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NOTA lepidopterologica

**VI. Congress of European Lepidopterology
Sanremo 5-9.IV.1988**

Summaries of the lectures
Zusammenfassung der Vorträge
Résumé des exposés

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Nota lepidopterologica

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The following papers have been, or will be, submitted as full articles for *Nota lepidopterologica* :

Die folgenden Arbeiten wurden oder werden als Publikationen an *Nota lepidopterologica* eingesandt :

Les travaux suivants ont été ou seront remis à *Nota lepidopterologica* pour publication :

KUDRNA, O. : Hidden wing patterns in the European species of the genus *Colias* FABRICIUS, 1807 (Pieridae).

MIKKOLA, K. : A joint Finnish-Soviet lepidopterological expedition to NE-Siberia in the summer of 1987.

RAINERI, V. : *Horisme predotai* BYTINSKI-SALZ, 1936 – a separate species (Geometridae).

THOMAS J. : The five European *Maculinea* species (Lycaenidae) – recent discoveries in their ecologies. (John HEATH memorial lecture).

Preface

This supplement to *Nota lepidopterologica* consists of the summaries of lectures presented at the 6th European Congress of Lepidopterology. The congress was held at Sanremo, in northern Italy from 5-9th April 1988 and was attended by over 120 lepidopterists from most European and some overseas countries.

The two main themes of the congress were Lepidoptera conservation, and evolutionary systematics and genetics. A total of 17 lectures were presented on these topics. The lively discussions at the end of each of these lectures demonstrated the topical nature of these subjects, and enabled the participants to exchange information and opinions. However, other important areas of interest to the modern lepidopterist were also represented. The eight lectures on faunistics and biogeography helped to fill gaps in our knowledge of the distribution of European Lepidoptera and demonstrated the continued importance of such studies, not least for the planning of nature protection projects. Detailed observations on the biology of the individual species and even populations are just as important. Seven lectures were presented in Sanremo on this topic. The importance of lepidopterology in applied entomology was underlined by two contributors. Questions of nomenclature and taxonomy were addressed in four lectures. Even the history of lepidopterology was represented, with two lectures. The SEL General Meeting was held on 7th April. A detailed account of this meeting appeared in *SEL News* 16 (1988).

Despite all these interesting lectures, many participants managed to find the time to explore the surrounding hills, although the weather was not very suitable for day-flying insects. However, some important observations were made on the microlepidoptera fauna, which we look forward to seeing published soon.



Congress participants on the Piazza Colombo near the Congress Centre Ariston.

Geleitwort

Der vorliegende Supplementband zu *Nota lepidopterologica* beinhaltet die Kurzfassungen der anlässlich des 6. Europäischen Kongresses für Lepidopterologie gehaltenen Vorträge. Der Kongress fand in Sanremo, Italien, vom 5.-9. April 1988 statt und wurde von über 120 Lepidopterologen aus den meisten europäischen und einigen überseeischen Ländern besucht.

Als Hauptthemen wurden die Gebiete Schmetterlingsschutz sowie Evolutionäre Systematik und Genetik angekündigt. Zu diesen Themen wurden insgesamt 17 Vorträge gehalten. Die regen Diskussionen nach diesen Beiträgen bestätigten die Aktualität der beiden Hauptthemen und erlaubten den Teilnehmern einen regen Informations- und Meinungsaustausch. Wie die vorliegende Zusammenstellung zeigt, wurden auch weitere Gebiete der modernen Lepidopterologie gut vertreten. Die acht Beiträge über Faunistik und Biogeographie halfen mit Lücken in der Kenntnis der Verbreitung der europäischen Schmetterlinge zu schliessen und wiesen auch darauf hin, dass solche Untersuchungen nach wie vor von grosser Bedeutung auch für die Formulierung von Naturschutzkonzepten sind. Ebenso wichtig sind genaue Beobachtungen zur Entwicklung und Biologie der einzelnen Arten und oft sogar einzelner Populationen. Zu diesem Themenkreis wurden in Sanremo sieben Vorträge gehalten. Die Bedeutung der Lepidopterologie in der angewandten Entomologie unterstrichen zwei Vortragende. Fragen der Nomenklatur und Taxonomie wurden in vier Beiträgen diskutiert. Auch die Geschichte der Lepidopterologie wurde in zwei Beiträgen gewürdigt.



Wednesday 6th April 1989 Congress Centre Ariston, Sanremo.
Opening of the Congress. From left to right :
Prof. Dr. Pietro PASSERIN D'ENTRÈVES, Secretary of the Congress.
Prof. Dr. Emilio BALLETO, President of the SEL.
Prof. Sergio BEER, Opening address.

Am 7. April fand auch die Generalversammlung der SEL statt. Detaillierte Berichte über dieses Ereignis wurden in *News* 16 (1988) veröffentlicht.

Trotz allen interessanten Vorträgen fanden manche Teilnehmer noch die Zeit um die nahen Hügel zu untersuchen, obwohl das Wetter nicht sehr günstig für Tagfalter war. Immerhin wurden einige wichtige Beobachtungen über die Mikrolepidopterenfauna gemacht.

Avant-propos

Le présent Supplément No 1 de *Nota lepidopterologica* groupe les résumés des exposés présentés lors du VI^e Congrès Européen de Lépidopterologie à Sanremo, qui s'est tenu du 5 au 9 avril 1988, avec la participation de plus de 120 lépidoptéristes venus de presque tous les pays d'Europe et de quelques pays d'outre-mer.

Les deux principaux sujets traités furent la protection des Lépidoptères d'une part et la systématique et la génétique évolutionnaires d'autres part. Les discussions très animées qui suivirent chaque présentation confirmèrent l'actualité de ces deux thèmes centraux et permirent aux participants un large échange de renseignements et d'opinions. Comme le montre la Table des matières, d'autres domaines importants de la lépidopterologie moderne furent également abordés. Les huit travaux sur la faune et la biogéographie ont contribué à combler maintes lacunes de nos connaissances sur la répartition des Lépidoptères en Europe, et montré que les recherches de ce genre ont toujours et encore une importance considérable pour l'établissement des projets de protection de la nature. Tout aussi importantes sont les observations sur la biologie des espèces, et souvent aussi des populations. Sept exposés furent consacrés à ce sujet durant le Congrès de Sanremo. Deux orateurs ont souligné le rôle de la lépidoptérologie pour l'entomologie appliquée. Des problèmes de nomenclature et de taxonomie ont fait l'objet de quatre travaux. Même l'histoire de la lépidoptérologie a été abordée, et cela par deux participants.

L'assemblée générale de la SEL s'est tenue le 7 avril ; le procès-verbal de celle-ci (suivi d'un rapport du Conseil de la SEL sur la période du 9 avril 1986 au 5 avril 1988) a été publié dans *Nouvelles* No. 16 (1988).

En dehors de tous ces intéressants exposés, de nombreux participants ont trouvé le temps d'explorer les collines de l'arrière-pays, alors même que la météorologie ne fût guère propice à la sortie des insectes diurnes durant cette semaine. Malgré cela, quelques observations importantes ont été enregistrées sur la faune locale des Microlepidoptères.

Applied entomologie — Angewandte Entomologie — Entomologie appliquée

**Lépidoptères nuisibles aux cultures floricoles
et moyens de lutte**

Giuseppe BESTAGNO

Les cultures d'œillets, de première importance pour la floriculture industrielle de la «Riviera des fleurs», sont sujettes aux dégâts causés par les chenilles de deux Tortricides : la *Cacoecimorpha pronubana* Hb., indigène, et l'*Epichoristodes acerbella* Wkr. arrivée d'Afrique du Sud. Cette espèce exotique a rapidement vaincu l'espèce locale, si bien qu'elle constitue actuellement le 95% environ de la population totale des deux espèces.

Le rapporteur décrit en détail la biologie des deux espèces et les moyens employés pour les combattre, lutte à laquelle il a contribué par des expériences personnelles et en collaboration avec d'autres experts. Cette lutte se fonde maintenant sur deux moyens principaux qui visent à réduire l'emploi des pesticides chimiques, écologiquement dangereux : les phéromones contre les papillons et l'exposition des fleurs destinées à l'exportation aux rayons gamma qui tuent les larves cachées dans les tiges et les boutons. Cette dernière méthode, particulièrement étudiée par le rapporteur, a été proposée à la Communauté européenne, mais son adoption, quoique accueillie favorablement, n'a pas eu de suite officielle jusqu'ici.

Un autre lépidoptère nuisible aux œillets est la Noctuelle *Peridroma saucia* Hb., à répartition presque mondiale : sa larve polyphage cause des dégâts, parfois graves, à nombre de plantes cultivées. À Sanremo et dans les environs, il est courant de trouver ces papillons en plein hiver. L'auteur signale encore : *Autographa gamma* L. (Noct.), qui attaque les marguerites ; *Spodoptera littoralis* Bsd. (Noct.) dangereuse pour les plantes d'*Alstroemeria*, *Lisianthus* et *Gypsophila* ; *Bembecia uroceriformis* Tr. (Sesiide) et *Uresiphita limbalis* D. & S. (Pyraust.) qui causent des dégâts aux cultures de genêt.

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Pine processionary moth (*Thaumetopoea pityocampa*) complex in Catalonia.

Its geographical phenology and current methods of control

V. SARTO I MONTEYS, J. M. VIVES & M. ROJO

This species is the most serious defoliator of pines (*Pinus*) and, to a lesser extent, cedars (*Cedrus*), in an area extending through south-central and southern Europe to North Africa.

In Catalonia pine processionary larvae attack more or less severely all native and introduced pine species occurring below 1500 m ; attacks on cedars are more unusual. Higher up, the much colder conditions stop their successful development. The most susceptible Catalan native pine trees are the Iberian-Austrian pine (*P. nigra* ssp. *salzmannii*) and the Scots pine (*P. sylvestris*). Among introduced pines, the Monterey pine (*P. radiata*) and the Canarian pine (*P. canariensis*) are heavily attacked.

Heavy defoliation, by itself, does not usually completely kill the trees — unless affecting very young ones —, however it seriously delays their growth and weakens them so that they become much more susceptible to secondary attack by other insect pests and pathogens.

A serious problem for people living in close proximity to infested areas is that the larvae are covered with urticating hairs that can produce painful allergies when contacting the human skin.

For all the reasons mentioned above Catalonia — and other affected communities — spend, year after year, large sums of money for research on biological and chemical control of this pest. However solutions are still far from conclusive and further research needs to be funded. The rather specialized biology of this species is probably the reason why it is so difficult to obtain permanent satisfactory results in its control.

