the genus *Freyeria*. The ensuing transfer of *trochylus* to *Chilades* was, as said above, in line with Moore's inclusion in that genus of the very similar to it *Lycaena putli*. Their views in full are expressed as follows:

"Courvoisier bemerkte zur Einführung seines "Genus *Freyeria* (nov.)" lediglich: "(Von Genus *Chilades* völlich verschieden, z. B. auch durch Mangel an Androkonien)". Das ist nicht gerade eine überzeugende Gattungsdiagnose. *Lycaena putli* Kollar, 1848, die Moore neben *Papilio lajus* Stoll in seine neue Gattung *Chilades* einreihte, betrachtete Courvoisier (1920: 235) nur als "Nebenform" von *Freyeria trochylus*. Wir sehen taxonomisch keinen Grund, die Gattung *Freyeria* aufrechtzuerhalten, und stellen *trochylus* Freyer in die Gattung Chil*a*des Moore. Wir verhehlen jedoch nicht daß diese Gattung hinsichtlich der zu ihr gehörenden Arten dringend der Revision bedarf (siehe Abb. 56)."

It can hardly be said that the Hesselbarth *et al*. argument per se is not correct, but the authors left it at that and did not bother to investigate any other characters by which the two genera, *Freyeria* and *Chilades*, indeed might prove to be separate from one another, and the former of the two, therefore, maintainable.

Strangely enough these authors ignored also the work by Stempffer (1967, pp. 246–249, figs. 212, 214) in which the genus *Freyeria* is maintained and treated as separate from the genus *Chilades* on genitalic criteria.

