

The identification of *Apatura metis* and *Apatura ilia* and their distribution in Greece and Turkey (Lepidoptera: Nymphalidae)

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Abstract. An attempt of the use of morphometric analysis for the confident identification of *Apatura metis* and *A. ilia*. The known localities of *A. metis* and *A. ilia* in Greece and Turkey are reviewed and their list is updated with recent unpublished records.

Samenvatting. De determinatie van *Apatura metis* en *Apatura ilia* en hun verspreiding in Griekenland en Turkije (Lepidoptera: Nymphalidae)

De auteurs vermelden de reeds bekende vindplaatsen van *Apatura metis* (Freyer, [1829]) en *Apatura ilia* ([Denis & Schiffermüller], 1775) in Griekenland en Turkije en voegen daar de recent bekend geworden, maar nog niet gepubliceerde, gegevens aan toe.

Résumé. L'identification d'*Apatura metis* et d'*Apatura ilia* et leur répartition en Grèce et en Turquie (Lepidoptera: Nymphalidae)

Les auteurs donnent un aperçu des localités connues d'*Apatura metis* (Freyer, [1829]) et d'*Apatura ilia* ([Denis & Schiffermüller], 1775) en Grèce et en Turquie et les complètent avec des données récentes non encore publiées.

Key words: *Apatura metis* - *Apatura ilia* - Greece - Turkey - distribution - variability.

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Introduction

Until recently, only little information on the genus *Apatura* was available for Greece and there were no records at all for Turkey. Thanks to the investigations made by some lepidopterists (J. G. Coutsis, N. Ghavalas, J. Dils, D. van der Poorten, G. Müller and some others) more distributional data became known. In 1995 we decided to update the distribution maps for both *Apatura metis* (Freyer, [1829]) in Greece and Turkey and *Apatura ilia* ([Denis & Schiffermüller], 1775) in Greece. *A. ilia* has not been observed in Turkey so far, except for an unconfirmed record from the north-eastern part.

Differences between *Apatura metis* and *A. ilia*

External morphology

Apatura metis can be distinguished from *A. ilia* by the following relative characters:

Wing outline.

(1) In *A. ilia* fore-wing is shorter but broader. (2) In *A. metis* fore-wing is more elongated, with a tapered apex.

Wing pattern.

Fore-wing. (1) In *A. metis*, the eyespot (ocellus) between veins Cu₁ and Cu₂ is strongly reduced, at least dealing with the European populations; Varga (1978) published biometric data confirming this. (2) In *A. ilia* this eyespot is surrounded by a round orange periocellar border, compared with *A. metis* this border is ovale or even quadrangular. (3) *A. metis* has 2, rarely 3, white subapical and apical spots; *A. ilia* has 3, rarely 4 spots.

Hind-wing. (1) In *A. metis*, the external border of the submarginal pale band is regularly festooned because delimited by triangular extensions of the dark submarginal band along the veins. With regard to *A. ilia* this border is almost straight. (2) With regard to *A. metis*, the pale discal band is sharp internally deviated in cell M₂-M₃. In *A. ilia* external border of this pale band presents no sharp angle and is precisely delimited. (3)

With regard to *A. metis*, the dark area limited by the discal and submarginal pale bands is significantly narrower. As compared to *A. ilia*, this area is homogeneous dark. With regard to *A. ilia* the dark area is larger; its external half is darker and tends to form isolated macules.

We have tried to corroborate the usefulness of this last character by biometric measurements (fig. 1).

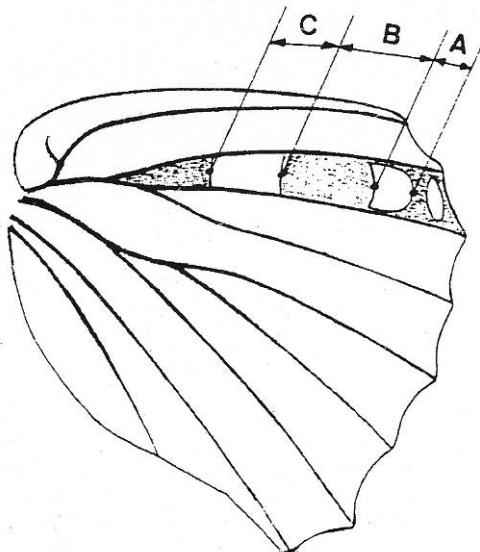


Fig. 1. Biometric measurements (see charts 1, 2 and 3).

