The male genitalia of the butterflies placed in the subgenus *Neolysandra* of the genus *Polyommatus* (Lycaenidae)

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Summary. The male genitalia of the butterflies currently placed in the subgenus *Neolysandra* Koçak, 1977 of the genus *Polyommatus* Latreille, 1804 (Lycaenidae) are being illustrated and described and their differences are revealed and discussed. This information is presented in hope that, in parallel with other aspects not dealt with in the present paper, it may eventually be used toward a better understanding of the taxonomy of this group of butterflies.

Zusammenfassung. Die männlichen Genitalien der Bläulingsarten der Untergattung *Neolysandra* Koçak 1977 innerhalb des Genus *Polyommatus* Latreille, 1804 werden beschrieben. Unterschiede zwischen den Arten werden aufgezeigt. In Verbindung mit anderen, hier nicht berücksichtigten Daten könnten diese morphologischen Informationen zu einem besseren Verständnis der Taxonomie und Systematik der Gattung *Polyommatus* beitragen.

Résumé. L'armure génitale mâle des espèces actuellement placées dans le sous-genre *Neolysandra* Koçak, 1977 du genre *Polyommatus* Latreille, 1804 (Lycaenidae), est illustrée et décrite et les différences entre chacune d'entre elles sont ainsi révélées et commentées. Cette information est présentée afin que, parallèlement à d'autres aspects non discutés dans la présente contribution, elle puisse être utilisée dans le but d'une meilleure compréhension de la taxonomie de ce groupe de papillons.

Key words. Lepidoptera, Lycaenidae, *Polyommatus*, *Neolysandra*, genitalia, taxonomy, Palaearctics.

Introduction

The generic group taxon *Neolysandra* was established by Koçak (1977) as a subgenus of *Agrodiaetus* [Hübner, 1822]; type species by original designation *Lycaena diana* Miller, 1913. The reasons given for this action were based both on superficial characters ("Uns. [underside] of wings submarginal markings absent, rudimentar [sic! recte rudimentary], or few traces of lunules appear in a different shape at anal angle of hw [hindwing] (especially in female); uns. of hw. without basal spots"), as well as on characters of the male genitalia ("Male genitalia (Fig. 21) is [sic! recte are] charaterized by larger and broader unci and slender subunci.").

Koçak also included in *Neolysandra* the species-group taxa *coelestinus* (Eversmann, 1843), *ellisoni* (Pfeiffer, 1931) and *corona* (Verity, 1936), presumably on what he believed to be exterior as well as structural similarities between these three taxa and *diana*. This practice was later also followed by Hesselbarth et al. (1995), but in their instance *Agrodiaetus* and *Neolysandra* were both placed as subgenera of the genus *Polyommatus* Latreille, 1804 and the taxon *fatima* (Eckweiler & Schurian, 1980) was added to *Neolysandra*.

The assignment of these taxa to *Neolysandra* is now generally accepted, the more so as all of them share similar exterior characters on the underside of the wings and all are *Vicia* feeders in their larval stages (Larsen 1974; Schurian 1980; Hesselbarth et al. 1995; Tolman & Lewington 1997; Tuzov et al. 2000).