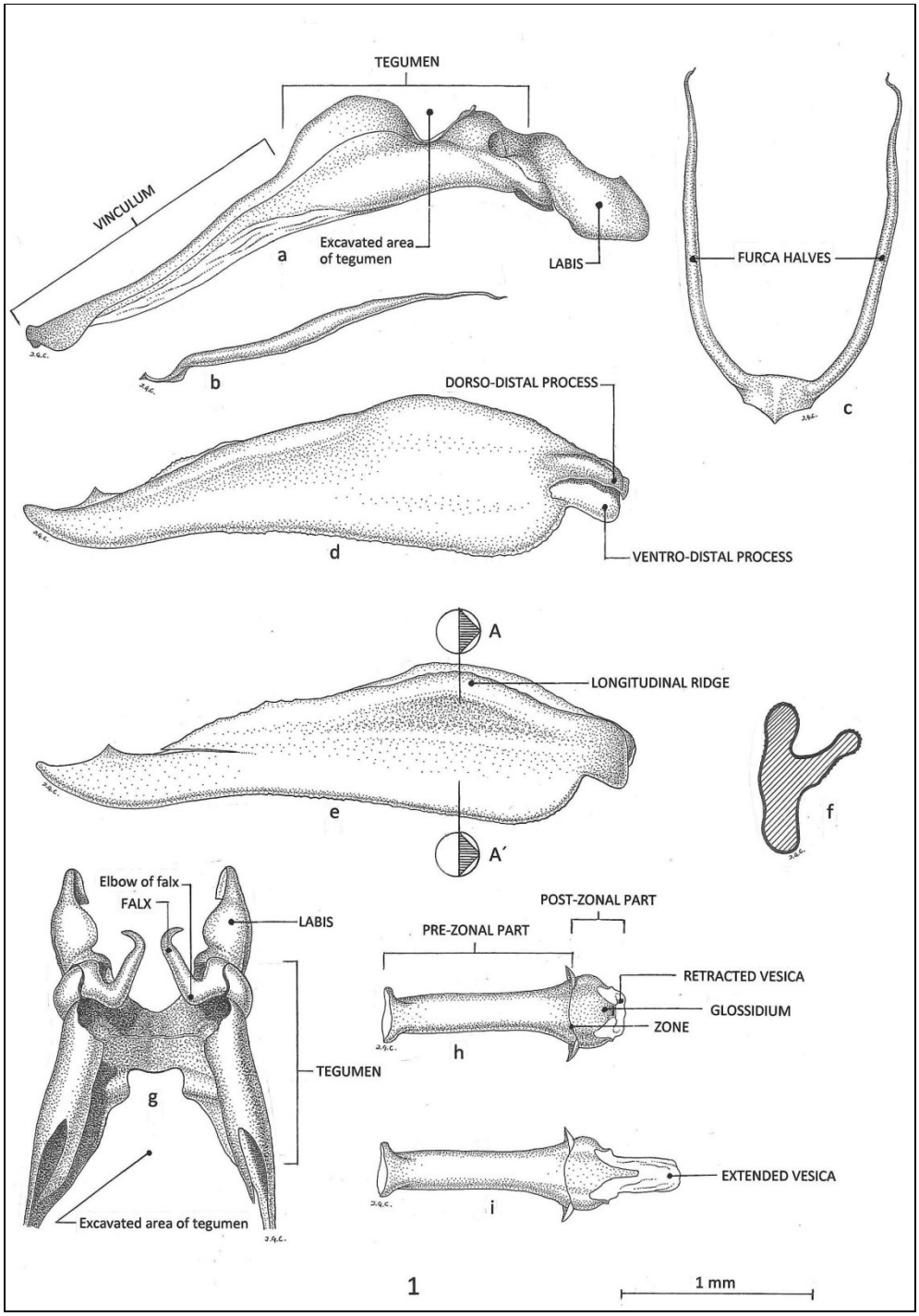


Fig. 1. Terminology of the genitalia components of a male member of the subtribe Polyommatiti: *Polyommatus* (*Plebicula*) *amandus* (Schneider, 1792), Lebanon, Massif des Cèdres, 1880–2270 m, 16.vi./11.vii.1999, prep. No. 3647.

a. Left lateral aspect of genitalia with valvae, furca and aedeagus removed.

b. Left lateral aspect of furca.

c. Ventral aspect of furca.

d. Lateral aspect of outer face of left valva.

e. Lateral aspect of inner face of right valva.

f. Section A – A´ of right valva.

g. Ventral aspect of tegumen together with labides and falces.

h. Dorsal aspect of aedeagus in normal position.

i. Dorsal aspect of aedeagus in copulatory position.

Male and female genitalia of the species-group taxon *trochylus*

An investigation of the male and female genitalia of this taxon (Figs. 2, 7 respectively) immediately shows it to belong to the subtribe Polyommatiti Swainson, 1827 of the tribe Polyommatini Swainson, 1827 whose genitalia are characterized by the following characters:

Male: valvae positioned perpendicular to the horizontal, oblong, ending distally into two roughly parallel processes, one being dorsal and the other ventral; aedeagus oblong and slender; labides small, usually oblong, and set parallel to one another; falces abruptly angled, distal part beyond elbow slender to moderately so; furca halves long and slender; vinculum long and slender; saccus absent.

Female: greater part of ductus bursae enclosed within an eversible, tubular extension of the abdominal wall, named henia, which carries near its distal end the ostium bursae. The henia is unique to the Polyommatiti, and therefore in itself sufficient in defining the subtribe.

The various male genitalia components of trochylus (Fig. 2) may be described in detail as follows:

Aedeagus: post-zonal part equal in length to pre-zonal one, and distally pointed; pre-zonal part in lateral aspect moderately and evenly curved downwards; glossidium prominent, long and very close at base to zone.

Valva: in lateral aspect oblong, longitudinal ridge of its inner face incomplete; dorso-distal process distally wide and furnished with minute serrations as in most

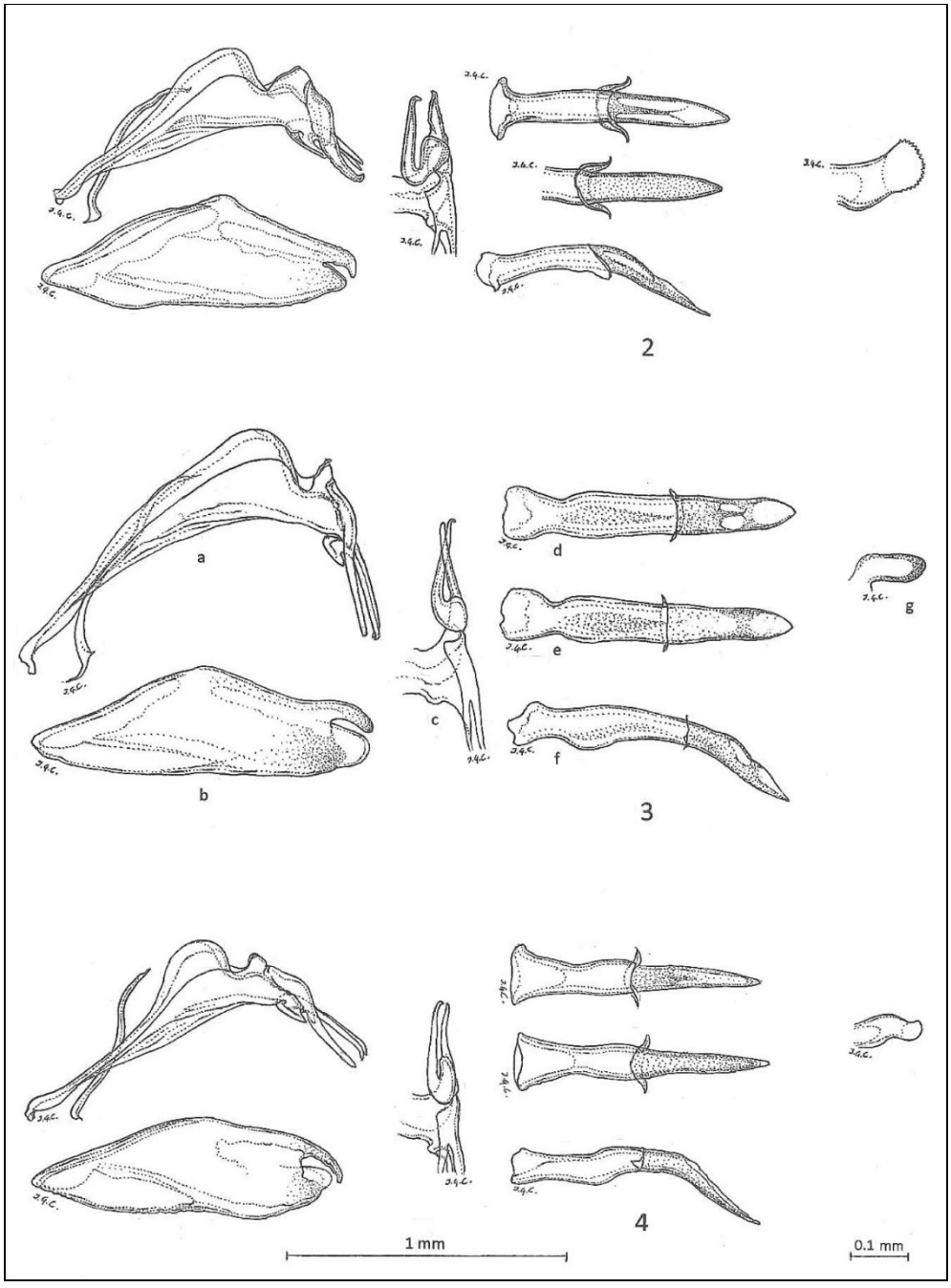
Holarctic Polyommatiti; ventro-distal process not transparent, but instead lightly sclerotized as is the remainder of valval outer face.