Legend of plate 1:

- 1 - *Apatura metis* ♀, orange morph, Hungary, Baja, Duna River, 21.VIII.1983, J. Mairiaux leg.
- 2 - *Apatura metis* ♀, white morph, Hungary, Baja, Duna River, 18.VIII.1988, J. Mairiaux leg.
- 3 - *Apatura ilia* ♂, white morph, Hungary, Kisvaszar (Komló), 30.VI.1995, G. Arién leg.
- 4 - *Apatura ilia* ♂, orange morph, Hungary, Kisvaszar (Komló), 30.VI.1995, G. Arién leg.
- 5 - *Apatura metis* ♂ (damaged), orange morph, Hungary, Kisvaszar (Komló), 30.VI.1995, G. Arién leg.
- 6 - *Apatura ilia* ♂, orange morph, Hungary, Bár Mohács, Duna River, 28.VI.1995, G. Arién leg.
- 7 - *Apatura ilia* ♂, orange morph, Greece, Áno Kliné, Nomós Flórina, 730 m, 25.VI.1995, J. Mairiaux leg.
- 8 - *Apatura ilia* ♀, orange morph, Greece, Akratas, Nomós Flórina, 790 m, 25.VI.1995, J. Mairiaux leg.

Plate 1



The biometric measures obviously show a difference between *A. metis* and *A. ilia*, with the exception of subspecies *A. metis substituta*, in Ussuri/Korea and Japan. The specificity and taxonomy of those populations are beyond the scope of this publication.

It was necessary to study the Gaussian distribution of the measured values in order to estimate more precisely the differences in this respect between the populations of both species.

We defined a cut off value for the relative width of the dark postdiscal band (B/A+B+C) of 0.40 for the males, 0.36 for the females. Only 5 males (1.0%) and no females (0 %) of *A. metis* were out of range. Only 1 male (1.5 %) and 3 females (10.3%) of *A. ilia* were in overlap.

Wing venation.

Varga (1978) has pointed out and illustrated the differential venation characteristics concerning wing veins (veins 7, 8 and 9, or R₃, R₄ and R₅) of the fore-wings of *A. ilia* and *A. metis* but this character seems at least inconstant to us. All available Greek material of both species belongs to the clytid morph (f. *clytie* [Denis & Schiffermüller], 1775). In Central Europe the white form of *A. metis* seems to be very scarce. Only a few specimens are known. One female caught by the first author in Hungary is shown on plate 1, fig. 2. A characteristic orange morph is shown on plate 1, fig. 1.

Genital structures (figs. 2-3)

Apatura metis can be distinguished from *A. ilia* by the following characters in the male genitalia:

- overall size slightly smaller
- coastal margin of valva slightly more concave posteriorly
- proximal end of tegumen turned down (in lateral view)
- distal end of aedeagus pointed (in lateral view)

Chart 1. Relative significance of the dark postdiscal area on upperside hind-wing (males and females) – mean, maximal and minimal values.