In Catalonia, over the last seven years, and especially after the identification of the moth's sex pheromone in 1981, research has been focussed in three main directions : 1. Climato-geographical phenology of the adult stage, in relation to the main different climates within Catalonia. 2. Studies on the species' natural predators and parasites and 3. Studies on the killing efficacy of different selective chemicals sprayed — by aeroplane or helicopter — over extensive infected areas of pine trees.

The authors have been directly involved with research related to the first and third of these approaches. Provisional results indicate that adult coastal populations occur about one month later than inland ones, which is the opposite to what one would expect considering the milder climate. Coastal populations also have a shorter flying period (about one month shorter than inland ones).

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Conservation – Schmetterlingsschutz – Protection des Lépidoptères

On the conservation of butterflies in the northern High Rhön (Germany)

Otakar KUDRNA

The paper presented at the 6th European Congress of Lepidopterology constituted a summary of the author's publication "Die Tagschmetterlinge der nördlichen Hohen Rhön" which appeared in March 1988. The English summary of this book is reprinted here in a shortened form as a summary of the above lecture.

The present paper constitutes a comprehensive work on the butterflies of the northern High Rhön (Hohe Rhön, Germany : Bavaria & Hessen). The paper is based on a survey and research carried out by the author between 1984 and 1987 (including two complete vegetation periods in 1986 and 1987). The aim of the paper is to provide recommendation for the conservation of butterflies in several nature reserves, above all "Rotes Moor" and "Lange Rhön", as well as in other sites of special scientific interest in the Nature Park Rhön.

The High Rhön stretches vertically from about 500 m to just over 900 m ; it was originally covered by beech dominated woodland. The present landscape dominated by open grassland originated after massive felling of woodland in medieval times. The aim of conservation authorities is to maintain this open country by means of habitat management. The aim of the research described here was to provide data for a comprehensive management plan for the area. The habitat types include pastures (inhabited by very few butterfly species), wet meadows and limestone grassland (both very rich in butterflies), mixed woodlands and peat bogs.

In all 30 sites have been surveyed in an area of some 20 km across. The High Rhön was until recently poorly known from an entomological point of view. It is therefore quite surprising that a total of 89 butterfly species have been recorded (incl. some doubtful and old records) ; about 80 species have been found over the past four years ; three species recorded previously have not been confirmed, but are believed present (*Parnassius mnemosyne*, *Melitaea parthenoides*, *Pyrgus alveus*) ; one species is extinct (*Colias palaeno*).

Sites surveyed are described in chapter 3 ; reference is given to general and site-specific management ; some important localities are figured. The distribution of all species is shown in the form of tables. The following sites are of special scientific interest : Rotes Moor, Eisgraben, Maihügel, Steinschlag-Wiesen, Schwarzes Moor, Weinberg, Thürmleinwiese, Oberelsbach, Mühlwiese and perhaps also Himmel-dunkberg and Holzberg ; Gangolfsberg and Hangen-Leite could also be counted to this group if *Parnassius mnemosyne*, *Melitea parthenoides* and *Pyrgus alveus* can be confirmed there.

Larval hostplants are listed in chapter 4.1 ; only hostplants recorded in the area and known to grow on the sites concerned are included, with reference to the type of larval biotope. Adult phenology is summarized in tables ; apart from the flight period, reference is given to a number of broods and to the hibernating stage.

Chapter 5 presents a comprehensive survey of all Rhön butterfly species. Reference is given to the distribution, larval ecology and adult phenology of each species, followed by short biogeographical characteristic of the species. Each monograph deals in detail with the history, distribution, biotop preferences and conservation of the species concerned. The following species are worthy of special reference :

Parnassius mnemosyne has not been found in the area since 1976 ; it is probably still present, but very rare and not easy to locate ; unfavourable weather in 1987 did not make the search easier. (Note : *P. mnemosyne* was confirmed in 1988 and a special paper devoted to the ecology of this species is in preparation).

Colias palaeno became extinct in "Rotes Moor" apparently after a massive afforestation of wet meadows adjacent to peat bogs with *Vaccinium uliginosum* after ca. 1950. The last reliable record of the species is nearly 50 years old. The habitat of this species has been restored. *C. alfacariensis* is quite common in limestone grasslands with *Hippocrepis comosa*.

Lycaeides argyrognomon, *Maculinea arion*, *Polyommatus amandus*, *P. bellargus*, *P. coridon*, *P. damon*, and *P. thersites* are confined to limestone grasslands in the south-eastern parts of the area, at an altitude of about 500 m. *P. coridon* is the commonest species of this group, *L. argyrognomon* has been found only on one occasion. *Maculinea nausithous* is represented in the area by one small colony only ; it urgently requires species-specific management and monitoring.

Boloria aquilonaris has only two relatively (and unusually) small colonies in both large peat bogs, "Rotes Moor" and "Schwarzes Moor". *B. eunomia* flies with *B. aquilonaris* together and in addition to this inhabits some wet meadows with *Polygonum bistorta*, mostly adjacent to peat bogs. Its colonies are very strong and could possibly be counted among the largest populations of this species in Central Europe. *Brenthis ino* is one of the commonest butterflies here.

Euphydryas aurinia apparently disappeared from both its typical former sites ("Rotes Moor" and "Schwarzes Moor" ; it has only been found once in a habitat unusual for this species : xerotherm limestone grassland ("Weinberg").

Melitaea diamina is well represented ; *M. neglecta* has recently been discovered in the "Rotes Moor" ; it was probably treated as *M. athalia* in the past ; the identification is subject to confirmation : the taxonomic status of the species is uncertain. The occurrence of *M. parthenoides* is subject to confirmation.

Coenonympha tullia has apparently disappeared from two of its former sites : "Rotes Moor" and "Schwarzes Moor", where it is known to have occurred ; the last small colony of this species was discovered in "Thürmleinwiesen".

Chazara briseis was found on two occasions only ; its discovery was unexpected. Even more surprising is the absence of *Hipparchia semele* and *Coenonympha glycerion*, species not rare in limestone grasslands adjacent to the High Rhön.

Apatura iris, *A. ilia*, *Limenitis camilla* and *Erebia aethiops* inhabit some mixed woodlands at lower levels, up to about 500 m ; *E. ligea* and *Argynnis paphia* are widespread and locally abundant. A few mostly old records of *Iphiclides podalirius* and *Aporia crataegi* are questionable ; it can be assumed that these species do not live in the area.

It is strongly recommended to reintroduce *Colias palaeno* to its former site “Rotes Moor” as its habitat is believed to have been restored. The reintroduction would be unique in Germany ; if successful, it would enable an endangered species to recolonize a part of its former range and increase its total population. In addition to this, the attempt would provide valuable experience for similar future projects. Recommendations are made as to the future recording and monitoring of selected species and sites. It is made abundantly clear that the success of the conservation programme outlined in this paper depends entirely on the implementation of all recommendations made here ; the exceptionally rich butterfly fauna of the High Rhön is well worth all our efforts.

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Conflict and conservation : the El Segundo blue and the airport (Lycaenidae)

Rudi MATTONI

The largest remaining population of the El Segundo blue, *Euphilotes battoides allyni* is on the sand dunes at the west end of the Los Angeles International airport (LAX). The habitat, as an ecosystem, is deteriorating from alien plant invasion following severe disturbance of 75% of the site. The major threat to the butterfly are two species of microlepidoptera which are predators as larvae. These endemic moths are now significant because of the introduction of a secondary foodplant which permits them to build their populations in advance of the butterfly. When the butterfly appears (it is univoltine), the moths virtually overwhelm it. Other extirpations, and the position of these dunes as the last in southern California, make them a unique heritage.

To restore and preserve this habitat, airport planning proposed a recreation facility, including a golf course, on about 80 ha of the part of the dunes which are essentially completely disturbed. The funds from the project would be used to restore and provide management for the 36 ha which could be a conservancy and preserve. The plan was rejected by the political body charged with regulating coastal growth, an action supported by part of the environmental activist community. The irony is that without development of some part of the property the entire habitat value will be lost.

In the meantime, the airport commission has provided emergency funds sufficient to augment the habitat to reduce immediate pressures and authorized a major study to provide a detailed biological survey and evaluation of the fine grain habitat value over the entire property.

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Was bedeutet das neue Naturschutzrecht der Bundesrepublik Deutschland für die europäische Entomologie ?

Hermann MORGENROTH

Innerhalb eines Kurzvortrages alle Aspekte des neuen Naturschutzrechtes der Bundesrepublik Deutschland zu erläutern ist nicht möglich. Doch 20 Minuten dürften vollkommen genügen, wenn auf das Wesentliche hingewiesen werden soll.

Naturschutz im heutigen Sinn wird weltweit erst seit etwa 150 Jahren betrieben. Umfassende gesetzliche Vorschriften sind in Deutschland erst seit rund 50 Jahren bekannt – Reichsnaturschutzgesetz 1935 –. Einen umfassenden Artenschutz für Schmetterlinge gibt es hier erstmals seit 1980 – Bundesartenschutzverordnung.

Die Ausführungen über das neue Naturschutzrecht von 1987 sind deshalb so wichtig, weil diese Gesetze als Vorbild im Zuge der Harmonisierung des Rechtes in der EG dienen könnten. Was könnte für die europäische Entomologie wichtig werden und was hat ein ausländischer Entomologe in der Bundesrepublik zu beachten ?

Die Bestimmungen des Bundesnaturschutzgesetzes können vollinhaltlich bejaht werden mit wenigen dafür aber stark einschneidend wirkenden Bestimmungen. Es sind hauptsächlich drei, die ins Auge fallen. Erstens : die generelle Befreiung einer „ordnungsmässigen Land- und Forstwirtschaft“ von den Einschränkungen des Bundesnaturschutzgesetzes – etwa 80% der Fläche der Bundesrepublik werden hiervon betroffen –. Zweitens : die Regelung der Ausnahmebestimmungen und der hierfür zuständigen Behörden. Drittens : die in die Artenschutzliste – Anlage zur Artenschutzverordnung aufgenommenen Schmetterlingsarten.

Zu erstens : anscheinend werden die Gefahren für die Natur nicht gesehen, die hier insbesondere von einer sehr intensiv ausgerichteten Landwirtschaft ausgehen.

Zu zweitens : hier sind die Ausnahmegenehmigungen über Fangen, Inbesitznahme, Besitz, Nachweis eines rechtmässigen Besitzes, Verbringen – hier ist der grenzüberschreitende Verkehr besonders stark berührt – und Verkauf durch sehr komplizierte Verfahren stark behindert. Hinzu kommt, daß für die verschiedenen Ausnahmegenehmigungen jeweils auch verschiedene Behörden zuständig sind. Für Fangerlaubnis ist in einigen Ländern eine Stelle in anderen, z.B. Nordrhein-Westfalen sind es örtliche Stellen, also für das Land insgesamt 54 untere Landschaftsbehörden jeweils auch nur für ihren engen Bezirk.