Labides: moderately long; in lateral aspect moderately slender, evenly, but moderately curved upwards, with distal extremity being abruptly hooked upwards; in ventral aspect rather wide, with distal extremity hooked inwards.

Falces: base, in ventral aspect, wide; portion distad of elbow moderately slender, tapering to slender extremity with distal end pointed, and hooked outwards.

Furca: halves moderately long.

Vinculum: moderately long.



Figs. 2–4. Genitalia components of male butterflies in the subtribe Polyommatiti.

2. *Freyeria trochylus* (Freyer, [1845]), Greece, Stereá Ellás, near Dhelfí, ca. 600 m, 13.vi.1990, prep. No. 3715.

3. *Chilades lajus* (Stoll, [1780]), India, Madras Presidency, Salem Plains, 900 ft., Sept. 1924, H. Latham, B.M. 1925-90, BMNH(E) 1498335, BM(NH) Loan No. ENT 2015-102, vial No. 9378, prep. No. 5570.

4. *Chilades eleusis* (Demaison, 1888), Egypt, Nile River, near Aswan, 29.xii.1983, prep. No. 5568.

a. Left lateral aspect of genitalia with valvae and aedeagus removed.

b. Lateral aspect of outer face of left valva.

c. Ventral aspect of right half of tegumen, together with right falx and labis.

d. Dorsal aspect of aedeagus.

e. Ventral aspect of aedeagus.

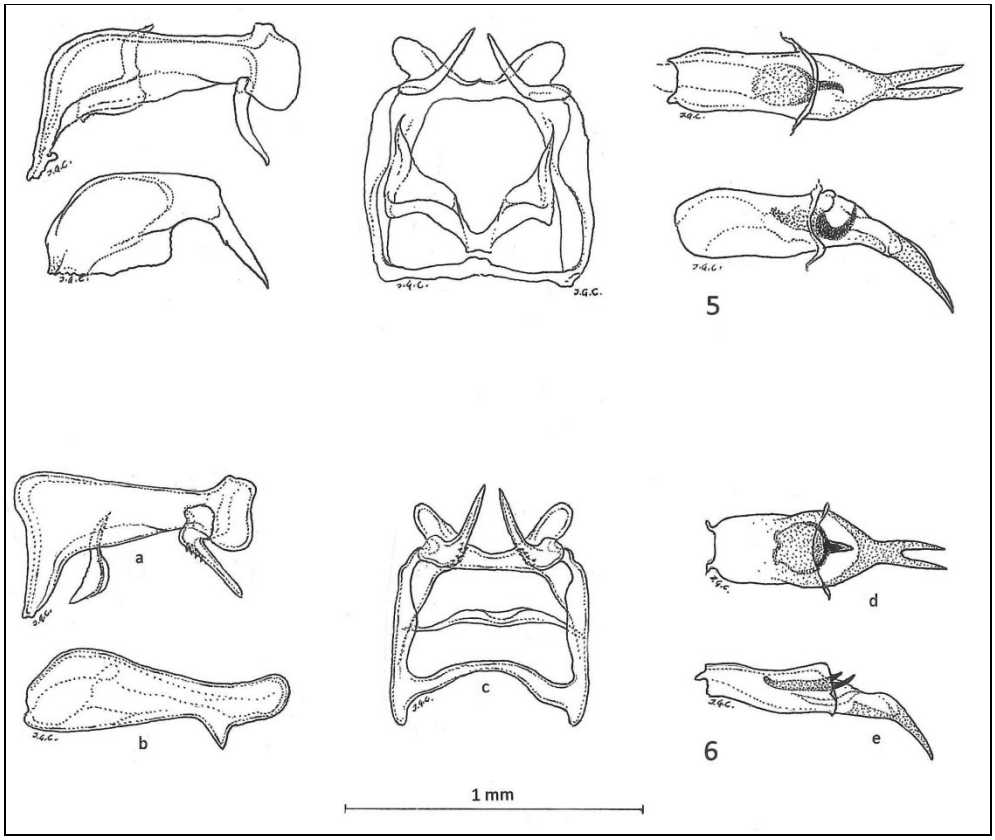
f. Left lateral aspect of aedeagus.