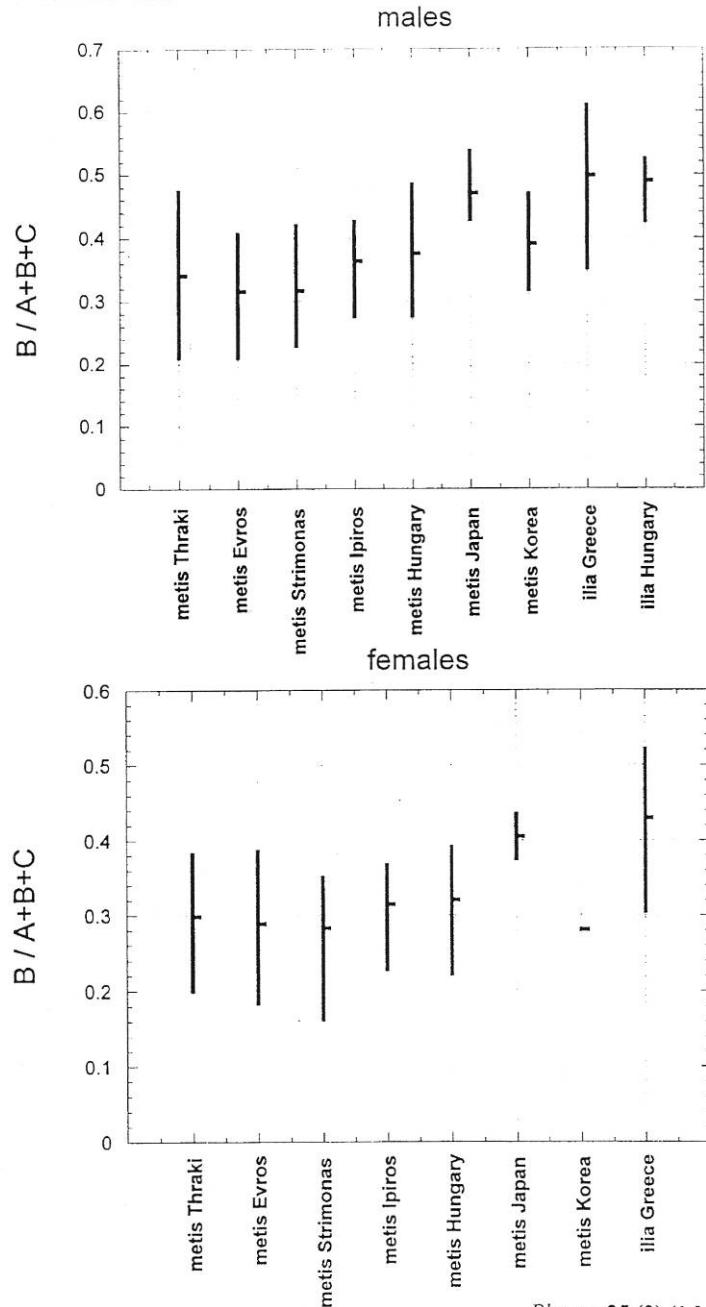
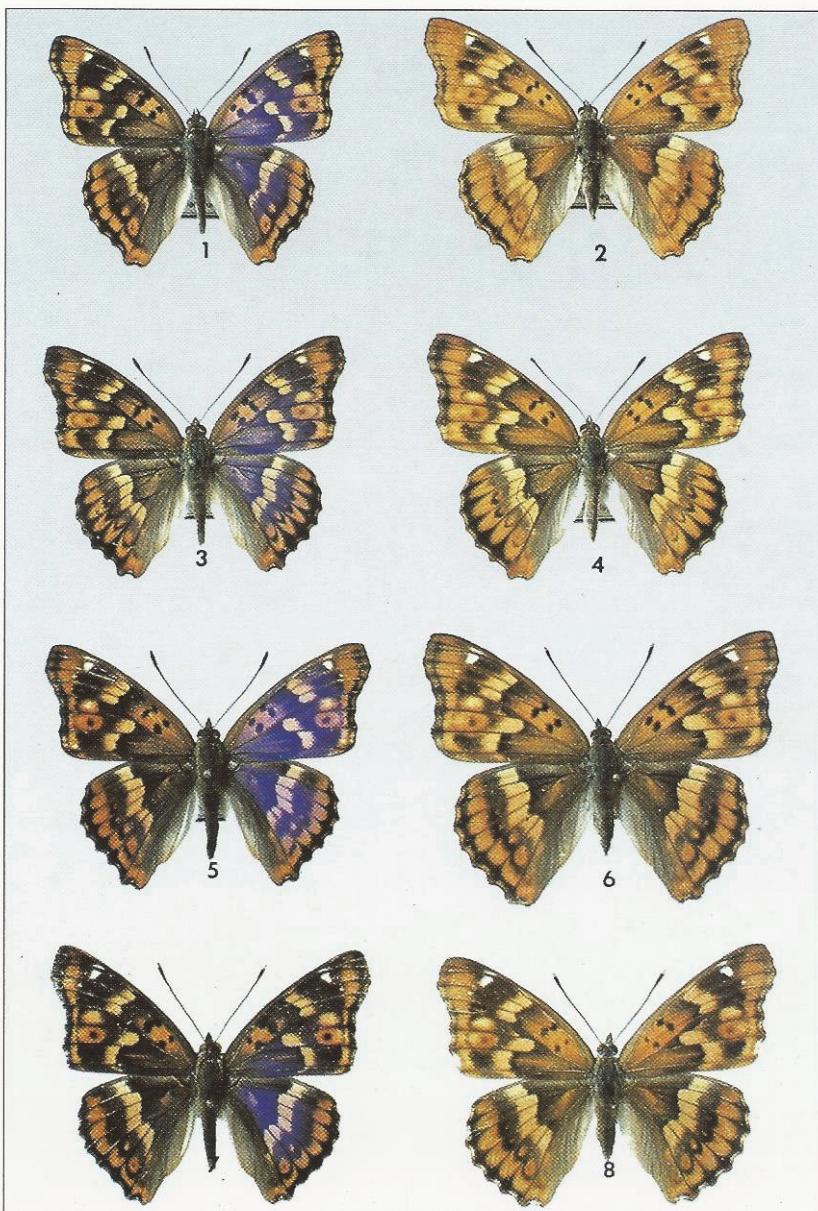