Je weiter die Genehmigungsbehörden nach unten verlagert sind, desto geringer ist auch die Fachkenntnis der über die Genehmigung entscheidenden Personen. Da das Schwergewicht des Naturschutzrechtes beim Arten- und nicht beim Biotopschutz liegt, glauben viele Genehmigungsbehörden durch das Versagen einer Fangerlaubnis

den Forderungen des Naturschutzgesetzes am besten zu genügen. Es gibt z.B. in Nordrhein-Westfalen untere Landschaftsbehörden, die grundsätzlich keine Genehmigungen zum Fang von Schmetterlingen erteilen.

Die Anlage zur Bundesartenschutzverordnung – Liste der besonders zu schützenden Arten – ist praktisch eine Zusammenstellung der „Roten Listen“. Die Einhaltung des Schutzes der aufgeführten Schmetterlingsarten setzt eine Kenntnis voraus, die sich ein Entomologe erst nach langer und intensiver Beschäftigung aneignen kann. Eine solche Kenntnis sich aus Büchern anzueignen erscheint kaum möglich. Zudem sagt die Liste nichts aus über die Nomenklatur nach der sie aufgestellt ist. Wenn also Gattungen oder sogar Familien unter den Schutz des Gesetzes fallen sollen, muß die Nomenklatur klar genannt sein, da je nachdem welche Nomenklatur man nimmt, die Anzahl der dem Schutz unterstehenden Arten um 100 Stück oder sogar noch mehr differiert, was wiederum zu einer unerträglichen Rechtsunsicherheit beiträgt. Auch fehlen in der Liste Arten, die bei einem Vergleich mit der Liste in diese gehörten – z.B. fehlt *Eudia spini* – und andere.

Durch die Aufnahme in Artenschutzlisten ist meines Wissens bisher keine Art wirksam geschützt worden. Auch wenn man Vögel und Schmetterlinge nicht miteinander vergleichen kann, so hat ein seit über 50 Jahren praktizierter Artenschutz ein Verschwinden von Arten aus ihrem bisherigen Verbreitungsgebiet nicht verhindert. Auch für die Schmetterlinge wird sich ein gleiches sicher herausstellen. Dem Schutz der Schmetterlinge dient meiner Ansicht nach allein ein verstärkter Biotopschutz.

Was kann in Zukunft getan werden? In der Bundesrepublik Deutschland ist eine Änderung des Gesetzes und der hierzu ergangenen Naturschutzverordnung auf absehbare Zeit nicht möglich. Hier wäre es Sache der mit Entomologie Beschäftigten, sich dafür einzusetzen, daß ein Klima geschaffen wird, in dem Ausnahme genehmigungen leichter zu erhalten sind. Den Entomologen der übrigen Länder kann nur empfohlen werden, sich auf Länderebene zusammenzuschließen, Kontakte zu in der Gesetzgebung maßgeblichen Personen herzustellen und ein Klima zu schaffen, daß durch Sachkenntnis und nicht durch Emotionen geprägt ist.

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Legislation for Lepidoptera conservation — towards a rationale

M. G. MORRIS

Conservation legislation exists in most European countries. It affects the conservation of Lepidoptera both directly and indirectly. Most direct legislation is orientated towards the protection of species, and much of it is aimed at 'protection' from collectors. However, it is important to integrate species protection with habitat conservation, including biotope management where this is necessary.

Much legislation is based on the concept of 'protected species'. Superficially this is similar to the concept of 'endangered species', but the philosophy underlying these terms is very different. It is suggested that 'endangered species' is the more useful concept because it more closely relates species to their habitats and leads to positive conservation in the form of recovery plans.

Although conservation legislation may have a variety of aims, its most important entomological objective is the maintenance (and possibly enhancement) of populations of endangered species. To do this, effective habitat conservation is an absolute requirement. Habitat and species legislation should be closely linked. An example is the Bern Convention. However, as invertebrate species have only recently (1987) been placed on the Appendices of this Convention, and because legislation on habitat conservation has not yet been fully worked out, the effectiveness of the Convention is not so far apparent on the ground.

Lawyers, administrators, conservationists and field entomologists all have different viewpoints on legislation. In order to refine effective legislation from these sources, it is necessary to examine in detail the ecology of threatened species, the nature of perceived threats, the measures for recovery of populations that are most likely to succeed, and the response of populations to more general conservation management. The insect ecologist thus has a key rôle in effecting good conservation legislation.

It is apparent that there continue to be misunderstandings between those involved in legislation for wildlife conservation. It is important that misunderstandings be resolved if the effectiveness of legislation is to be recognised and improved.

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Biology and conservation of the endangered lycaenid species of Sierra Nevada, Spain

M. L. MUNGUIRA, J. MARTIN

The Sierra Nevada, with its highest peak of 3482 m, is the southernmost range of mountains in Europe with a genuine high-altitude tundra; together with its biogeographic isolation this is the reason for its high percentage of endemics of the fauna and flora.

A total of five Lepidoptera, two Orthoptera, more than fifty Coleoptera and around one hundred plant species are endemic to the study area. These are some examples of the uniqueness of the Sierra Nevada. Ten butterflies have been listed in the Spanish Lepidoptera Red Data Book (VIEDMA & GOMEZ-BUSTILLO, 1985) of which seven are lycaenids. Four of these lycaenids fly in low mountain habitats and can also be found in other Spanish localities. The other three lycaenids are endemic to this Sierra, where they live at high altitudes in places almost devoid of vegetation, but with plant communities peculiar to the area, and over carboniferous schists.

The table summarizes our knowledge of the biology of Sierra Nevada's endangered lycaenids.

All the species considered are single brooded and those species associated with ants in the larval stage are facultative myrmecophils.

Plebejus pylaon and *Iolana iolas* have not been collected by us in the study area, although they have been recorded in it and we have found them in localities very close to the Sierra with very similar characteristics.

In the Iberian Peninsula, we consider a species to be endangered when it is present in less than 20 UTM 100 km² squares, vulnerable when present in 20 to 50 squares and rare when it is found in more than 50 squares, but is not frequent through its range. In our study *Lysandra golgus* and *Agriades zullichi* that are endemic to Sierra Nevada should be considered endangered. *Iolana iolas* should be added to these two species because although present in 30 squares in Spain it is extremely rare, and its populations are vulnerable due to several anthropogenic factors. *Plebejus pylaon* and *Cupido lorquini* should be listed as vulnerable and *Aricia morronensis* and *Lysandra nivescens* as rare although *nivescens* is fairly common in Spain. *A. morronensis* lives in many Iberian localities, but subspecies *ramburi* is restricted to the Sierra Nevada despite being quite abundant there in suitable habitats.

For the conservation of the seven species we suggest the creation of a protected zone in almost all the high-altitude tundra (121 km²), and plots of some plant communities of lower levels. This would protect the seven butterfly species and the great majority of the insect and plant endemic species of the Sierra.

	<i>I. iolas</i>	<i>P. pylaon</i>	<i>C. lorquini</i>	<i>L. nivescens</i>	<i>L. golgus</i>	<i>A. zullichti</i>	<i>A. morronensis</i>
Vegetation & character		Clearings of <i>Quercion rotundifoliae</i> forests, seral	<i>Astragaleto-Yelletum</i> seral		<i>Arenario-Siderition glacialis</i> climatic		
Substrate	limestone or gypsum		carboniferous marble		carboniferous schists		
Foodplant	<i>Colutea atlantica</i>	<i>Astragalus alopecuroid.</i>	<i>Anthyllis vulneraria</i>	<i>Anthyllis vulneraria</i>	<i>Anthyllis v. arundana</i>	<i>Vitaliana primuliflora</i>	<i>Erodium cheilantifol.</i>
Part. foodpl.	seeds	leaves	seeds	leaves	leaves	leave/fruit	leaves
Relationships with ants	none	<i>Camponotus</i> , <i>Plagiolepis</i> , <i>Formica</i> & <i>Crematogaster</i>	<i>Plagiolepis</i> , <i>Tapinoma</i>	no data	<i>Tapinoma</i>	amirmecophil	<i>Tapinoma</i>
Overwintering stage	pupa	larva III	pupa	larva III	larva III	larva III	larva III
Flying period & maximum	V-VI V	V-VII V	III-VII V-VI	V-VIII VI-VII	VII	VII	VII-IX VIII
Nr. instars	4	5	4	5	5	5	5
Sexual behav.	patrolling	patrolling	patrolling	perching	perching	patrolling	patrolling
Nr. 10 km sq.	30	37	33	88	3	3	44 (4 in ssp. <i>ramburi</i>)
Height (m)	800-1200	800-1200	900-1700	800-2000	2500-2700	2550-3000	2050-3000

Due to the climacic character of the higher oromediterranean plant communities (*Arenario-Siderition glacialis*) the best way to conserve this zone would be to leave it alone and reduce human impact to the lowest possible level. The other two seral zones (those of the seral *Astragaleto-Velletum* communities and those placed in clearings of the climacic *Paeonio-Quercetum rotundifoliae* forests) would only need slight control to maintain the actual clearings of the forest and a moderate grazing. Traditional land uses such as beekeeping and goat and sheep grazing, can be allowed to continue because they do not alter the habitat of the four species living in lower supramediterranean levels. On the contrary, these land uses will probably help to conserve the successional stages as they are at present.

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The importance of woodlands in the conservation of butterflies in the centre of the Iberian peninsula

J. L. VIEJO ⁽¹⁾, M. G. DE VIEDMA ⁽²⁾ and E. MARTÍNEZ FALERO ⁽³⁾

The butterfly fauna of 51 sites in the centre of the Iberian peninsula were compared. The sites fall into three areas : the Southern Iberian Mountains, the Middle Tagus Depression and the province of Ciudad Real, in accordance with data recently published by different authors.

For each site four variables indicative of wealth of fauna were calculated :

- (1) Number of species (NS).
- (2) Average biotope amplitude ($\overline{BA}$). This is an estimation of the rarity value of the butterfly fauna from a site.
- (3) Average chorological index ($\overline{CI}$). This is the index proposed by KUDRNA (1986), and it is an estimation of the biogeographical value of the butterfly fauna from a site.
- (4) Diversity (DI). It is obtained by using the Shannon & Weaver index.

We grouped the 51 sites according to their geographical area. To each of these zones, with the assumption that the variables are quantitative with roughly normal multivariant distribution, a principal component analysis was applied to define a gradient for the sites as a function of the variables available. The application of this analysis made it possible to represent the sites on single axes, which explain respectively 78% and 82% of the variance in the Tagus Depression and Ciudad Real, and in the Iberian Mountains on two axes which explain 88% of the variance.