g. Lateral aspect of outer face of distal end of dorso-distal process of valva.

The female genital appendages are characterized by a slender, wholly membranous and diaphanous henia (Fig. 7) that bears near the ostium bursae a single, well-defined but small and horizontally oblong sclerotized plate.

It may be said that the male genitalia of *trochylus* resemble more those of *Plebeius kwaja* (Evans, 1932) (Fig. 12) than they do those of *Chilades lajus* (Fig. 3), while the henia of a female *trochylus* (Fig. 7) shares more characters with that of a *Polyommatus* (*Lysandra*) *corydonius* (Fig. 13) than it does with that of a *Chilades lajus* (Fig. 8). This in itself casts enough doubts about the validity of transferring *trochylus* from *Freyeria* to *Chilades*.

Illustrations in literature of male genitalia: Stempffer (1967: p. 249, fig. 214, as *Freyeria trochylus*); Higgins (1975: p. 138, fig. 170, as *Freyeria trochylus*); Hesselbarth *et al*. 1995: p. 580, pl. 56, fig. 3, as *Chilades trochylus trochylus*).



Figs. 5, 6. Genitalia components of male butterflies in the subtribe Leptotiti.

5. *Leptotes pirithous* (Linnaeus, 1775), Greece, Stereá Ellás, Mt. Parnassós, 1600–1800 m, 12.vii.1966, prep. No. 1190.

6. *Leptotes cassius theonus* (Lucas, 1857), U.S.A., Florida, Key West, ex coll. Bethune-Baker, B.M. 1927-360, BMNH(E) 1498332, BM(NH) Loan No. ENT 2015-102, vial No. 9379, prep. No. 5569.

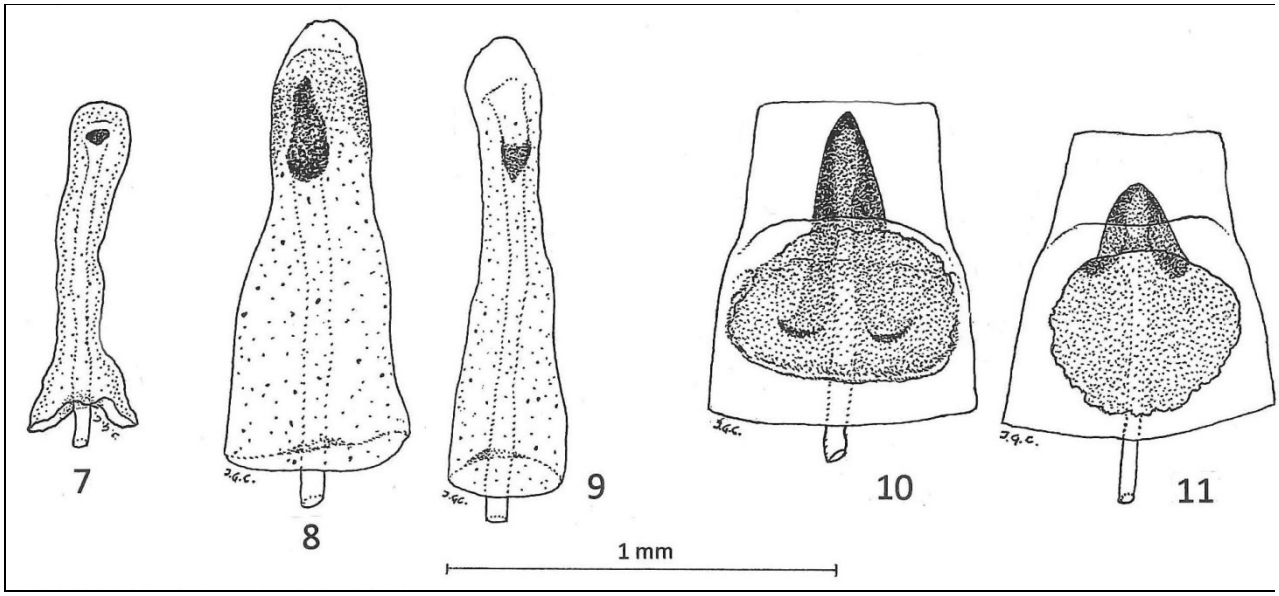
a. Left lateral aspect of genitalia with valvae and aedeagus removed.

b. Lateral aspect of outer face of left valva.

c. Ventral aspect of genitalia with valvae and aedeagus removed.

d. dorsal aspect of aedeagus.

e. Left lateral aspect of aedeagus.