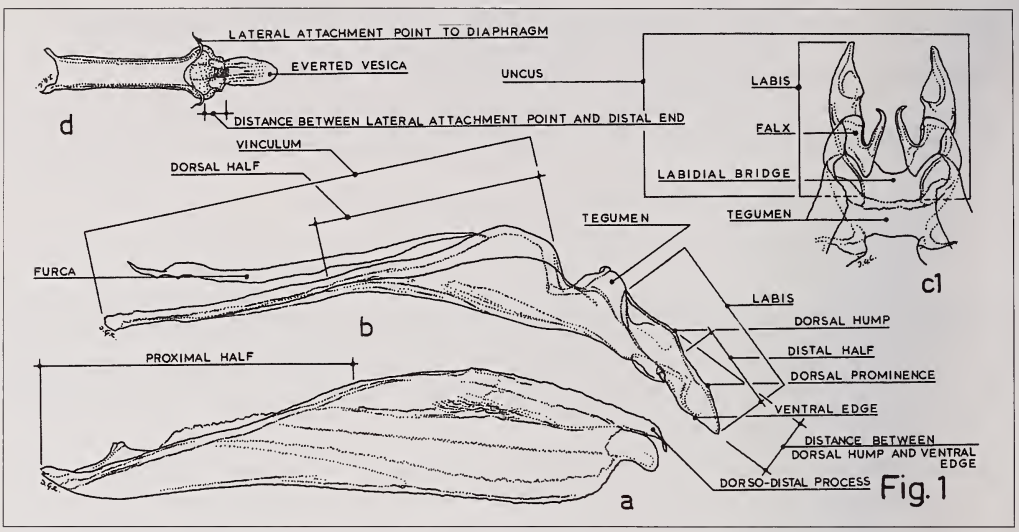

Fig. 1. Explanatory drawing of male genitalia of a taxon of the subtribe Polyommatiti (here and in Figs. 2–8: *a* – side view of exterior face of left valva; *b* – side view of left side of genitalia with valvae and aedeagus removed; *b1* – side view of exterior face of left falx and immediately neighbouring elements; *c* – ventral view of right labis and falx, together with immediately neighbouring elements; *c1* – ventral view of labides and falces, together with immediately neighbouring elements; *d* – dorsal view of aedeagus; *e* – flat view of dorso-distal process of valva).

The taxa that have been selected by the present author for comparative purposes are those belonging to the subtribe Polyommatiti Swainson, 1827, whose aedeagus, when viewed either dorsally or ventrally, invariably possesses a bulbous distal end; a character that is also shared by *Neolysandra.* Taxa in the Polyommatiti that lack this character have been excluded from the present study. On the basis of the taxonomic arrangement used by Hesselbarth et al. (1995), the following entities possessing such an aedeagus have been taken into consideration: 65 taxa placed in the subgenus *Agrodiaetus* of the genus *Polyommatus*; the species group taxa *bellargus* (Rottemburg, 1775), *syriacus* (Tutt, [1910]), *dezinus* (de Freina & Witt, 1983), *ossmar* (Gerhard, [1851]), *corydonius* (Herrich-Schäffer, [1852]), *coridon* (Poda, 1761), *albicans* (Herrich-Schäffer, [1851]), *hispanus* (Herrich-Schäffer, [1852]) and *punctiferus* (Oberthür, 1876), all placed in the subgenus *Meleageria* de Sagarra, 1925, of the genus *Polyommatus*; the taxa *dorylas* ([Denis & Schiffermüller], 1775), *golgus* (Hübner, 1813), *nivescens* (Keferstein, 1851), *atlanticus* (Elwes, 1905), *amandus* (Schneider, 1792), *thersites* (Cantener, [1835]) and *escheri* (Hübner, 1823), all placed in the subgenus *Polyommatus* of the genus *Polyommatus.*

The aforementioned group of butterflies, together with *Neolysandra*, possesses very uniform male genitalia, whose differences, when present, tend to be unpronounced and often subtle. These are expressed mostly by the shape of the labides (when these are being viewed laterally) and the length of the valvae, and to a lesser extent by the overall genitalia proportions, the shape of the valvae and the shape of the distal end of the

aedeagus, and can only be made apparent in undistorted genitalia preparations that have not been mounted under pressure.
A careful examination of the male genitalia of all *Neolysandra* species-group taxa revealed unexpected differences between them, whose significance at present is impossible to interpret. The purpose of this paper is to reveal these differences, in hope that this information, combined with other aspects not dealt with here, might eventually shed some more light on the taxonomy of this group of butterflies.

