

Lepidoptera species with a western and eastern distribution in the Mediterranean: reasons for a disjunction

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SUMMARY

A brief review of Lepidoptera species occurring at both extremities of the Mediterranean region and absent in the middle is given. It is suggested that determinants producing such an 'escatomediterranean' distributional pattern were the most diverse.

INTRODUCTION

The common practice of ascribing a species' distribution to a convenient standardised distributional pattern (*e.g.*, Müller, 1974; La Greca, 1964, 1975; Vigna Taglianti et al., 1993) while analysing the faunal composition of a given area is sometimes hampered by species showing unusual or bizarre distributions. In fact, they may not comfortably fit with predetermined schemes, also in case these were empirically produced by superimposing actual distributions of a high number of taxa. Inquiries about the standardised pattern that should be tributed to these 'oddly distributed' species are therefore often addressed.

The observation that some species of butterflies and moths occur at both extremities of the Mediterranean region and are absent from the middle, thus not corresponding with any of the standardised patterns commonly in use for this area, gave the impetus for reviewing Lepidoptera species showing congruence in such a disjunction. Surprisingly, the number of cases showing a similar pattern is so high that further research should ascertain whether this state of affairs is restricted to this group of insects or occurs in other animal taxa.

EXAMPLES

The following review synthetically outlines the distribution of some Lepidoptera species that in the Mediterranean region occur only in Western (W) and Eastern (E) areas, or in regions ecogeographically related to the latter ones. In order to

emphasise species clearly represented at both extremities of the Mediterranean, species that in the western sector occur only in Southern France or the South-Western Alps were not included, although many of those thoroughly reviewed by Audisio and De Biase (1992) may largely share part of the story with those here listed. The list does intentionally exclude species of the so-called 'microlepidopteran' families, as faunistic recording is not exhaustive for many of them.

Pseudohadena commoda (Staudinger, 1889) (Noctuidae)

Range: (W) Northern Spain; (E) from Caucasus area, Turkey and Jordan to Central Asia (Warren, 1909-1914; Boursin, 1970; Hacker, 1990; Yela and Ronkay, 1992; Zilli, unpublished).

Eremodrina armeniaca (Boursin, 1936) (= *clara* Schawerda, 1928 nec Harvey, 1878) (Noctuidae)

Range: (W) Morocco, Algeria, Spain; (E) Armenia, Syria, Northern Iran, Turkestan (Boursin, 1936; Rungs, 1981; Hacker, 1990).

Remarks: Not yet recorded from Turkey (cf. Baisch et al., 1998).

Oxytripia orbiculosa (Esper, 1799) (Noctuidae)

Distribution: (W) Pyrenees; (E) Central Balkans and Danubian area, from North-Eastern Turkey and Caucasus area in a narrow zone across Central Asia to Hokkaido (Varga, 1989; Redondo Veintemillas, 1990).

Xylena lunifera (Warren, 1910) (Noctuidae)

Range: (W) Morocco, Spain; (E) Central-Eastern Balkans, Caucasus area, and Turkey (Rungs, 1981; Hacker, 1989, Karsholt and Razowski, 1996).

Oncocnemis nigricula (Eversmann, 1847) (Noctuidae)

Range: (W) Spain (Alava); (E) Caucasus area, Central and Eastern Turkey, from the Southern Urals to Altay Mts (Ronkay and Ronkay, 1995).

Enterpia laudeti (Boisduval, 1840) (Noctuidae)

Range: (W) Spain, Southern France, South-Western Alps; (E) from the Central Balkans and Eastern Danubian area to South-Western Russia and West Kazakhstan; Caucasus area, Turkey; from Eastern Egypt and the Middle East to Iran and Turkmenistan (Hacker, 1996).

Chersotis elegans (Eversmann, 1837) nec auctt. (Noctuidae)

Range: (W) Spain, Pyrenees, South-Western Alps; (E) from Central Balkans and South-Western Russia to Central Asia; Caucasus area, Turkey, Middle East (Fibiger, 1993; Zilli, 1995: 39).