Plate 2



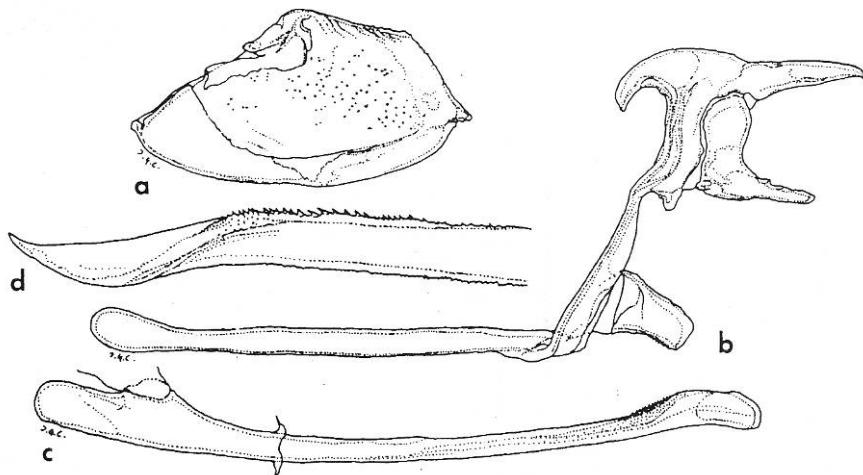


Fig. 2: Male genitalia of *Apatura metis* (Freyer, [1829]); a. valva, b. tegumen + saccus, c. aedeagus, d. distal end of aedeagus (del. J. G. Coutsis).

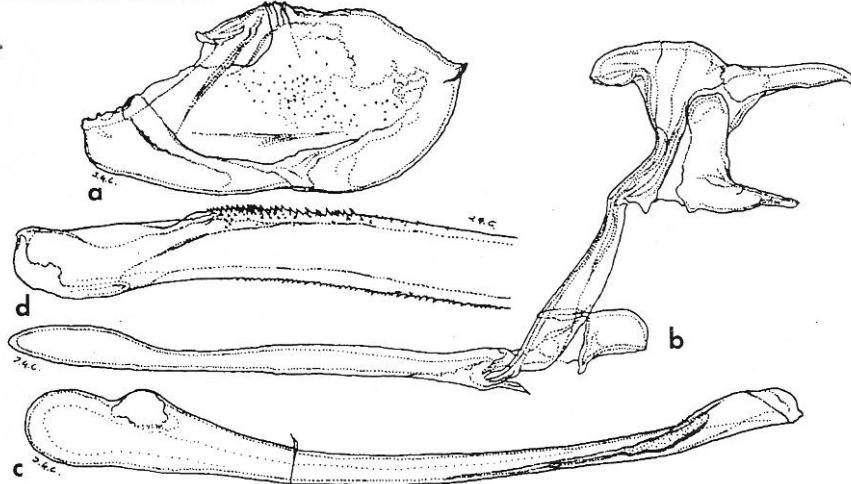
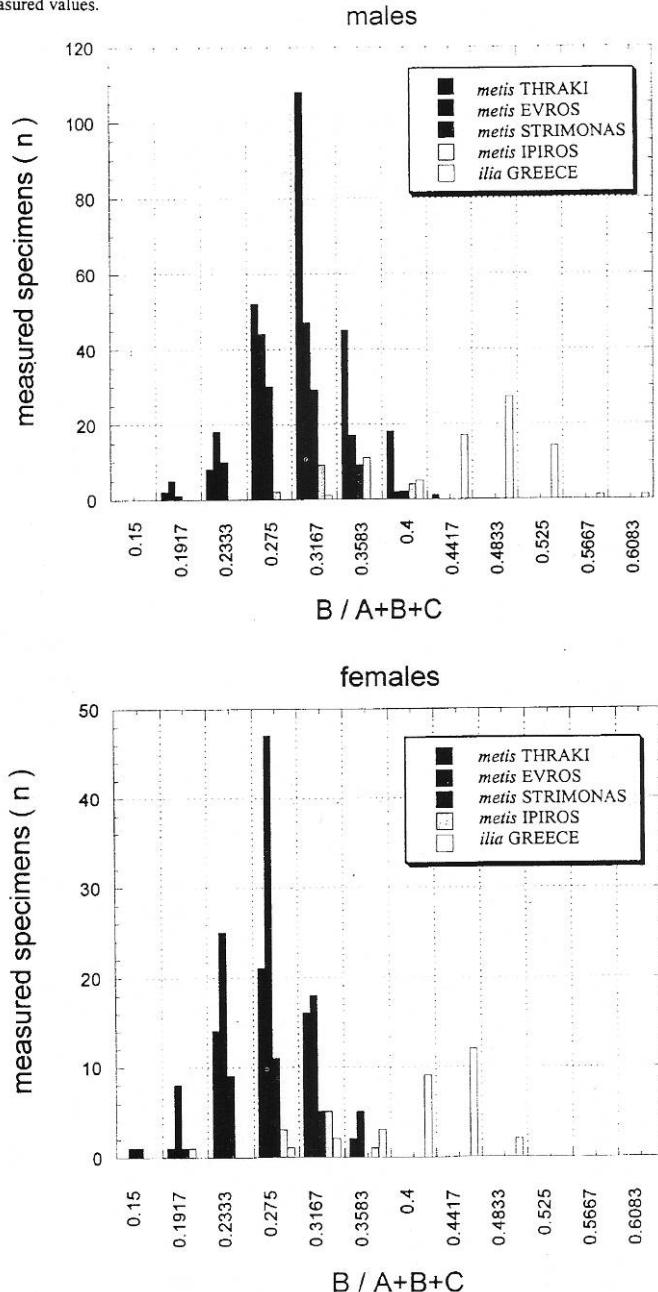


Fig. 3: Male genitalia of *Apatura ilia* ([Denis & Schiffermüller], 1775); a. valva, b. tegumen + saccus, c. aedeagus, d. distal end of aedeagus (del. J. G. Coutsis).