Material and methods

The genitalia under consideration were dissected from specimens loaned from the joint collection of Willy De Prins, Alain Olivier and Dirk van der Poorten, of Antwerpen, Belgium, as well as from specimens in the author's collection. These were eventually stored in vials containing 80% alcohol, after having first been kept overnight immersed in a 10% KOH solution and eventually clarified.
The appendages were drawn directly in Indian ink under a WILD M5 stereomicroscope together with its drawing tube, without the previous rendering of an intermediate pencil drawing; this was done while these were kept immersed in 80% alcohol, free from pressure due to mounting, and were held in place by being propped against glass slides. In each drawing a scale is also provided and in all cases the left valva is placed at the start of it, so that it can be measured directly. In addition to this, the length of the right forewing is also included in order to provide a reference to the insect's overall size.
In all drawings but two (the explanatory drawing excluded), a flat view of the dorso-distal process of the valva is also shown under a magnification that is twice that being used for the rest of the appendages; the reason for not including this process in two of the drawings stems from the fact that when the relevant specimens were made available for dissection, the proper magnification lenses were not yet available.
For each *Neolysandra* species-group taxon, the genitalia of more than one specimen have been studied. In the case of *diana*, *corona* and *fatima*, which are rare in collections, these amount to two for each, in the case of *ellisoni*, to three and in the case of *coelestinus* and *dorylas*, to more than ten for each.

Description of the genitalia

The genitalia nomenclature used follows to a great extent that of Higgins (1975), but certain terms had to be newly coined by the present author in order to better explain certain aspects relating to the drawings.
In the case of *corona* and *fatima* (Figs. 2 & 3), as well as in the case of *coelestinus* and *ellisoni* (Figs. 5, 6 & 7), the male genitalia show the same general pattern as that of the genitalia of all the taxa of the subgenus *Agrodiaetus* of the genus *Polyommatus*, as well as that of the genitalia of the taxa *escheri*, *thersites*, *amandus*, *dorylas* and its closely allied species, and *coridon* and its closely allied species. In all these cases and relative to *diana*, the proximal half of the valvae is slender, the distal half of the labides is devoid of any serrations (though it may possess in side view a single, poorly defined,

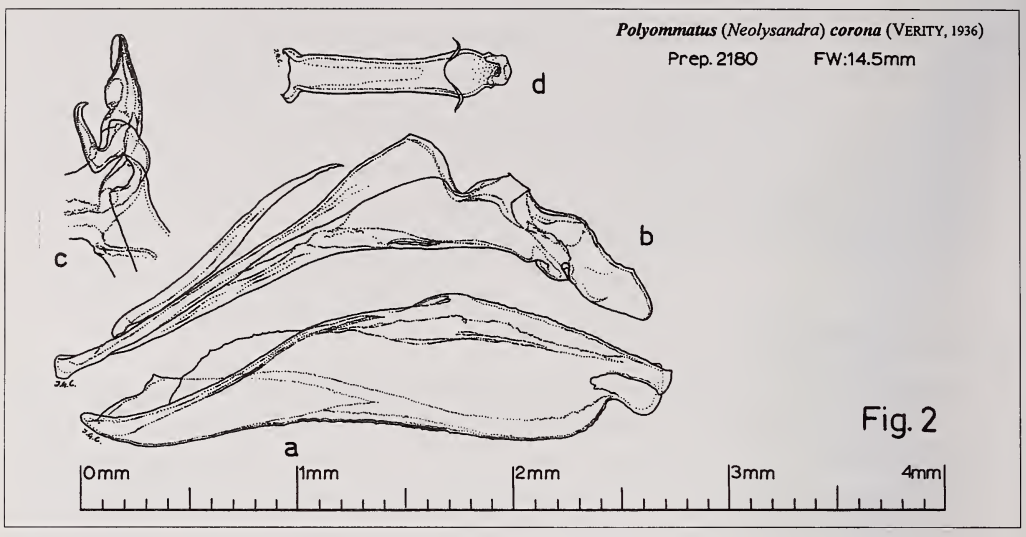

Fig. 2. Male genitalia of *Polyommatus* (*Neolysandra*) *corona* (Verity, 1936). Preparation No. 2180. Iran, Tehran, Dizin, Gardaneh Reshteh Ye Alborz, 2700–3500 m, 11–17.vii.1972.