Figs. 7–11. Ventral aspect of genitalia components of female Lycaenid butterflies. 7–9. Henia of members of the Polyommatiti subtribe. 7. *Freyeria trochylus* (Freyer, [1845]), Greece, Stereá Ellás, near Aráhova, ca. 800 m, 2.iv.1968, prep. No. 1532. 8. *Chilades lajus* (Stoll, [1780]), India, Madras Presidency, Mysore Plateau, Hosur nr. Bangalore, 3000 ft., July 1924, H. Latham, B.M. 1925-90, BMNH(E) 1498334, BM(NH) Loan No. ENT 2015-102, vial No. 9377, prep. No. 5571. 9. *Chilades eleusis* (Demaison, 1888), Egypt, Nile River, near Aswan, 29.xii.1983, prep. No. 5567. 10, 11. Vaginal plates of members of the Leptotiti subtribe. 10. *Leptotes pirithous* (Linnaeus, 1775), Greece, N Aegean Sea, Límnos Island, Mírina, 30 m, 16.x.1999, prep. No. 5573. 11. *Leptotes cassius theonus* (Lucas, 1857), U.S.A., Florida, Key West, ex coll. Bethune-Baker, B.M. 1927-360, BMNH(E) 1498333, BM(NH) Loan No. ENT 2015-102, vial No. 9380, prep. No. 5572.

Male and female genitalia of *Chilades lajus*

Strangely enough this butterfly (Figs. 18–21), though perhaps appearing by external characters to fit in the subtribe Leptotiti Wagener, 1995, is in actuality a member of the subtribe Polyommatiti for exactly the same reasons given for the species-group taxon *trochylus*. But this is where all similarities between these two taxa end.

The male genitalia of this butterfly are as follows (Fig. 3):

Aedeagus: close to that of *trochylus* but: post-zonal part shorter than pre-zonal one; pre-zonal part in lateral aspect not evenly curved downwards, as is in *trochylus*, but possessing a ventral swell about midway between base of aedeagus and zone; glossidium not as prominent as in *trochylus*, short, and not close at base to zone as is the case in latter.

Valva: close to that of *trochylus*, but: dorso-distal process distally narrow and smooth; ventro-distal process totally transparent and preceded along valval outer face by a rather heavily sclerotized, contrasting area; longitudinal ridge absent.

Labides: in all aspects very long and slender; in lateral aspect totally straight, while in ventral one just barely bent outwards.

Falces: base, short and wide; portion distad of elbow very long and slender with distal tip abruptly hooked outwards.

Furca: as in *trochylus*, but halves much longer.

Vinculum: as in *trochylus*, but much longer.

The female genitalia (Fig. 8) differ from those of *trochylus* by the broader henia and the more prominent, perpendicularly oblong sclerotized plate, set at a certain distance basad of ostium bursae; distal end of henia lightly sclerotized.

Illustrations in literature of male genitalia: Stempffer (1967: p. 247, fig. 212, as *Chilades laius*.