The main results were that the Iberian Mountains, Lusitanian oak (*Quercus faginea*) and holm oak (*Q. ilex*) woods (outstripping *Juniperus thurifera* and pine woods) contain the most interesting fauna, i.e. the largest number of species, high average chorological indices, high diversity and low average biotope amplitude. In the Tagus Depression high values were found in Lusitanian and kermes (*Quercus coccifera*) oak woods ; in Ciudad Real in the Pyrenean oak (*Q. pyrenaica*) forests of Sierra Madrona and, to a lesser extent, in the holm oak woods in the north of the province. The richest butterfly communities are thus linked to *Quercus* woodlands, mainly Lusitanian, Pyrenean and kermes oaks. Marshy and intensely farmed areas, on the other hand, are less rich.

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We therefore believe a very close correlation to exist between plant formations and lepidopterous fauna. This correlation may help those interested in selecting sites for the establishment of natural reserves to recommend criteria on which to base conservation priorities. It would be most worthwhile to carry out similar studies on other groups of less conspicuous species. There is no a priori reason, after all, to believe that the most eye-catching species to be under greater threat than the less conspicuous ones. Moreover, greater stress must be laid on the protection of biotopes than on the protection of species.

Spain is a relatively large country (in western European terms) where knowledge about the precise distribution, abundance and ecological requirements of the majority of butterfly species as well as the threats hanging over them is scarce as yet. In this context, what THOMAS and MALLORIE (1985) term ecosystem conservation as opposed to a species approach to butterfly conservation would seem to be the most effective policy.

Mellicta athalia ROTT. :

An example of successful Lepidoptera conservation
in the United Kingdom

M. S. WARREN

The UK has a relatively long-established conservation movement which has aimed to protect a representative network of habitat, covering all the major types that occur. However, many nature reserves have lost their populations of rare or declining butterflies, largely due to insufficient or incorrect habitat management. In recent years, several threatened species have been studied in great detail and their ecological requirements are now much better known. A common theme has been the discovery of the importance of traditional forms of habitat management, which when applied to reserves has enabled far more effective conservation of the butterfly fauna. This lecture will examine the history of the conservation of one of the most endangered UK species, *Mellicta athalia*.

M. athalia once occurred across southern Britain, but has declined very seriously during the 20th century. The first national survey in 1980 identified only eight remaining localities, which contained numerous, mostly small, populations. At that time, two reserves had been established primarily to conserve large populations of the species, but both had virtually become extinct. From 1980-85 a detailed ecological study was conducted which discovered that the species mainly occurs in short-lived, transitional habitats. Its main breeding habitat remains suitable for only 5-8 years after cutting and the species requires the continual cutting of new areas of woodland in close proximity so that it can move from clearing to clearing. In the past, such conditions were provided by coppicing, which was the traditional form of woodland management throughout lowland Britain. Most woods were cut on a strict rotation of 8-15 years which provided ideal habitats for *M. athalia*. During the 19th and 20th centuries the practice declined rapidly, resulting in numerous local extinctions of the butterfly. Today, less than 2% of Britain's woods are coppiced and most of this is chestnut coppice in SE England, which is the last major stronghold of the species. In SW England, coppicing has ceased entirely and *M. athalia* has survived only by using two completely different types of habitat, often with different foodplants. The ecology of these alternative habitats will be discussed briefly.

The recommendations of the study have subsequently been applied to several nature reserves, with spectacular results. On the Blean Woods National Nature Reserve, numbers have risen from less than 20 adults in 1980 to over 5,000 in 1986. Nearly all the remaining sites are protected in some way and most are responding very well to new management initiatives. Also, the species has been successfully reintroduced to a few former localities where coppicing has been re-started. On a reserve in Essex, 53 adults were released in 1984 and by 1986 the population had reached over

4,000 ! However, *M. athalia* is still threatened on some important sites which are still managed by commercial forestry companies. The Nature Conservancy Council is currently negotiating detailed management agreements with the owners but this will require regular annual expenditure indefinitely in order to maintain viable populations. The future of *M. athalia* in the UK is therefore firmly in the hands of conservationists, and, by applying traditional management procedures, the initial results have been very successful. In some cases, though, traditional management has had to be modified as we are now attempting to conserve the species on much smaller areas of land than it occupied formerly. This has only been possible through the application of detailed applied research.

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Evolutionary Systematics and Genetics – Evolutionäre Systematik und Genetik – Systématique et génétique évolutionnaires

Taxonomy and evolution in *Lycaena* (subgenus *Heodes*) (Lycaenidae) (*)

Luigi CASSULO, Paola MENSÌ & Emilio BALLETO

Among the several subgenera of the broadly Holarctic genus *Lycaena* (FABRICIUS, 1807), the subgenus *Heodes* (DALMAN, 1816) is characterized by its short valvae, with a prominent spine on the dorsal margin (male), and a sclerotized ostium bursae (female).

The following taxa were considered for morphological and cladistic analysis : *Lycaena alciphron* ROTTEMBURG, 1775 ; *Lycaena ottomana* LEFÈBVRE, 1830 ; *Lycaena virgaureae* LINNÉ, 1758 ; *Lycaena miegi* VOGEL, 1857 ; *Lycaenus tityrus* PODA, 1761 ; *Lycaena bleusei* OBERTHÜR, 1884 ; *Lycaena subalpina* SPEYER, 1851. *Lycaena phlaeas* LINNÉ, 1761 was included in the study and treated as an outgroup. Characters selected were the following :

External morphology :

- (1) an orange spot at anal angle of hind wings (males) 0 = no 1 = yes
- (2) spots on forewings : absent (0), present (1)
- (3) anal angle of hindwings : rounded (0), acute (1)
- (4) series of white discal spots on und.hindwings : absent (0), present (1)
- (5) basal dot on upperside hindwings : absent (0), present (1)

Male genitalia :

- (6) penis normal (0), elongate (1)
- (7) penis apex turned downwards (0), upwards (1)
- (8) valva : dorsal and ventral margins parallel (0), curved (1)
- (9) valva : spine on dorsal margin proximal (0), distal (1), absent (2)
- (10) genitalia normal size (0), large (1), very large (2)

Female genitalia :

- (11) lamina supravaginalis bilobate (0), whole (1), reduced (2)

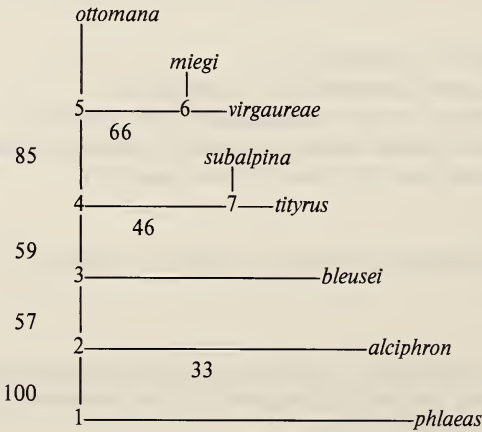
(*) This research was financially supported by the Ministry for Public Education (MPI) under 60% research funding program (Biogeography of Circum-Mediterranean lands) and the National Research Council (CNR).

Multistate characters (9-11) in the original data set (not reported) were transformed into binary by J. FELSENSTEIN's (1985) program FACTOR in his PHYLIP package. As a consequence in the following table characters 9, 10, 11 occupy columns 9,10 ; 11,12 and 13,14, respectively.

Character-state data

Factors	+ - - +	- + - +	- - + +
<i>phlaeas</i>	11101	01011	1100
<i>alciphron</i>	11101	11110	1000
<i>bleusei</i>	11101	11110	0000
<i>tityrus</i>	01101	11100	0000
<i>subalpina</i>	01001	01100	0000
<i>virgaureae</i>	10010	10100	0011
<i>miegi</i>	11010	10000	0010
<i>ottomana</i>	11000	00000	0010

A cladistic analysis was carried out on these characters using FELSENSTEIN's PHYLIP package. The tree shown below conforms to maximum criteria of parsimony (19 steps, program PENNY), likeliness (BOOT) and compatibility (CLIQUE). Figures below or to the left of connecting lines indicate percent likeliness of the preceding knot by a bootstrap estimate (BOOT).



Steps in each character :

	0	1	2	3	4	5	6	7	8	9
0		1	1	2	1	1	3	1	3	1
10	1	1	1	1	1					

From	To	Any steps ?	State at upper node
	1		11101 ?1?1? 1?00
1	<i>phlaeas</i>	maybe	 0.0.1 .1..
1	2	maybe	 1.1.0 .0..
2	3	yes	 0...
3	4	yes	..?.. ...0.
4	5	yes	..0.0 .0?.. ..1.
5	<i>ottomana</i>	yes	 0.0..
5	6	yes	...1. ..?..
6	<i>miegi</i>	maybe	0..
6	<i>virgaureae</i>	yes	.0... ..1... ..1
4	7	yes	0.?..
7	<i>subalpina</i>	yes	..0.. 0....
7	<i>tityrus</i>	maybe	..1..
3	<i>bleusei</i>	no	
2	8	no	
8	<i>alciphron</i>	no	

All of these taxa are characterized by unique genitalic features and all qualify as separate morphospecies.

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An inconsistency in the methodology of cladism

U. DALL'ASTA

Cladism is becoming a classic methodology for many lepidopterists in constructing a classification. At the species level this methodology has now become well known and can be considered a three stage process. First comes the study of the actual specimens : as many characters as possible are scored, ordered or measured and their polarity determined. All this information is put into a data matrix. The second step is feeding all this data into a computer. This computer calculates the phylogenetic affinities and prints this information out as a series of cladograms. The choice between these cladograms is performed by the way of a posteriori changing of polarities or weighting of characters. This results in a new data matrix, which is again submitted to the computer, this procedure being repeated until a satisfactory classification is obtained. The third step is the description of the finally obtained cladogram and the comments on the classification which can be inferred from it.

It is clear from the above analysis that the taxonomist has two stages in his own hand : the first, being the study of the organisms and the preparation of the data matrix, and the second, the description of the finally obtained cladogram and classification. But what about the theory and the methodology that were the basis for an algorithm used to make the computer program ? It is self-evident that before using a methodology its internal consistency must be verified.