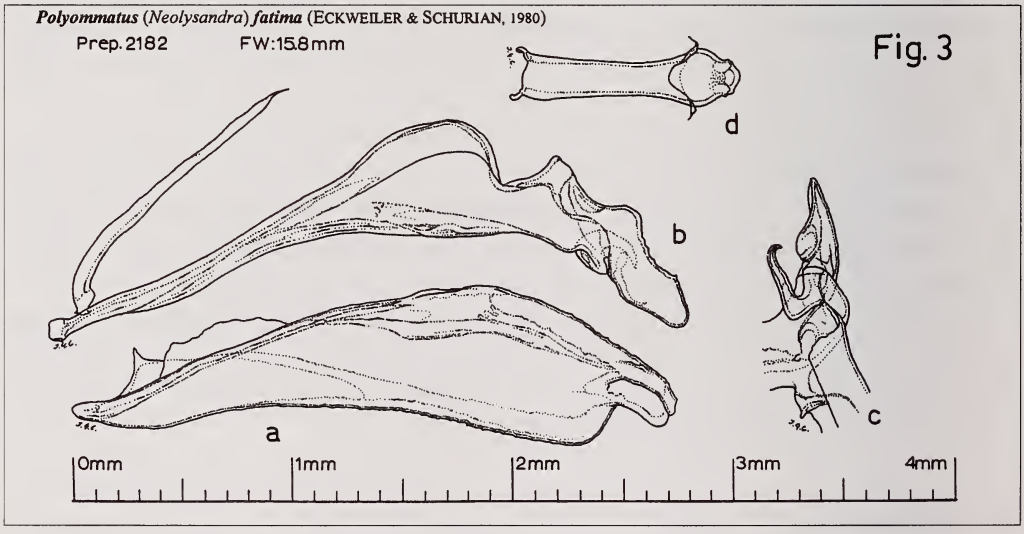

Fig. 3. Male genitalia of *Polyommatus* (*Neolysandra*) *fatima* (Eckweiler & Schurian, 1980). Preparation No. 2182. Turkey, Hakkari prov., Tali valley, 13 km SW of Hakkari, 1400 m, 20–21.vii.1992.

dorsal prominence), the distance between the lateral attachment points to the diaphragm and the distal end of the sclerotized part of the aedeagus is short, the distance between the dorsal hump and the ventral edge of the labides is short and the furca and vinculum are long.

In *corona* and *fatima*, the labides in lateral view are slender relative to *coelestina* and *ellisoni*, more or less distally pointed and possess in their distal half a dorsal pointed