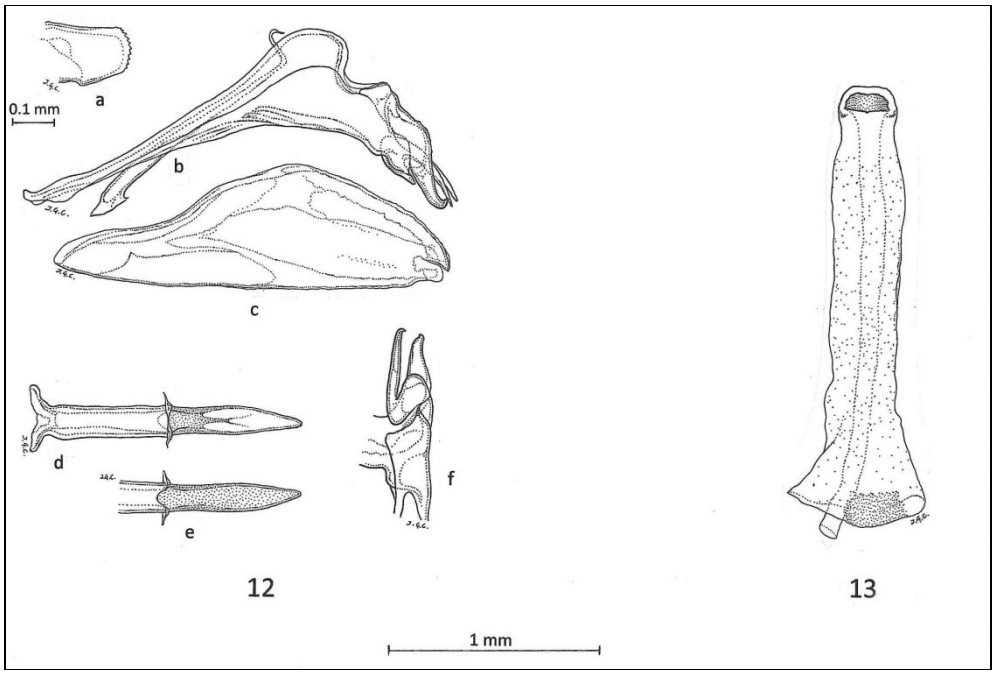


Fig. 12. Genitalia components of male *Plebeius kwaja* (Evans, 1932), Pakistan, Baluchistan, Ziarat, 2400–2700 m, 17–23.v.1983, prep. No. 3231.

a. Lateral aspect of outer face of distal end of dorso-distal process of valva. b. Left lateral aspect of genitalia with valvae and aedeagus removed. c. Lateral aspect of outer face of left valva. d. Dorsal aspect of aedeagus. e. Ventral aspect of aedeagus. f. Ventral aspect of right half of tegumen, together with right falx and labis.

Fig. 13. Ventral aspect of henia of *Polyommatus* (*Lysandra*) *corydonius* (Herrich-Schäffer, [1852]), Turkey, Erzincan province, Munzur dağları, 5 km S of Çağlayan, 1400–1700 m, 3.vii.1997, prep. No. 3201.

Discussion and Conclusion

Certain differences between the genitalia, both male and female, of the species-group taxon *trochylus* and *Chilades lajus*, type-species of the genus *Chilades*, involving length of furca halves and of vinculum, as well as width of henia, may not be significant for generic differentiation, as at least one other member of the genus *Chilades*, that of *eleusis* (adult: Figs. 22–25; genitalia: Figs. 4, 9), lacks these differentiating characters. Differences, however, involving the shape and size of the labides, falces, aedeagus, glossidium, dorso-distal process of valva, as well as of the sclerotized plate in the henia, have always proved significant elements in the generic differentiation of Polyommatiti butterflies. The fact also, as already stated, that the genitalia of *trochylus* in some ways are closer to those of other members of the subtribe Polyommatiti than they are to those of *lajus* further supports that the genus *Freyeria* should be maintained and that *trochylus* should be removed from the genus *Chilades*, and reinstated in *Freyeria*, a genus originally erected by Courvoisier specifically and rightfully for this taxon.

The following taxonomic and nomenclatural arrangement is therefore now being proposed for the species-group taxon trochylus:

Freyeria trochylus (Freyer, [1845]) **comb. rev.**

The above conclusion agrees with the one by Talavera *et al*. (2012, p. 14), which was based on molecular data.

Syntarucus vs. *Leptotes pirithous*

The genus *Syntarucus* was erected by Butler ([1901]), who designated *Papilio telicanus* Lang, 1789 (= *Papilio pirithous* Linnaeus, 1767) (Figs. 26–29) as its type species by monotypy.

The genus *Leptotes* was erected by Scudder (1876), who designated *Lycaena theonus* Lucas, 1857 (= ssp. of *Leptotes cassius* (Cramer, 1775)) (Figs. 30–33) as its type species by original designation.

Eliot (1973), in his higher classification of the Lycaenidae, retains these two genera as separate from each other and includes them under what he calls the "*Leptotes* section" together with the genera *Syntarucoides* Kaye, 1904 (type species by original designation *Papilio cassius* Cramer, [1775]) and *Cyclyrius* Butler, 1897 (type species by original designation *Polyommatus webbianus* Brullé, [1840]). [The taxon *cassius* is conspecific with *theonus*, and therefore cannot be designated as type species of a genus that is separate from that for which *theonus* is the type species. Therefore, the older genus of the two, i.e. *Leptotes*, taking precedence over the other, is the valid generic name for both *theonus* and *cassius*].