Chersotis larixia (Guenée, 1852) (Noctuidae)

Range: (W) Sierra Nevada, Pyrenees, South-Western Alps; (E) from Caucasus area, Turkey, Crete, and Lebanon to Central Asia (Fibiger, 1993).

Xestia trifida (Fischer von Waldheim, 1820) (Noctuidae)

Range: (W) Central and Northern Spain; (E) from Dobrogea and Ukraine to South-Western Russia and Caucasus area; from Central-Eastern Turkey to Turkmenistan (Kozhantshikov, 1937; Fibiger, 1993; Rakosy, 1996).

Remarks: Records from Sardinia (Kapfer, 1987) need confirmation.

Yigoga serraticornis (Staudinger, 1897) (Noctuidae)

Range: (W) Central Spain; (E) Turkey, Palestine, Iran (Fibiger, 1990).

Agrotis obesa Boisduval, 1829 (Noctuidae)

Range: (W) Algeria, Morocco, Iberian Peninsula, Southern France, South-Western Alps; (E) from Central Balkans to South-Western Russia; Caucasus area, Turkey and Iraq to Central Asia (Fibiger, 1990).

Remarks: A single record from Central Italy is likely due to mislabelling of an old museum specimen (cf. Zilli, 1990).

Rhegmaphila alpina (Bellier, 1881) (Notodontidae)

Range: (W) Iberian Peninsula, Southern France; (E) from Central Balkans to Turkey (Freina and Witt, 1987).

Parocneria signatoria (Christoph, 1883) (Lymantriidae)

Range: (W) Maghreb; (E) Turkey and the Middle East to Afghanistan (Freina and Witt, 1987).

Eupithecia variostrigata (Alphéraky, 1878) (Geometridae)

Range: (W) Algeria, Spain, Southern France; (E) Bosnia-Herzegovina, Ukraine; from Turkey, Caucasus area and Syria to Turkestan (Redondo and Gastón, 1999).

Eupithecia minusculata Alphéraky, 1882 (Geometridae)

Range: (W) Spain; (E) from Crimea, South-Western Russia and Caucasus area to Central Asia; Palestine (Redondo and Gastón, 1999).

Pyrgus cinarae (Rambur, [1839]) (Hesperiidae)

Range: (W) Central Spain; (E) from the Central-Eastern Balkans to South-Western Russia and Turkey (Lukhtanov and Lukhtanov, 1994; Hesselbarth et al., 1995; Tolman, 1997).

Pseudophilotes bavius (Eversmann, 1832) (Lycaenidae)

Range: (W) Morocco, Algeria; (E) from Southeastern Europe to Southern Urals, Caucasus area, Turkey, Syria, Iran and Kazakhstan (Lukhtanov and Lukhtanov, 1994; Hesselbarth et al., 1995; Tennent, 1996; Tolman, 1997).

Agriades pyrenaica (Boisduval, 1840) (Lycaenidae)

Range: (W) Asturias, Pyrenees; (E) from Bosnia-Herzegovina to Turkey and Caucasus area (Hesselbarth et al., 1995; Tolman, 1997).

Polyommatus ripartii (Freyer, 1830) (Lycaenidae)

Range: (W) From North-Eastern Spain to South-Western Alps; (E) Central Balkans, Turkey and Caucasus area (Hesselbarth et al., 1995; Tolman, 1997).

Pseudochazara hippolyte (Esper, 1784) (Satyridae)

Range: (W) Southern Spain (Sierra Nevada); (E) from Southern Urals to Central Asia (Tolman, 1997).

Zegris eupheme (Esper, [1804]) (Pieridae)

Range: (W) Morocco, Spain; (E) from Ukraine, Caucasus area, Turkey and the Middle East to Iran and Kazakhstan (Lukhtanov and Lukhtanov, 1994; Hesselbarth et al., 1995; Tennent, 1996; Tolman, 1997).