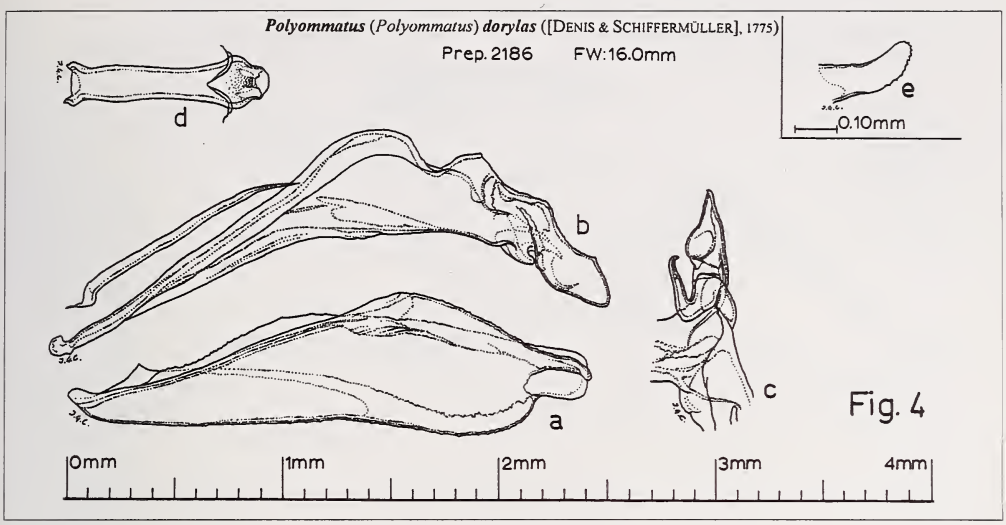

Fig. 4. Male genitalia of *Polyommatus* (*Polyommatus*) *dorylas* ([Denis & Schiffermüller], 1775). Preparation No. 2186. Turkey, Ardahan, 2500 m, Ilgardagi Geçidi, 1.viii.1993.

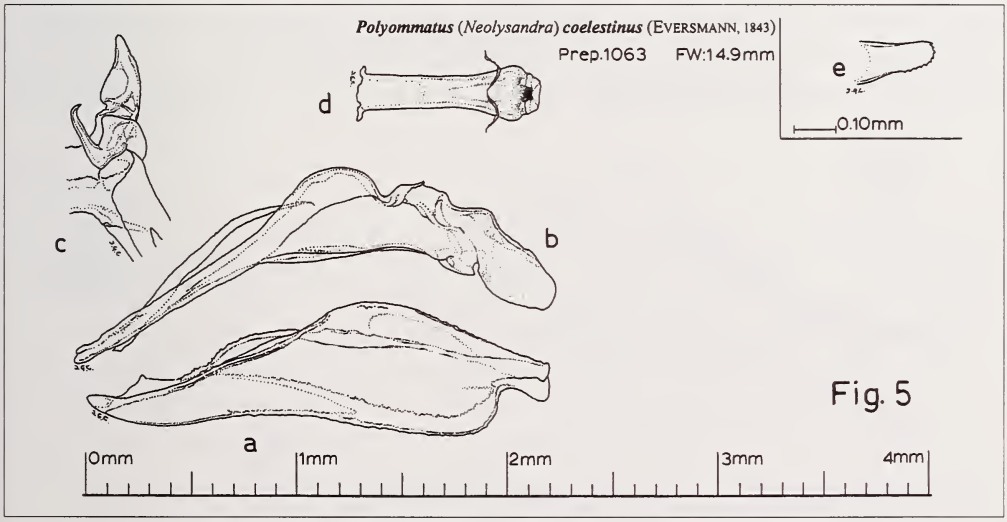

Fig. 5. Male genitalia of *Polyommatus* (*Neolysandra*) *coelestinus* (Eversmann, 1843). Preparation No. 1063. Saratov, 150 m, 27.v.1978.

prominence. Curiously enough, the male genitalia of these two taxa appear closer to those of the *dorylas* species-group (Fig. 4) than to those of any other afore-mentioned taxon, this being expressed by the shape of the labides in side view, as well as by the overall proportions of the appendages.

In *coelestinus* and *ellisoni*, however, the labides in side view are wide relative to those of *corona* and *fatima* (In Fig. 7, Prep. 3198, the labis appears more slender, but this is