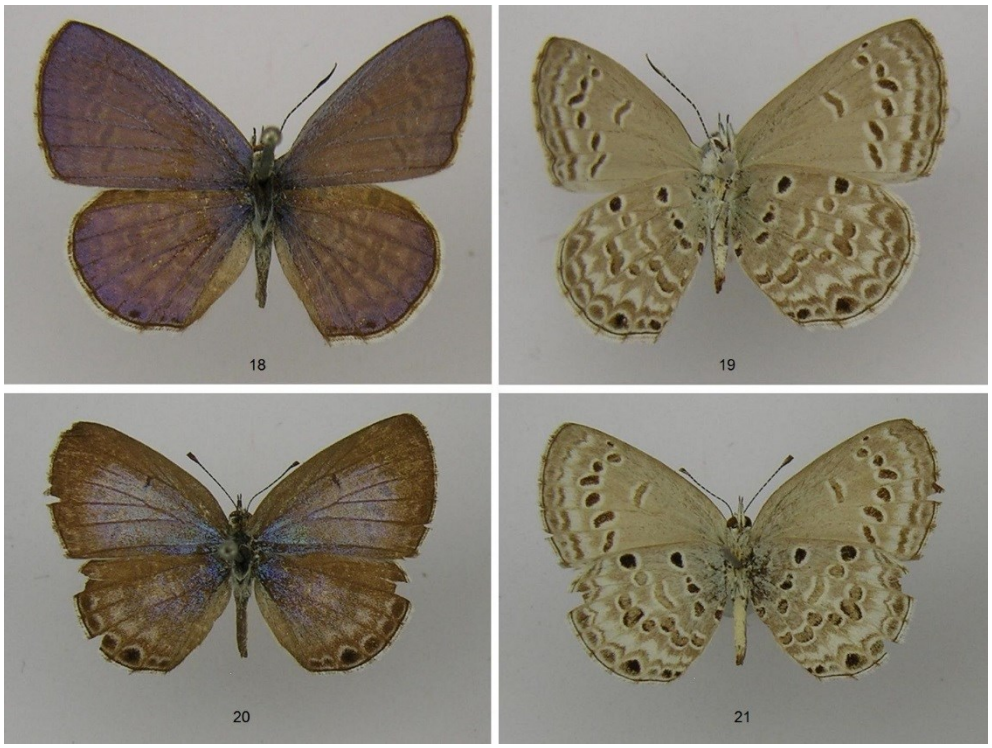
Figs. 14–17. *Freyeria trochylus* (Freyer, [1845]), Greece, Stereá Ellás.

14, 15. Male, near Dhelfí, ca. 600 m, 13.vi.1990, genitalia prep. No. 3715.

16, 17. Female, near Aráhova, ca. 800 m, 2.iv.1968, genitalia prep. No. 1532.

14, 16. Upper side.

15, 17. Underside.



Figs. 18–21. *Chilades lajus* (Stoll, [1780]), India, Madras Presidency, H. Latham, B.M. 1925–90, BMNH(E) 1498332, BM(NH) Loan No. ENT 2015-102.

18, 19. Male, Salem Plains, 900 ft., Sept. 1924, NHM No. 9378, BMNH(E) 1498335, genitalia prep. No. 5570.

20, 21. Female, Mysore Plateau, Hosur, nr. Bangalore, 300 ft., July 1924, NHM No. 9377, BMNH(E) 1498334, genitalia prep. No. 5571.

18, 20. Upper side.

19, 21. Underside.

The abolition of the genus *Syntarucus* and ensuing transfer of the species-group taxon *pirithous* from *Syntarucus* to the genus *Leptotes* was formally carried out by Fox *et al*. (1965) on the basis of what Stempffer had first noticed and discussed, and later published, in respect of similarities between the species in the genera *Syntarucus*, *Leptotes* and *Cyclyrius* in wing venation and markings, genitalia, and dense pilosity of the eyes (1942, pp. 126, 127). The author strongly suggested that these species should better be considered congeneric, but did not formally take any action on this issue.

An examination of the genitalia, both male and female, of these two species confirms that the similarities between the male genitalia of the species-group taxon *pirithous* (Fig. 5) and *Leptotes cassius theonus* (Fig. 6) are expressed by the bifurcate, with pointed halves, distal extension of the aedeagus (a characteristic of the subtribe Leptotiti), the positioning and general shape of the cornutus and its sclerotized base in that organ, and the general shape of the vinculum together with labides, falces and tegumen in both lateral and ventral aspect. The pronounced valval differences strangely are not significant, as they also exist in other members of this genus, such as are *Leptotes brevidentatus* Tite, 1958, *L. jeanneli* Stempffer, 1935 and *L. babaulti* Stempffer, 1935, all of which can hardly be

told apart from each other, as well as from *L. pirithous*, by wing characters alone (Larsen 1991: p. 231, fig. 15; Larsen 2005. Text volume: p. 253, fig. 3.47). In the female genitalic appendages both species have the ostium bursae directly placed on the abdominal wall and not on any eversible extension of it, as is the henia in the Polyommatiti, and both have a roundish pre-vaginal plate and a triangular, distally pointed post-vaginal element (Figs. 10: *pirithous*, 11: *cassius theonus*).

Illustrations in literature of male genitalia: *pirithous*: Verity (1943, Vol. II: pl. IV, figs. 2, 3, as *Syntarucus pirithous*); Higgins (1975: p. 118, fig. 143, as *Syntarucus pirithous*); Larsen (1991: p. 231, fig. 15d, as *Leptotes pirithous*; 2005. Text volume: p. 253, fig. 3.47D, as *Leptotes pirithous*).

Figs. 22–25. *Chilades eleusis* (Demaison, 1888), Egypt, Nile River, near Aswan, 29.xii.1983.

22, 23 Male, genitalia prep. No. 5568.

24, 25. Female, genitalia prep. No. 5567.

22, 24. Upper side.

23, 25. Underside.