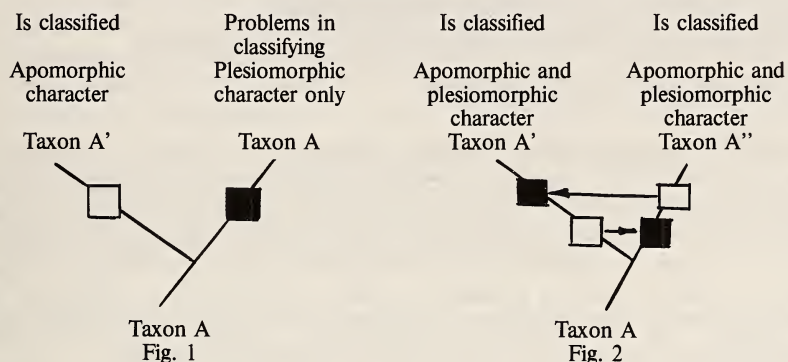
According to HENNIG (1981), considered the father of the cladistic methodology, characters of organisms can be divided into two categories : the plesiomorphic (ancestral characters) and the apomorphic (evolutionary novelties). According to him, organisms should not be classified by using their plesiomorphic character states, only by using their apomorphic ones. This poses a problem at the moment of splitting into two sister taxa as outlined by him (*loc. cit.*, p. 25). Between the moment of splitting and the acquisition of its own apomorphic character later on, there arises a problem with the classification of the sister taxon with the plesiomorphic character due to the above mentioned principle (its only difference with the sister taxon being a plesiomorphic character).

For this problem HENNIG (1981 : 25) proposes three solutions to classify the sister taxon :

- a. classifying it as belonging to the ancestral line
- b. classifying it as a new taxon, the distinctive character being its sister group relation and
- c. considering it a structural type, which means that it is classified using other characters as is done by typologists, without distinction of plesiomorphic or apomorphic ones.

What surprises most is that Hennig does not propose a final solution, and that this problem never arises elsewhere in his publications. The reason for this is to be found

in his graphical representations of phylogenetic groupings. If one only takes into account his explanation of the phylogenetic process, the drawing of a last branching of a cladogram could be represented as in fig. 1, an asymmetrical drawing. But HENNIG's (1981 : 7) representations on the other hand look like fig. 2, symmetrical.



It is clear from both figures how the problems of classifying the taxa having as the only difference with their sister taxon one plesiomorphic character has been solved : in those taxa an apomorphic character is postulated at the same time. In other words, according to this graphic representation, apomorphic characters always arise in pairs, otherwise there would be a problem in classifying the taxon situated in time between the origin of both apomorphic characters. But the fact that apomorphic characters always arise in pairs goes obviously against the general accepted ideas of phylogeny and particularly against the explanation of the phylogenetic process by HENNIG himself.

The outline of this problem has been submitted to Dr. PLATNICK (Am. Mus. Nat. Hist., New York) and his comments were that this analysis is completely irrelevant. The methodology of cladism has to be considered from the point of view that organisms should be classified on plusses (apomorphic characters) and not on minuses (plesiomorphic ones) and that not doing it in this way (as the former pheneticists) leads to less satisfactory classifications. But this does not solve the problem outlined above. HENNIG himself found as the only solution for the problem of not using plesiomorphic characters for classifying, joining apomorphic and plesiomorphic characters in pairs. The programmers obviously do not consider the fact that apomorphic characters arise in pairs a Hennigian principle, however, they claim that his principles form the basis of their programs. Consequently the question remains whether this logical deduction incorporated by HENNIG himself in his graphical representations does not imply an inconsistency in his methodology.

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Expériences d'hybridation intra- et interspécifiques dans le genre *Zerynthia* (Papilionidae). Relativité des critères mixiologiques de l'espèce.

Henri DESCIMON et François MICHEL

Le genre circumméditerranéen *Zerynthia* comprend deux espèces. La première, *Z. rumina*, possède une distribution atlanto-méditerranéenne : Maghreb, Péninsule ibérique, Sud de la France. La seconde, *Z. polyxena*, ponto-méditerranéenne, s'étend du Sud-Est de la France à l'Asie Mineure, avec des colonies allant jusqu'à l'Autriche. Elles sont largement sympatrides dans le Languedoc oriental et la Provence. Il existe une très relative exclusion mutuelle au niveau phénologique et écologique, qui n'empêchent pas une cohabitation fréquente. On a signalé des accouplements interspécifique et un seul cas précis d'hybride interspécifique naturel.

Chaque espèce possède des sous-espèces peu nombreuses mais prononcées. Les populations maghrébines et andalouses de *Z. rumina* sont bien distinctes des populations françaises (ssp. *medescaste*), de même que les populations grecques de *Z. polyxena* de celles de France (ssp. *cassandra*).

À l'aide d'expériences diversifiées de croisements, nous avons tenté de préciser la nature et l'importance des barrières agissantes et potentielles entre les divers taxa, subsécifiques et spécifiques.

A. Croisements entre taxa géographiquement éloignés de la même espèce (*Z. polyxena* France × *Z.p.* Autriche ; *Z.p.* France × *Z.p.* Grèce ; *Z. rumina* France × *Z.r.* Algérie, Maroc et Andalousie). Les résultats sont les suivants :

- l'attirance entre les sexes est toujours forte et, entre individus compétents (mâles vigoureux, femelles très jeunes), l'accouplement se réalise spontanément sans aucune barrière. Une seule exception a été observée (sur un nombre significatif d'essais), entre des individus d'origine marocaine et provençale. Aucune des tentatives acharnées des mâles n'a produit d'accouplement ; la disparité de taille semble être la raison principale de l'échec (les individus marocains étaient trop grands).
- les accouplements sont toujours féconds et les F1 bénéficient d'une vigueur hybride spectaculaire et sont d'une grande homogénéité.
- les F2 (F1 × F1) sont au contraire irrégulières. Dans le croisement *Z. polyxena* France × *Z.p.* Autriche, la viabilité demeure excellente et se maintient dans les générations suivantes. Au contraire, avec *Z.p.* France × *Z.p.* Grèce, une baisse de viabilité sensible (50 à 75%) apparaît ; elle diminue sensiblement dans les générations ultérieures. Dans le croisement *Z. rumina* France × *Z.r.* Andalousie, la viabilité de la F2 était très faible (autour de 5%) ; même les rétrocroisements avec les souches parentales montraient une viabilité faible. La mortalité frappe tous les stades, alors qu'ailleurs elle se concentre sur les stades embryonnaires.

B. Croisements interspécifiques : nous avons effectué des tentatives entre tous les taxa mentionnés plus haut et les souches françaises de chaque espèce, dans les deux sens chaque fois que cela était possible. Voici nos résultats :

- il n'y a pas de barrière précopulatoire comportementale ; quels que soient les insectes mis en présence (en particulier qu'ils proviennent de populations cohabitant avec l'autre espèce ou non), les mâles sont vivement attirés visuellement par les femelles et tentent l'accouplement avec acharnement. Au contraire il y a des barrières mécaniques importantes : l'intromission est difficile à réaliser et échoue très souvent ; même obtenu, l'accouplement est souvent «boîteux» et dure ou trop longtemps (plus d'une heure) ou pas assez (moins de 25 mn).
- Une barrière physiologique existe aussi très probablement : même dans le cas d'accouplements apparemment normaux, les pontes subséquentes ont été stériles, à une exception près, dont les résultats vont être détaillés.

C. Le seul accouplement interspécifique fécond a suivi une *double* fécondation : une ♀ *polyxena* (France) a d'abord été fécondée par un ♂ *rumina* (France × Andalousie) puis par un ♂ *polyxena* ; la descendance a comporté moitié d'hybrides et moitié de *polyxena*.

À partir de là, une série de rétrocroisements a été effectuée sur 5 générations (voir schéma). Les tentatives non marquées sur ce schéma ont échoué ; pratiquement toutes les combinaisons possibles ont été tentées. En F2, les deux rétrocroisements avec les espèces parentales ont réussi ; en F3, non seulement les croisements avec l'espèce parentale la plus proche ont réussi, mais aussi ceux avec l'espèce la plus éloignée. En F4, nous avons obtenu 12 accouplements entre les rétrocroisements «5/8» symétriques ; un seul s'est montré viable, et faiblement (9 chenilles sorties de l'œuf et 9 adultes) ; nous n'avons malheureusement pas pu continuer à suivre cette lignée «médiane», trop peu nombreuse. De même, un croisement entre hybrides a été réussi en F5 (11/16 *polyxena* × 13/16 *rumina*), mais il n'a pu engendrer de lignée ultérieure.

Chaque fois qu'un parent d'espèce pure était impliqué, la fécondité et la viabilité étaient excellentes ; il semble donc qu'un stock haploïde homogène soit suffisant pour assurer celles-ci. Une dose même minoritaire du génôme d'une espèce suffit à assurer la fécondité de l'accouplement avec un individu pur de cette espèce. L'échec du rétrocroisement «5/8 *polyxena*» × *rumina* semble être dû, là encore, à une incompatibilité de taille. Il n'a pas été observé d'asymétrie dans la fécondité des sexes, ni de distortion du sex ratio, ni de déséquilibre sensible dans la régulation de la diapause.

La viabilité des deux croisements mettant en jeu des hybrides des deux côtés est beaucoup plus faible. Un «hybrid breakdown» important se manifeste au cours des stades précoces du développement : beaucoup d'embryons sont retrouvés à l'intérieur de l'œuf arrêtés à des stades divers. En revanche, la chenille éclore, la viabilité devient normale.

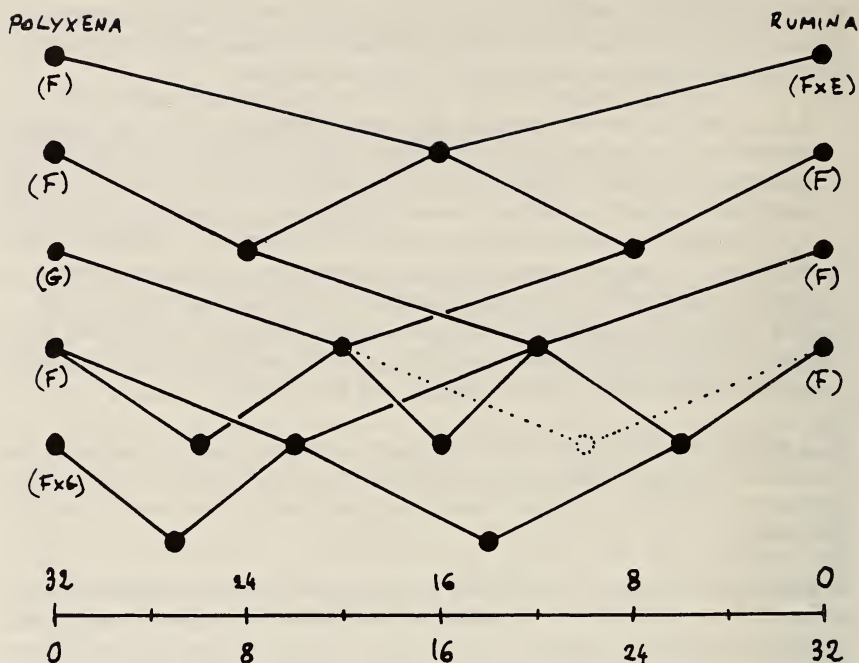


Fig. 1. Cinq générations de croisements entre *Zerynthia polyxena* et *Z. rumina*. La position des points représente la «distance» de chaque lignée obtenue par rapport aux espèces parentales. F : lignée d'origine française, E, espagnole (Málaga), G, Grecque (Delphes). En pointillé, le rétrocroisement «5/8 *polyxena*» × *rumina* qui, malgré un extraordinaire acharnement des mâles, a échoué car les femelles étaient trop grosses.