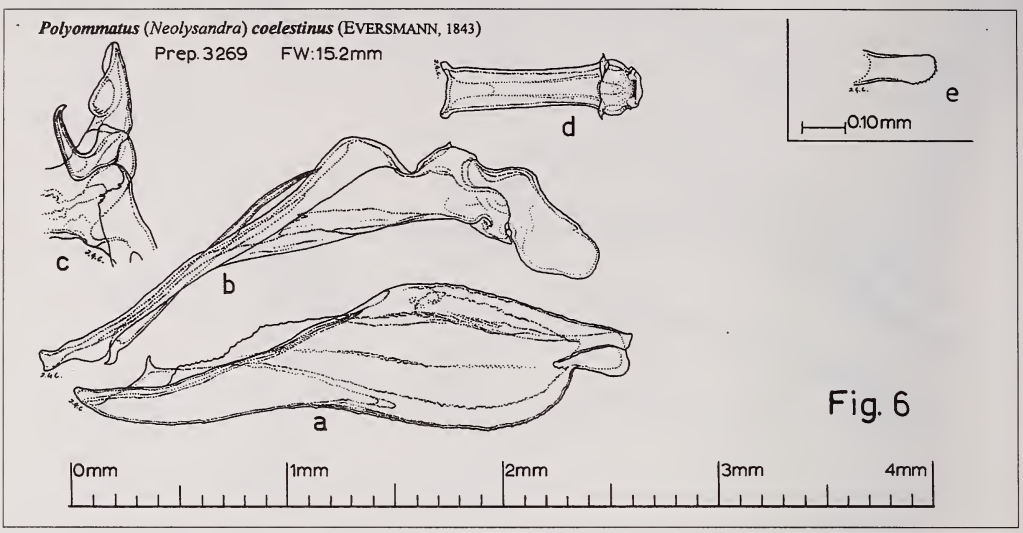

Fig. 6. Male genitalia of *Polyommatus* (*Neolysandra*) *coelestinus* (Eversmann, 1843). Preparation No. 3269. Greece, Peloponnisos, Mt. Helmos, 1000–1500 m, 10.vi.1972.

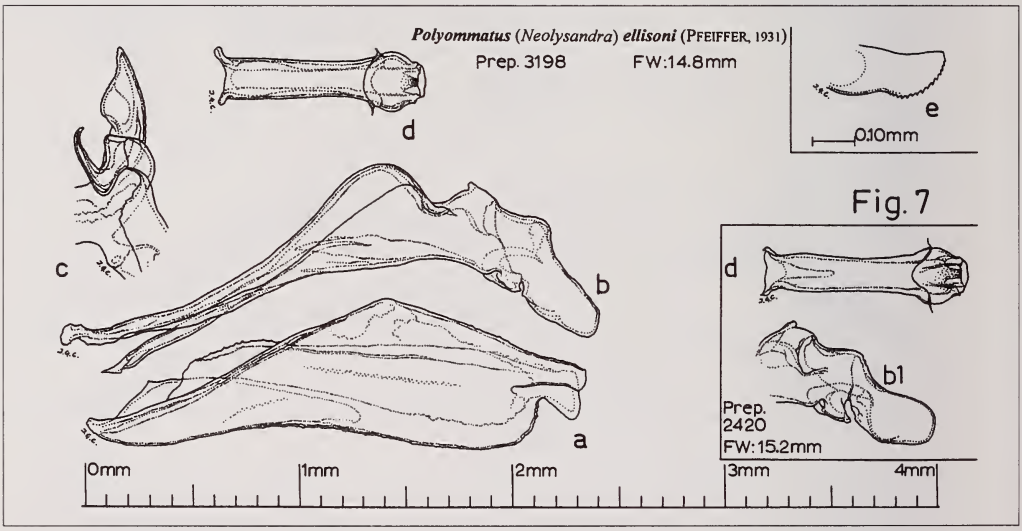

Fig. 7. Male genitalia of *Polyommatus* (*Neolysandra*) *ellisoni* (Pfeiffer, 1931). Preparation No. 3198. Lebanon, Mohafazat Bcharré, Les Cèdres (EL Arz), 1950 m, 4.vi.1998. Preparation No. 2420. Lebanon, Ceddars of Bcharré, 1950 m, 12.vi.1967.

due to the fact that its sideways-tilted position resulted in a narrower projected area; this situation is remedied in Prep. 2420 of same Figure). They are more or less distally rounded and are devoid of any dorsal prominence along their distal half.