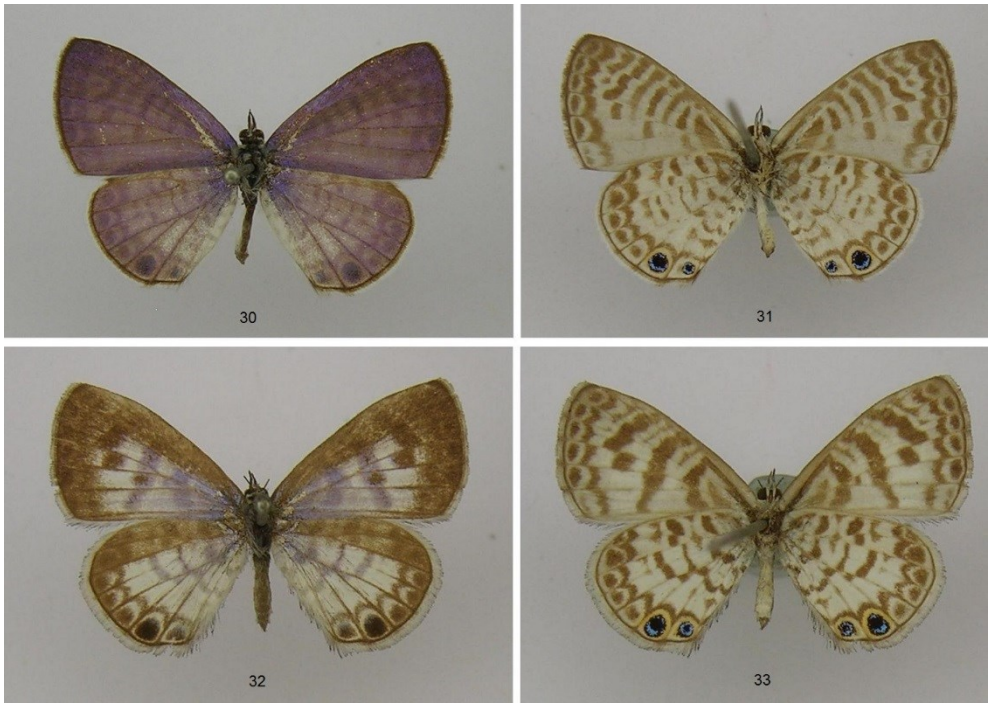
Figs. 26–29. *Leptotes pirithous* (Linnaeus, 1767), Greece

26, 27. Male, Stereá Ellás, Mt. Parnassós, 1600–1800 m, 12.vii.1966, genitalia prep. No. 1190.

28, 29. Female, N Aegean Sea, Límnos Island, Mírina, 30 m, 16.x.1999, genitalia prep. No. 5573.

26, 28. Upper side.

27, 29. Underside.



Figs. 30–33. *Leptotes cassius theonus* (Lucas, 1857), U.S.A., Florida, Key West, ex coll. Bethune-Baker, B.M. 1927-360, BM(NH) Loan No. ENT 2015-102.

30, 31. Male, BMNH(E) 1498332, vial No. 9379, genitalia prep. No. 5569.

32, 33. Female, BMNH(E) 1498333, vial No. 9380, genitalia prep. No. 5572.

30, 32. Upper side.

31, 33. Underside.

Discussion and Conclusion

The genitalic similarities between *pirithous* and *theonus*, type species of the genus *Leptotes*, clearly confirm that the two are congeneric and that therefore the genus *Syntarucus* should not be maintained, thus making *Leptotes pirithous* (Linnaeus, 1767) the valid name for this species-group taxon, in full agreement with the finds by Stempffer (1942) and the taxonomic action that followed by Fox *et al.* (1965).

Chilades vs. *Leptotes eleusis*

All recent literature places *eleusis* (Figs. 22–25) in the genus *Chilades*, and rightfully so, as its genitalia, both male and female (Figs. 4, 9 respectively), show pronounced affinities to those of *Chilades lajus* (Figs. 3, 8), type species of that genus. The male appendages in fact only differ by their slightly shorter furca halves and vinculum; the valvae, falces and labides are almost exact replicas of those of the latter species. The female appendages differ only by the size of the sclerotized plate just basad of the ostium bursae, a character that may prove individually variable.

Strangely enough *eleusis*, which by wing characters appears to belong to the Leptotiti, actually belongs structurally to the totally different subtribe of the Polyommatiti, being instead a closer relative of taxa belonging to genera and, or, subgenera such as *Polyommatus*, *Agrodiaetus*, *Plebeius*, etc. It is not surprising, therefore, that it should have recently been listed as *Leptotes eleusis* in Tshikolovets (2011, p. 183).

Discussion and Conclusion

As *Chilades* and *Leptotes* belong to two entirely different subtribes, and as *eleusis* is congeneric with *Chilades lajus* of the subtribe Polyommatiti, it becomes evident that *Chilades eleusis* (Demaison, 1888) is indeed the valid name for this species-group taxon.

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