NB : les croisements ont souvent eu lieu dans le sens femelle hybride × mâle sauvage ; ceci n'est pas dû à une fécondité différentielle, mais à la plus grande efficacité sexuelle des mâles de la nature.

Les *Zerynthia* sont des Papilionoïdes primitifs, où les mécanismes d'isolement semblent assez rudimentaires. Cependant, les résultats exposés ici soulignent à la fois la multiplicité des barrières et leur relativité. Les facteurs précopulatoires jouent un rôle essentiel dans la séparation des pools géniques (l'intromission non suivie de fusion gamétique est, en dernière analyse, de nature précopulatoire). La stérilité des hybrides F1 semble au contraire avoir peu d'importance ici. Les incompatibilités génomiques, barrière ultime, agit fortement dès la F2, mais peut-être pas pour tous les gènes, car elle n'empêche pas les rétrocroisements.

L'importance des critères mixiologiques dans la définition des espèces est indéniable. Il nous paraît cependant abusif d'accorder une valeur absolue aux croisements expérimentaux (*a fortiori* s'ils utilisent l'accouplement artificiel). Des populations

éloignées géographiquement de continuums spécifiques indiscutables montrent une incompatibilité qui aurait pu autoriser, dans le cas de distributions discontinues, à les séparer spécifiquement. Au contraire, une fois les barrières précopulatoires enfoncées, des échanges géniques peuvent avoir lieu. Seules les situations naturelles peuvent servir à la définition des taxa.

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Eucheira socialis WESTW. (Pieridae) –
Loss of genetic variation
as a consequence of the population biology
and anthropogenic range extension

H. J. GEIGER, A. M. SHAPIRO and J. LLORENTE

Eucheira socialis WESTW. is a pierid butterfly, recorded only from Mexico, which has a bizarre population biology. The gregarious larvae construct silken nests on the branches of the host plant, emerging only at night to feed. They pupate inside the nest, and a substantial proportion of the adults remain there, mating, ovipositing, and dying within. Flight ability of the adults is strongly limited. In fact, wing venation of the females is reduced and laboratory observations show that the butterflies from most localities can hardly glide. However, not all populations show the same degree of reduced dispersal capacity. Individuals from populations in the north-west of Central Mexico (Durango, Sinaloa) can fly, although weakly, and they also show morphological variation (ssp. *westwoodii*). This is not true for the southern Mexican populations (ssp. *socialis*). Moreover, our observations show that only very few females, although mated, lay more than a few eggs. This population biology results in extremely frequent sib-matings and reduced dispersal capacity.

Population genetics theory predicts a low degree of genetic variation for such a case as inbreeding tends to reduce polymorphism. In fact, enzyme electrophoretic results show that there is no genetic variation within and among all southern Mexican populations (ssp. *socialis*) at 32 loci, except one locality in which at one locus a different electromorph is fixed in all nests. In contrast, there is polymorphism in the *westwoodii* populations at three loci. The electromorphs found in *socialis* are also observed in *westwoodii*.

These observations can be explained by the following scenario : *Eucheira socialis* originally lived in NW-Central Mexico. The species, represented by today's ssp. *westwoodii*, already had a biology that allowed only a reduced gene flow caused by frequent sib-matings and limited flight abilities. In historic times the species became spread anthropogenically into the southern Mexican states as an item of commerce (the Aztecs used the nests as paper and the larvae and pupae are edible). This range extension was accompanied by a bottleneck event which resulted in the total loss of flight ability and polymorphism. The outcome is a taxon, ssp. *socialis*, that has no known means of dispersal and is genetically extraordinarily depauperate. Its survival is perhaps only guaranteed by the relatively stable environment the taxon is living in and is maintaining by the construction of nests, and its management by the native people of montane Mexico.

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Ghost moths and their primitive allies : towards a groundplan reconstruction for the suborder Exoporia

Niels P. KRISTENSEN

The “ghost” or “swift” moths, *Hepialidae*, familiar to European lepidopterists, appear to be strangely isolated moths. However, some of their primitive allies, such as some members of the Australian genus *Fraus*, have overall commonplace “microlepidopteran” facies (slender bodies, “normal size” antennae) and distinct proboscis remnants. Recent anatomical studies on *Fraus* have helped in making detailed inferences about the structure of ancestral hepialoids and have led to a new interpretation of the enigmatic hepialid male genitalia, bringing these more in line with conditions in other homoneurous moths. Ongoing anatomical work on the endemic New Zealand superfamily *Mnesarchaeoidea*, the putative sistergroup of the *Hepialoidea*, is yielding additional insight into the groundplan of the “next higher” taxon, i.e. the superorder *Exoporia*.

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Experimental evidence for a specific distinction between *Colias hyale* L. and *C. alfacariensis* RIBBE (Pieridae)

Z. LORKOVIC

In response to occasional assertions that *Colias alfacariensis* RIBBE (= *australis* VERITY) is no more than an ecological form of *C. hyale* L., the experimental evidence for their genetical reproductive isolation is reported.

Material

Experimental crossings between both taxa were made with *C. hyale* from Zagreb, Croatia, N.W. Yugoslavia, and *alfacariensis* from N.E. France (Vézelay, kindly supplied by H. DESCIMON) as well as from the Istrian coast of Quarnero, during the years 1978-1980.

Methods

Pairings were made in cages 25 × 25 × 25 cm or in green netting, without frame, placed over naturally growing plants. The males were taken partly from the field during their patrolling flight, when they were most disposed to mate.

Results

1. No natural pairing between five *alfacariensis* females and seven *hyale* males could be achieved, even when three of the exhausted males were replaced by fresh ones for 25 minutes. The same was the case with four *hyale* females and *alfacariensis* males. In contrast, the females used in the experiments copulated almost at once with the conspecific males. Therefore, the ethological sexual isolating mechanism between both taxa is fully developed in both directions.
2. Despite resistance to pairing by the females, five crossings with *alfacariensis* females and *hyale* males as well as two crossings of *hyale* females and *alfacariensis* males were achieved through the gynanaesthetic pairing method of the author (with anaesthetized immobilised females and conscious males) of normal mating duration. After two or three days normal oviposition followed with 60 or more eggs daily.
3. The fertilisation was normal, as in the conspecific breeding experiments.
4. Development of the F₁ larvae was normal, without losses, and fine, large adults emerged, three to four times more males than females. The hybrid males and females paired freely, sometimes with hesitation if with males of the paternal species.

5. The F_1 hybrid females from five matings were entirely infertile, depositing a very reduced number of mostly immature and deformed eggs. Such female sterility and the corresponding failure of the F_2 generation, is a common trait of interspecific hybridisation in butterflies. However, the F_1 hybrid females were highly fertile, and in the backcrosses with *hyale* or *alfacariensis* females produced a fine and viable R_1 generation. The ability for producing R_1 is a characteristic of closely related species. Moreover, the males of R_1 were also fertile, while the eggs of the females began to develop, but seldom reached the black head stage.

6. The uniform green colouring (without markings) of the *hyale* larvae is in the F_1 generation dominant to the more bluish-green of the *alfacariensis* larvae as well as to their sharply delimited dorso-ventral and suprastigmatal bright yellow lines, while the segmentally arranged black patches between and below the lines appear very reduced or in traces in only 4-5 percent of F_1 individuals. The dorsal yellowish lines occur only seldom as undefined interrupted pale yellowish lines or stripes. One of the genes for the dark spots is probably located on the Z (X) chromosome of *alfacariensis*, and passes in the crossing to the female sex so that it can be expressed in a single dose in spite of its recessivity.

7. As expected, the backcrosses give different phenotypes, depending on the parental species used.

8. The unusually great larval variability in the F_1 can be attributed to the great natural variability of the *alfacariensis* black colour, which varies from heavily black quadrangular patches to minute rounded spots. The black patches and the yellow lines are two independent genetic characters.

C. alfacariensis seems to be the only European *Colias* with such a prominent larval colour pattern, and this seems to have had an important selective advantage in the evolution of this species. Mimicry with the similarly brightly coloured and strongly patterned unpalatable larvae of the Zygaenidae, living on the same Papilionaceous plants, is proposed.

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Electrophoretic investigations in the *Polyommatus (Lysandra) albicans* – *P. (L.) hispanus* complex (Lycaenidae)

Paola MENSÌ, Luigi CASSULO & Emilio BALLETO

Among members of the genus *Polyommatus*, species of the subgenus *Lysandra* represent another taxonomically rather complicated group, which has undergone a number of changes. Members of the *P. (L.) coridon* (or the 'blue' complex), were the subject of a recent paper (MENSÌ et al., 1988). We shall therefore examine here the other W. Mediterranean taxa (the *P. albicans*, or 'white complex'). Contrary to the 'blue complex', the latter comprises both normal monovoltine and bivoltine populations.

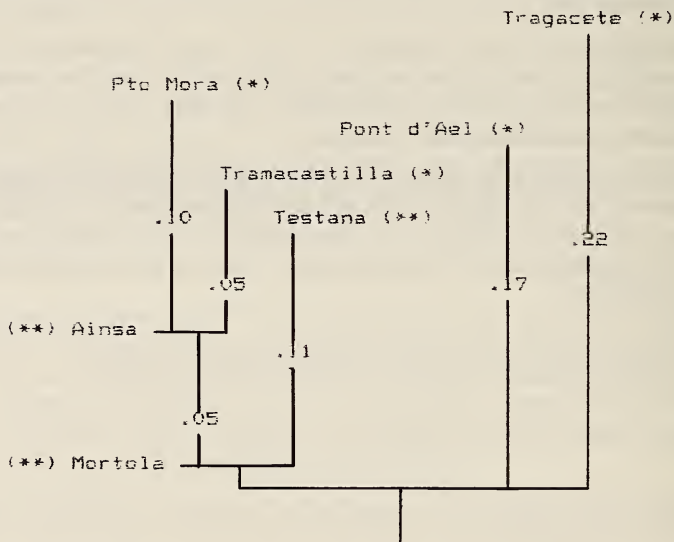


Fig. 1. Phylogenetic relationships within some populations of the *Polyommatus* (subgenus *Lysandra*) *albicans* complex obtained through J. FELSENSTEIN's (1985) CONTML program based on CAVALLI-SFORZA's chord measure. Branch lengths were set as to show a rough correspondence with electrophoretic distances (figures). Distances not significantly different from zero were set as zero (no figure reported). One or two asterisks indicate that the population is mono- or bivoltine, respectively.