In *diana* (Fig. 8), the distal half of the labides has inwardly pointing serrations along its edges, and relative to *corona*, *fatima coelestinus* and *ellisoni*, the distance between the dorsal hump and the ventral edge of the labis is long, the distal end of the aedeagus

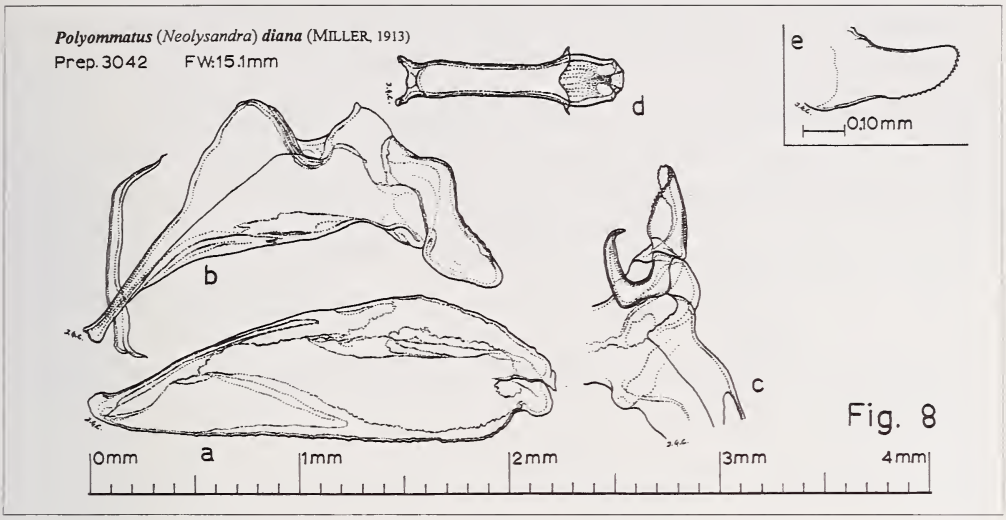

Fig. 8. Male genitalia of *Polyommatus* (*Neolysandra*) *diana* Miller. 1913. Preparation No. 3042. Turkey, Erzurum prov., 25–33 km NE of Erzurum, 1900–2000 m, 14–17.vii.1992.

(beyond the lateral attachment points to diaphragm), though bulbous in ventral or dorsal view, is long, the proximal half of the valva is wide, presenting a rather bulky appearance, and the furca and the vinculum are short, the latter also being wide along its dorsal half.

Discussion

The male genitalia of the taxa placed in the subgenus *Neolysandra* possess characters that suggest the following grouping: a. That of *corona* and *fatima*, with seemingly greater structural affinities to *dorylas* than to any other member of the Polyommatiti that possesses a bulbous aedeagus, and with differences from *coelestinus* and *ellisoni* expressed primarily in the shape of the labides (more slender and pointed when observed in side view). b. That of *coelestinus* and *ellisoni*, characterized primarily by their wide and rounded labides, and c. that of *diana*, which appears to be the most differentiated taxon in the subgenus *Neolysandra*, possessing at the same time genitalia characters that seem unique, even when compared to those of taxa placed in the subgenera *Agrodiaetus*, *Polyommatus* and *Meleageria*.

These genitalia "discrepancies" probably suggest that more taxonomic work is yet needed in this group of butterflies and that a more comprehensive overview of the whole matter might eventually be achieved only by analyzing large suites of characters including DNA sequences.

Acknowledgements

I would like to extend my thanks to Willy de Prins, Alain Olivier and Dirk van der Poorten for loaning me from their joint collection a good many of the specimens used in this endeavour and in particular to Prof. Dr. Konrad Fiedler and to Alain Olivier for invaluable advice.

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