Legend of plate 2:

- 1 - *Apatura metis* ♂, Greece, Didimóticho, Évros River, Nomós Évros, 4.VIII.1995, J. Mairiaux leg.
- 2 - *Apatura metis* ♀, Greece, Didimóticho, Évros River, Nomós Évros, 5.VIII.1995, J. Mairiaux leg.
- 3 - *Apatura metis* ♂, Greece, Strimonikó, Strimónas River, Nomós Séres, 10.VIII.1996, J. Mairiaux leg.
- 4 - *Apatura metis* ♀, Greece, Strimonikó, Strimónas River, Nomós Séres, 9.VIII.1996, J. Mairiaux leg.
- 5 - *Apatura metis* ♂, Turkey, Silivri, Kınık River, prov. İstanbul, 2.VI.1996, J. Mairiaux leg.
- 6 - *Apatura metis* ♀, Turkey, Edirne, Tunca River, prov. Edirne, 29.V.1996, J. Mairiaux leg.
- 7 - *Apatura metis* ♂, Greece, Farángi Víkou, S. of Kónitsa, Vóidomatis River, Nomós Ioánnina, 29.VI.1995, J. Mairiaux leg.
- 8 - *Apatura metis* ♀, Greece, Farángi Víkou, S. of Kónitsa, Vóidomatis River, Nomós Ioánnina, 28.VI.1995, J. Mairiaux leg.

Chart 2. Relative significance of the dark postdiscal area (males and females) – Gaussian distribution of the measured values.



Variability of *Apatura metis* in Greece

No evident difference was observed between the metis populations of the Évros' region, in Greece, and Turkey, and contiguous Turkish Thrakia. In other respects we did not have the opportunity to significantly study the populations of the Néstos Valley, considering the small number of studied specimens.

Submarginal pale band – crescent-shaped spots.

With regard to the different studied populations (Turkish Thrakia/Évros, Strimónas Valley and Ípiros), some specimens are characterised by submarginal pale spots with the internal border deeply penetrating into the spot and consequently forming oblate "crescents". Analysing and counting up the different kinds of submarginal spots, quadrangular, crescent-shaped or intermediate, we obtained the following distribution:

%	Évros / Turkey	Strimónas	Ípiros
crescent-shaped	1.2	48.4	17.3
intermediate	15.35	19.35	17.0
quadrangular	83.45	32.25	65.7

The crescent-shaped submarginal spots are exceptional in Turkey/Évros, the most frequent form in the Strimónas Valley and slightly predominant in Ípiros. The qualitative characters has significantly different distribution between each two of the 3 studied populations ($p<0.01$).

Width of the pale submarginal band.

The pale submarginal band is the largest in the populations of Strimónas Valley, character frequently associated with the crescent-shaped form of spots.