Polyommatus coridon (population from Pont d'Ael : N Italy) and *P. caelestissimus* (population from Tragacete : C Spain) were tentatively enclosed as outgroups, to root the tree.

The karyology of the 'white complex' was studied by DE LESSE (1960, 1969). Haploid chromosome numbers proved 82 for the monovoltine and 84 for the bivoltine populations. Accordingly they were sorted into *P. albicans* and *P. hispanus*, respectively. This solution has been followed by later authors ever since.

Genetic relationships were studied for two monovoltine (*Pto Mora* : Sierra Nevada, *Tramacastilla* : Teruel) and one bivoltine (*Ainsa* : Jaca) populations from Spain and two bivoltine populations (*Mortola* : Imperia, *Testana* : Genova) from NW Italy. Sixteen gene-enzyme systems (*Ak*, *Est-1*, *Est-2*, *Est-3*, *Fh*, *Got-1*, *Got-2*, *G6pd*, *Hk*, *Me*, *Mdh*, *Idh-1*, *Idh-2*, *Pk-1*, *Pk-2*, *6Pgd*) were analyzed on Cellogel by standard electrophoretic procedures. Results are summarized in a cladogram (fig. 1).

Even though the number of populations so far investigated is rather low, results show that bivoltinism probably evolved more than once, for instance in NW Spain and C Liguria. A consequence of this finding is that either *Polyommatus* (*Lysandra*) *hispanus* does not represent a homogeneous (single) taxon, or alternatively, monovoltine and bivoltine populations might represent but one species.

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Structure génétique
des populations de *Parnassius mnemosyne* (L.)
dans le sud de la France.
Étude biométrique et électrophorétique.
(Papilionidae)

Michel NAPOLITANO

Une étude de la variabilité phénotypique et génotypique de 24 populations de *Parnassius mnemosyne* (L.) a été réalisée dans le Sud de la France (fig. 1). La plupart des colonies échantillonnées vivent dans les Alpes, où l'espèce est répandue, ou dans les massifs périphériques. Le papillon existe également dans le Massif Central et les Pyrénées, où deux échantillons ont été prélevés.

L'étude biométrique a porté sur douze des paramètres les plus caractéristiques des ailes, qui ont été mesurés au micromètre étalonné. Une électrophorèse sur gel d'amidon a été pratiquée sur 23 locus enzymatiques dont 9 se sont révélés polymorphes. Un traitement informatique des données a permis de calculer les distances biométriques (x^2 euclidienne) et une distance génétique (I de Nei) entre l'ensemble des 24 populations, d'effectuer des épreuves de classification automatique et de réaliser des diagrammes d'analyse factorielle des correspondances.

La lecture du dendrogramme obtenu à partir de l'étude biométrique permet de diviser l'ensemble des colonies en six groupes de taille inégale (fig. 2) ; la partition réalisée rend compte de 55% de la variance totale. La plupart des regroupements sont satisfaisants à un point de vue écogéographique. Ces résultats sont bien visualisés sur le plan principal de l'AFC (fig. 3) ; celui-ci rend compte seulement de 46% de l'inertie totale, ce qui est assez peu. Cependant, on relève quelques aspects paradoxaux, comme l'isolement dans le dendrogramme et sur le diagramme d'AFC de la population très centrale de la forêt de Mélan et le regroupement de la vallée de la Lance (haut Verdon) avec le Nord du Briançonnais.

Le dendrogramme électrophorétique suggère cinq groupements (fig. 4) dont la cohérence géographique est évidente ; la partition rend compte de 81% de la variance. L'AFC confirme la classification précédente, avec quatre groupes bien individualisés selon les deux premiers axes (qui représentent 71,3% de l'inertie totale) (fig. 5).

La comparaison entre le coefficient d'aplatissement moyen des mesures biométriques, qui donne une idée de la variabilité absolue de celles-ci, et du taux d'hétérozygotie, qui est tiré des données électrophorétiques et renseigne sur la diversité génétique des populations, est particulièrement intéressante (fig. 6). Elle montre une corrélation très significative entre les deux types de données.

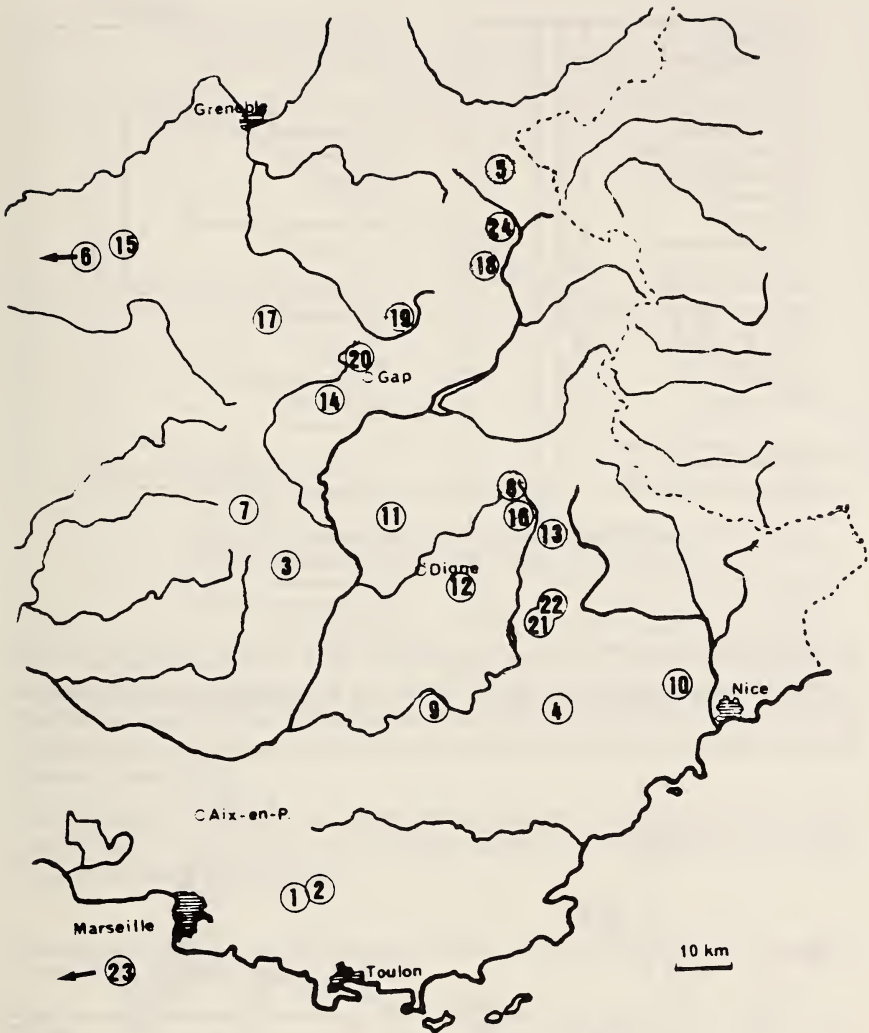


Fig. 1. Localisation des prélèvements. 1. Sainte Baume Ouest ; 2. id., Est ; 3. Montagne de Lure ; 4. Mgne de La Chens ; 5. Névache ; 6. forêt de Bonnefoy (Ardèche) ; 7. Mgne de Chamouse ; 8. la Foux d'Allos ; 9. gorges du Verdon ; 10. col de Vence ; 11. forêt de Mélan ; 12. les Dourbes ; 13. vallée de la Lance ; 14. Mgne de Céuze ; 15. col de la Bataille ; 16. sommet de l'Autapie ; 17. Lus la Croix Haute ; 18. Puy Saint Vincent ; 19. les Infournas ; 20. col de Gleize ; 21. Mgne de Chamatte ; 22. Montagnone ; 23. val de Galbe (Pyrénées Orientales) ; 24. les Combes.

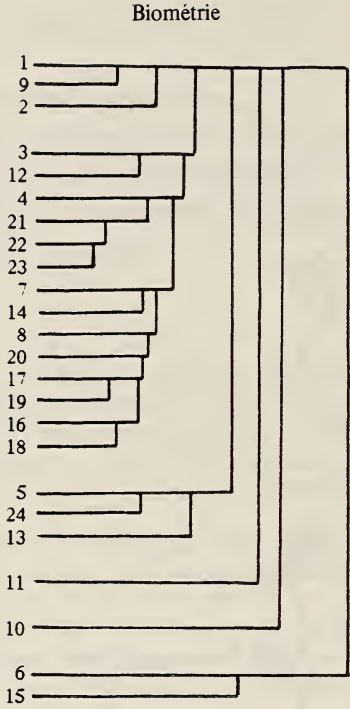


Fig. 2. Dendrogramme (dist. du x^2).

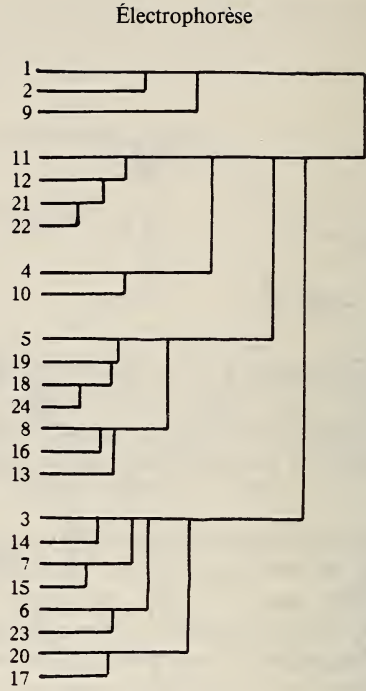


Fig. 4. Dendrogramme (dist. de Nei).

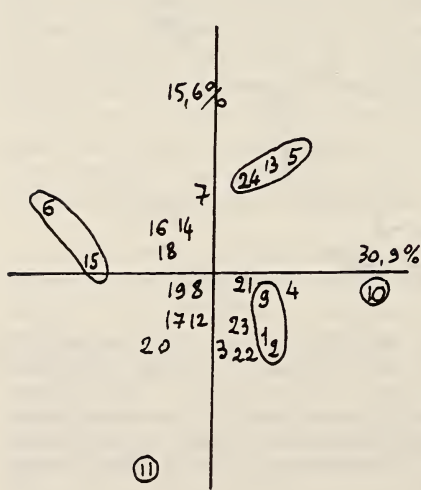


Fig. 3. Analyse factorielle des correspondances.