Considering also vicariant species pairs (many of which still questioned about their being split into distinct species) or sister group relationships within single genera the number of cases showing a similar disjunction greatly increases, e.g., *Hoyosa codeti* (Oberthür, 1883) - *H. cretica* (Rebel, 1906), *Eugnorisma arenoflavida* (Schawerda, 1934) - *E. pontica* (Staudinger, 1892), *Cucullia achilleae* Guenée, 1852 - *C. boryphora* Fischer von Waldheim, 1840, *Cleonymia pectinicornis* (Staudinger, 1859) - *C. opposita* (Lederer, 1870), *Omphalophana adamantina* (Blachier, 1905) - *O. pauli* (Staudinger, 1892), *Recoropha canteneri* (Duponchel, 1833) - *R. beata* (Staudinger, 1892), *Agrotis ripae* (Hübner, [1823]) - *A. desertorum* Boisduval, 1840, *Cinglis andalusiarum* Wagner, 1935 - *C. humifusaria* (Eversmann, 1837), *Victrix agenjoikarsiana-gracilis* complex, *Pseudohadena roseonitens-roseotinctoides-siri* complex, *Lophoterges* gr. *millierei* (Staudinger, 1870), genus *Phaselia* Guenée, 1858.

REMARKS

In order to explain the origin of such a distributional pattern, extinction of the in-between populations following the establishment of unsuitable habitats in the Central Mediterranean seems largely obvious, given the minimal divergence shown by the isolated populations, a circumstance thence allowing to exclude major vicariance events long dating back. As a matter of fact, appreciation of the ecological requirements of the involved species clearly indicates that xerophily is a common feature, and many of them are known to occur in a variety of habitats ranging from semi-deserts to steppes (e.g., *Pseudohadena commoda* Staudinger, *Enterpia laudeti* Boisduval, *Parocneria signatoria* Christoph). Both the surviving fragments of a once continuous range and habitat preferences by the species suggest that a major dispersion route must have developed across North Africa (cf. Wiltshire, 1977, 1982). As there are many suberic species, species pairs, and also triplets, showing a continuous distribution from Spain to the Middle East across North Africa, e.g., *Dichagyris*

imperator (A. Bang-Haas, 1912), *Cucullia* gr. *argentina* (Fabricius, 1787), it can be supposed that only more steppe-loving or orophilous species underwent extinction in the middle. Nevertheless, a number of species is characteristic of genuine mesoasiatic steppes (e.g., *Oncocnemis nigricula* Eversmann, *Oxytripia orbiculosa* Esper), are absent from the whole of North Africa, in the Near East occur only in North-Eastern Anatolia (or occasionally even further north, cf. *Pseudochazara hippolyte* Esper) and in the West usually survive only in montane areas of South-Western Europe. These species have most likely reached their current quarters following a northern route. Moreover, a few taxa are clearly not associated with xerothermic habitats, namely *Xylena lunifera* (Warren, 1910) and *Rhegmaphila alpina* (Bellier, 1881), respectively linked to submediterranean mixed-oak woodlands and hygrophilic Salix-Populus wood (Hacker, 1989; Freina and Witt, 1987). The dynamics which might have led to the acquisition of a disjunct range in the Mediterranean region by these species remain largely mysterious, due to the wide availability of suitable habitats in the intermediate area, but also in this case fitting uncomfortably with a southern connection.

Despite the fact that the disjunction in Central Mediterranean is largely due to ecological reasons, as occasionally shown by sparse relic populations in Southern Italy of xerothermophilous species showing a markedly uniform diffusion and abundance of populations at Western and Eastern districts of the Mediterranean (e.g., *Chersotis fimbriola* (Esper, [1803]) in Sicily; *Euxoa conspicua* (Boisduval, 1829) just observed in Calabria), the connection between areas of the currently fragmented ranges has seemingly developed through different ways during the Pleistocene. The circumstance that a so bizarre distributional pattern, hereafter called 'escatomediterranean' in order to emphasise that it relates to species occurring at extremities of the Mediterranean (although many of them admittedly reach the Turan region or even Central Asia), may be shared by species that once attained their distribution according to different routes, further supports the view that standardised patterns are categories of descriptive convenience and should be used in biogeographical inference with great care.

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