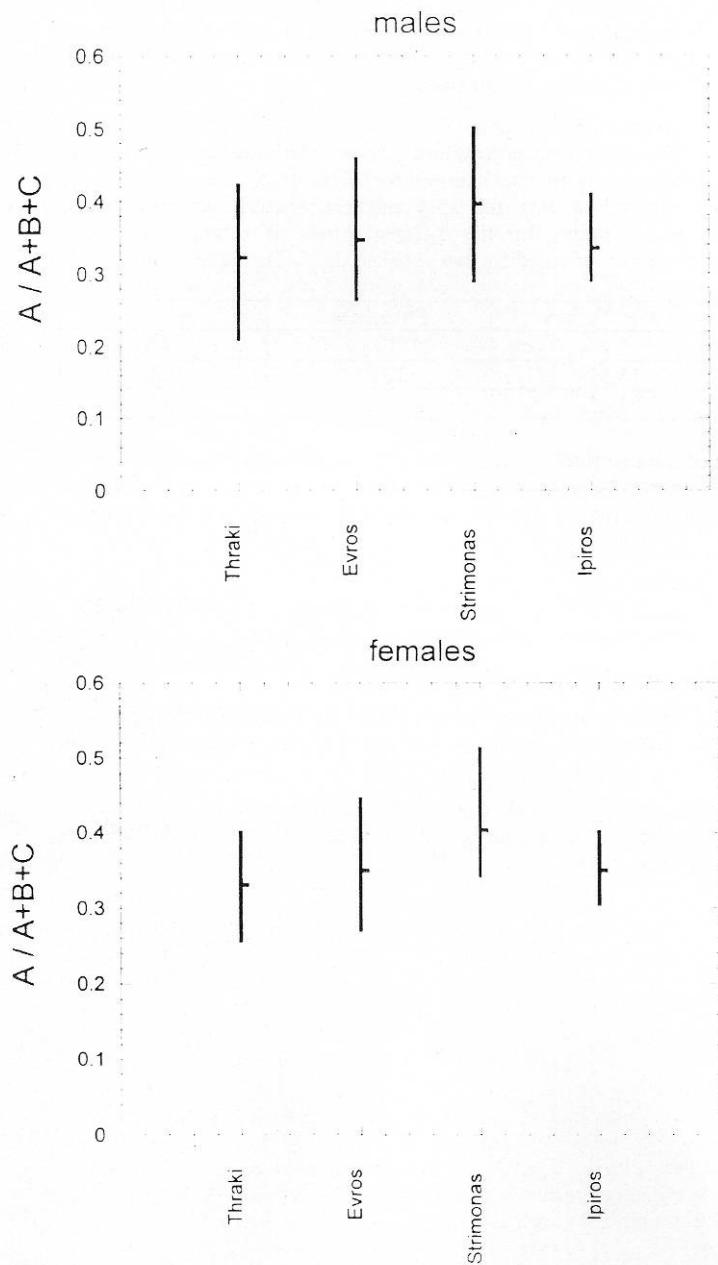
Relative size of the pale submarginal band (Chart 3).

The differences of biometric measurements between the Strimónas Valley population and all the others are statistically highly significant in both males and females ($p<0.00001$).

Width of the dark area between the two pale bands (discal and submarginal).

The specimens of Ípiros are, as a general rule, darker, with a larger brown area resembling the Hungarian specimens.

Chart 3. Relative size of the pale submarginal band.



The distribution of *Apatura metis* in Greece and Turkey Records from literature

Greece.

"Salonika" [Thessaloniki] (3 specimens in The Natural History Museum, London) (Nguyen 1976). Probably the original habitat has been destroyed by extensive spraying of DDT after the World War II. There is but little hope to rediscover *A. metis* or *A. ilia* in the region, as investigations on the southern banks of rivers like Gallikós, Axiós, and Loudias gave no result.

Dráma "Paranéstion, along the river Néstos, north-east of Dráma, 20.VII.1977" (1 specimen of the second brood) (Willemse 1980: 156, 1981: 42). This is in fact the very first confirmed record of *A. metis* for Greece as the earlier record from "Western Rhodópi" (Kattoulas & Koutsafitakis 1977) is unreliable.

"Évros, Didimótiko" (Coutsis & Ghavalas 1991: 135). The authors observed the species in numbers near Didimótiko on 27th and 28th June 1991 but most of them "were well past their prime".

"Évros, Soufli, Anfang August 1978, leg. Gerilis, in coll. VLCA [Vlaamse Lepidoptera Collectie Antwerpen]" (Hesselbarth, van Oorschot & Wagener 1995: 968).

Turkey.

"Edirne: Meriç, Subaşı, 2Bo, 15-28.05.1994 1♂ 1♀, 25.07-03.08.1994 9♂♂ 2♀♀ (GP No: 1493♂) (leg. SC)." (Seven 1995: 5-6).

"Tekirdağ, 10 km W[est of] İncek, 1.VI.1979, 5.VI.1982, leg. Müller – bei Ballı, 5.VI.1982, 28.V.1983, leg. Müller" (Hesselbarth, van Oorschot & Wagener 1995: 968).

New records

Thrakia.

In this part of the southern Balkans we found the most widely distributed populations over the Greek Nomós of Évros and the four Turkish provinces of Edirne, Kırklareli, Tekirdağ and İstanbul.

At the Greek side, in Évros the species is common along the Ardas River. We discovered it near Kómara, Kíprinos, and Rízia. It is also present along the very small river Kourounderes near Váltos which is a very atypical locality: the narrow, almost dry river is running in between cultivated fields; some willow trees (*Salix* spp.) are still growing here and there. It is present as well along the Erythropótamos River near Ellinohóri, along the same river nearly inside the village Didimóticho (plate 2, figs. 1-2), and along the Évros River near Píthio and Petrádes.

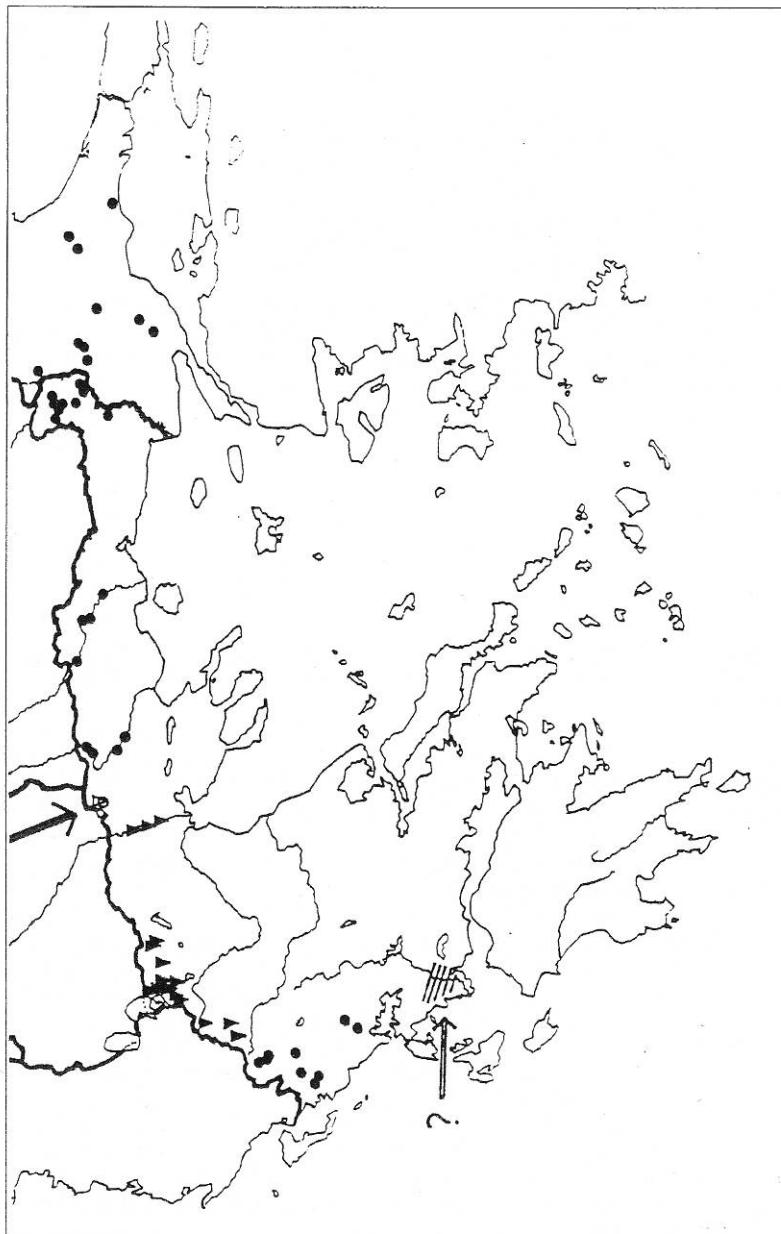
All these observations were done in July and August 1995 and 1996, and apply to the second brood. In some cases up to 20 specimens were seen at the same time (3.VIII.1995). When it is too hot and the atmospheric pressure is high, *A. metis* may be almost impossible to detect. It then prefers to stay motionless in the shadow of trees. This behaviour is particularly frequent at the end of the flight period when specimens are worn and prefer to save their energy.

At the Turkish side, east of the Évros River (Meriç Nehri), *A. metis* is present in four provinces of the five in the European part.

In the province of Edirne, we found it very abundant just north of the town of Edirne along the Tunca River (plate 2, fig. 6) in early June 1996 (first brood), and near Uzunköprü along the Ergene River, near Bayramlı along the same river.

In the province of Kırklareli, *A. metis* occurs near Pehlivanköy and Akarca along the Ergene River and its tributaries, and near Düğünçubası.

In the province of Tekirdağ, beside the observations of Müller (published in Hesselbarth, van Oorschot & Wagener 1995), we were able to locate the species ourselves at Kurtdere and Karliköy along the Ana River south-west of Saray.



Map of Greece and West Turkey with localities of:

- *Apatura metis* (Freyer, [1829])
- ▼ *Apatura ilia* ([Denis & Schiffermüller], 1775)
- sympatric occurrence of *A. metis* and *A. ilia*
- ↗ old record of *A. metis* (recorded as *A. ilia*)

In the province of İstanbul, only one locality was detected near Silivri along the Kınık River (plate 2, fig. 5).

All these observations took place from 26 May to 2 June 1996, and apply to the first brood.

Makedonia.

Only 5 localities are known to us.

Nomós Kilkís, near Doíráni Lake, leg. J. Dils, coll. VLCA (J. Dils, pers. comm.), an area revisited by us, where we found it scarce and local along the lake.

Nomós Séres, all along the Strimonas River, Róupel, ca. 5–6 km south of the Bulgarian border, a very small population; Virónia, abundant; near Strimonikó, abundant; near Vamvakóússa, a small population (plate 2, figs. 3–4).

In the past, *A. metis* probably occurred everywhere along the Strimónas River until the destruction of its habitat by human activities like the ecological disaster we have seen along the road from Nigrítia to Séres: all vegetation is burned or cut down and all the gravel and sand is removed to be used for the construction of new roads. All this activity causes an enormous cloud of dust.

Visits to several localities along the rivers Gallikós and Axiós remained without result.

East of the Strimónas River, in the Nomós Dráma, *A. metis* seems to be rare. We observed only 6 specimens in Dráma: near Paranéstí and north of Mesochóri. B. Maes found a male specimen in Potami, a locality near Stavroúpoli was found by J. G. Coutsis. Due to the canyon-shape of the valley of the river Néstos, we were unable to find other suitable localities for the species. Our search south of Galáni, where the river valley became accessible again, remained without success.

Despite extensive quest, no results were obtained in the provinces of Péla, Flórina, Kozáni and Grevená. It seems that populations from Makedonia and Ípiros are separated by a large gap.

Ípiros.

The first two records of the species are: Nomós Ioánnina, south of Kónitsa, near Arísti and near the village of Pápingo, in the Voídomatis River Valley (J. Dils, pers. comm.).

In 1995, S. M. Morton found *A. metis* in several places in Thesprotía along the Thíamis River, between Igoumenítsa and Ioánnina (pers. comm. to S. Cuvelier); B. Maes (1996) found it close to that locality near Neraida, Thíamis River.

We found the species in tree localities: in Ioánnina, near Klidoniá along the Voídomatis River plate 2, figs. 7–8), near Soulópolo (ca. 30 km west of Ioánnina) and in Thesprotía, near Pigadoúlia (ca. 15 km north-east of Igoumenítsa). Further to the south, we found a small locality for *A. metis* in Prevezá, ca. 50 km south of Ioánnina near Kerasóna along the Louros River, and along a river (we could not trace its name) running west of Romiá near Filipiáda (ca. 66 km south of Ioánnina). This is actually the southernmost confirmed (see below) population of *A. metis* in Greece.

Staudinger (1870: 56) reports the capture of “*Apatura v. Clytie* Hb. Von Dr. Krüper sicher in Acarnanien äusserst selten gefangen.” Bearing in mind the known distribution pattern of both *A. metis* and *A. ilia* in Greece, this record very probably applies to *A. metis* rather than to *A. ilia*, and, if so, it would represent the southernmost locality of *A. metis* in Greece (see shaded area on distribution map).

The distribution of *Apatura ilia* in Greece Records from literature

Dacie et al. (1972: 257) reported the capture of one worn female north of Flórina in July 1971. This is actually the first confirmed record of *A. ilia* in Greece (see above).

Van der Poorten (1980: 24) found a couple west of Flórina (Pisodérion and Varnoús Mts.) in July 1980.

New records

Compared to *A. metis*, the distribution of *A. ilia* seems to be much more restricted in northern Greece. Except for the region around Flórina, where the species can be fairly common, it occurs only in scattered populations over five nomi.

In Kilkís *A. ilia* has been found near lake Doíráni by: J. Dils and D. van der Poorten 1986. This is the easternmost locality in Greece. The species has not been reported from Turkey. We discovered two populations on the Axiós River, near Políastro where two worn specimens were observed by us and near Próhoma in August 1996.

In Flórina, J. Dils observed the species near Akrítas in 1982, the first author captured it near Vatohóri in 1983, D. van der Poorten found it in Andartikón (700 m) in 1984, J. G. Coutsis observed it near Ágios Germanós, and we found the species near Káto Kliné and Áno Kliné in 1995 (plate 1, figs. 7–8).

In Kastoriá, ca. 20 km north of Kastoriá D. van der Poorten observed several specimens in 1989. We found it in 1985 between Eptachóri and Zoúzouli, in the southwest of the Nomós.

To the northeast of Ioánnina, the first author found the species near Pirsógiani in 1982. This is the southwesternmost locality for *A. ilia* in Greece known so far.

Sympatric occurrence

A. metis flies in two broods, in May and in late July – early August, whereas *A. ilia* occurs predominantly in mountainous areas (in Greece) and only one brood in July is known. Therefore, both species are not likely to be observed simultaneously. However, in some very rare occasions, they have been seen flying together within the same day, as J. Dils and D. van der Poorten 1986 and 1989 (J. G. Coutsis and N. Ghavalas pers. comm.) observed near lake Doíráni (Kilkís).

The sympatric occurrence of both species has been reported already by Nguyen (1970: 76). Noteworthy are the observations by G. Ariën, who found both species together in south Hungary in 1995 at Bár near Mohács (plate 1, fig. 6), westbank of the Danube and near Kisvaszar (north of Komló) (plate 1, figs. 3–5).

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