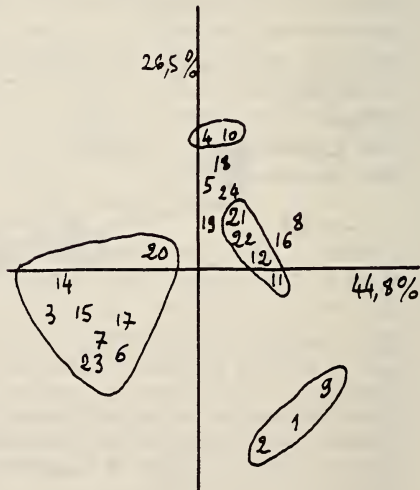


Fig. 5. AFC.

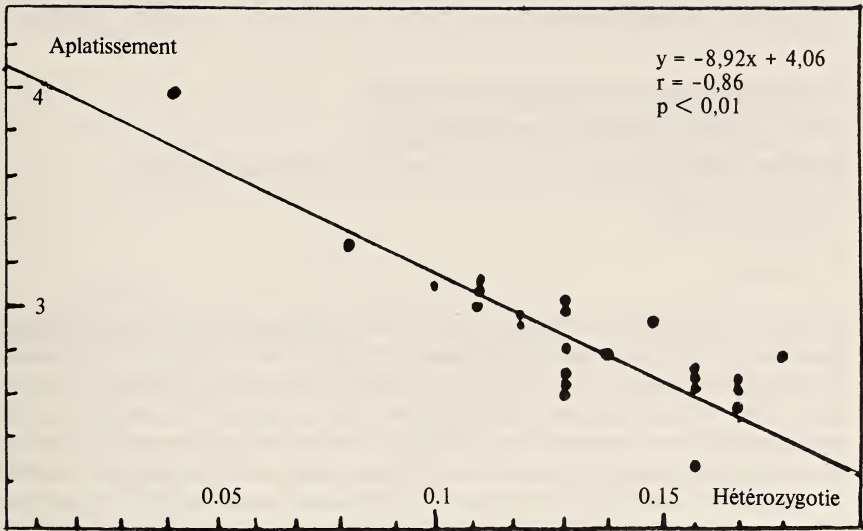


Fig. 6. Régression linéaire de l'aplatissement moyen des mesures biométriques contre le taux d'hétérozygotie.

Une coïncidence partielle peut être observée entre les deux classifications (en particulier dans le regroupement de la Sainte Baume et du Verdon). La classification électrophorétique permet de dégager des ensembles particulièrement cohérents. Les données électrophorétiques «répondent» bien mieux aux méthodes d'analyses que les données biométriques.

Particulièrement frappante nous paraît être la diminution corrélée des deux mesures, phénotypique et génotypique, de la diversité. Elle touche les populations à la mesure de leur isolement géographique.

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An attempt at a numerical model of the phylogenetical relationship between the genera of the tribe Gnorimoschemini (Gelechiidae)

D. POVOLNÝ

In view of the inherent difficulty in discerning apomorphic from plesiomorphic characters on the specific and generic level of the gelechioid tribe Gnorimoschemini, an attempt was made to interpret the phylogenetic relationships between 44 genera of this tribe. For this purpose 127 characters of the male and 42 characters of the female genitalia were analysed, and a five step gradient was elaborated to characterize the forewing pattern. In such a way a primary matrix was constructed, whereby the number of specific taxa belonging to the individual genera was also considered. As similarity functions, the Jaccard-index for binary data and Wishart-index for quantitative data were used. The above character complexes were classified both as weighted and unweighted data. For the cluster method of the hierarchic classification unweighted mean values were used and for non-hierarchic classification polar ordination was applied. The most successful classification was then transformed into a three dimensional idealized model of possible natural relationships of the treated genera. Despite the obvious methodological difficulties of numerical taxonomy, the proposed model of the relationships between the treated genera revealed a considerable coincidence of results when compared with our purely empirical knowledge of those relationships. This indicates that numerical taxonomy may positively contribute to the phylogenetic interpretations of relationships between taxa in situations where cladistic methods cannot be applied, due to the virtual impossibility to recognize the quality of characters studied.

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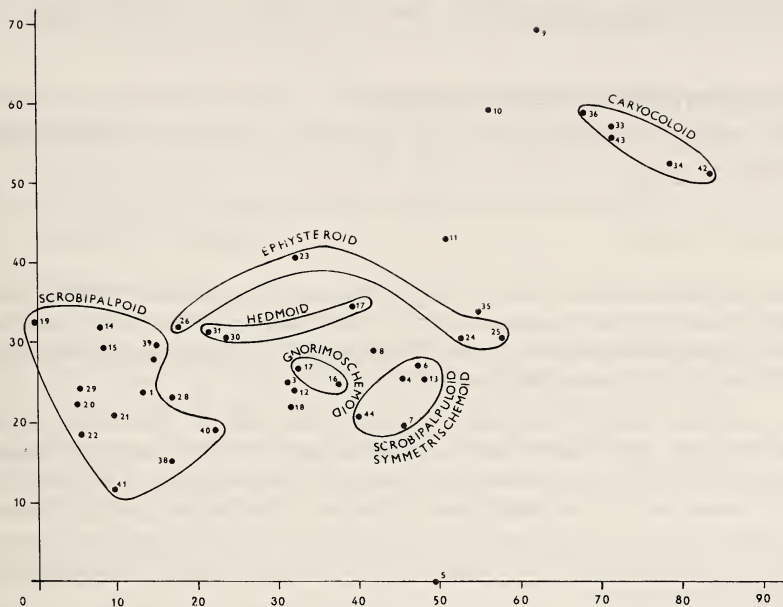


Fig. 1. Polarordination of gnorimoschemine genera (black dots with numbers from 1-44) whereby the pairs of genera *Euscrobipalpa*-*Caryocolum* and *Scrobipalpa*-*Keiferia* were used as ordination poles. (Results of the Wishart Index application with primary data standardized in percent).

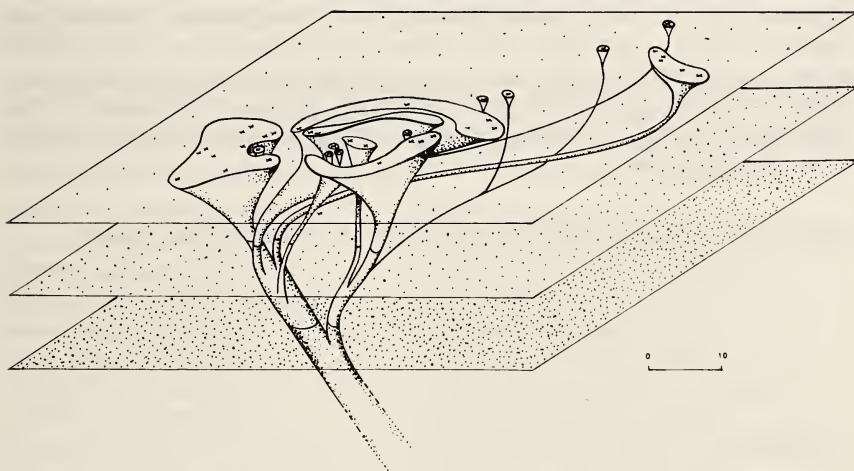


Fig. 2. Proposal of a tridimensional presentation of the phylogenetic relations within the tribe Gnorimoschemini based on previous polarordination. For details see POVOLNÝ & ŠUSTEK in 'Festschrift zum 85. Geburtstag von Dr. Josef KLIMESCH', Linz, 1988 (*Stapfia* 16 : 209-247).

Micropterigidae in fossil resins with special emphasis on the past and present distribution of this family

Andrzej W. SKALSKI

Micropterigidae constitute nearly 2% of all lepidopterous inclusions of fossil resins ranging in age from the Cretaceous to the Tertiary. Remains of these moths fossilized in other conditions are extremely rare. The majority of the micropterigid fossils have been found in the Eocene Baltic amber.

The systematic status of the fossil Micropterigidae from the Mesozoic remains unclear. In the Baltic amber there are representatives of both main phylogenetic lineages of the family, the so-called *Micropterix* and *Sabatinca* groups of genera. The first is represented by the recent genus *Micropterix*. The second by extinct genera, and species similar in many aspects of morphology to the South American *Hypomartiria micropteroides* and other members of the *Sabatinca* group occurring in the Southern Hemisphere.

The genus *Micropterix* occurs primarily in the West Palaearctic where about 70 species have been described, whereas in the East Palaearctic only 1 or 2 species are recorded. The *Sabatinca* group consisting of 8 genera, has a largely circum-Pacific distribution and also occurs on the Cape of South Africa. Fossil records and present distribution of the Micropterigidae support the theory that its main lineages originated on the Laurasia paleocontinent prior to the separation of several land masses or during a geological period when the continents were still in close proximity, a situation prevailing in early and mid-Mesozoic. The genus *Micropterix* became well established in the West Palaearctic, whereas the ancestors of the *Sabatinca* group which inhabited this region during the Tertiary became extinct during the Pleistocene.

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Faunistics and biogeography – Faunistik und Biogeographie – Faune et biogéographie

The Tortricidae fauna of the nature reserve park 'La Albufera' (Spain)

Joaquín Baixeras ALMELA

The 'La Albufera' nature reserve park is one of the most interesting marshy areas of the Iberian Peninsula. Recently protected by law, this park includes a littoral forest, 'El Saler', and the lake of 'La Albufera' that gives the park its name.

This interesting area has unfortunately suffered from human activities ; the water has become polluted and land was lost to urban developments in the 1960's. These have now been stopped, but their effects can still be observed.

The insect fauna is clearly one of the most important biological aspects of the area, but unfortunately we cannot assess the impact of these environmental changes since, perhaps with the exception of the Coleoptera and Hemiptera, there are very few old records. Several reports have focused on the Lepidoptera and perhaps the best known family may be the Noctuidae, of which 91 species have been recorded. Several are very rare in the Iberian Peninsula, such as *Brithys crini* (F.), *Mythimna straminea* (Tr.), *M. umbriger* (SAALM) and *M. joannisi* (BOURSIN & RUNGS). Moreover the Lymantriid and Cossid moths *Laelia coenosa* (Hb.) and *Phragmatocia castaneae* (Hb.) are known to have large populations in the marshy areas of the zone.

Very little data on the Microlepidoptera fauna is available, and the main aim of this paper is to present the more interesting Tortricidae of the area. So far 32 species have been recorded from the park, the majority coming from a sample of nearly 1300 specimens taken in a light trap run there in 1983 and 1984. The species are :

<i>Trachysmia simoniana</i> (STGR.)	<i>Lobesia bicinctana</i> (DUP.)
<i>Stenodes hilarana</i> (H.-S.)	<i>Ancylis sparulana</i> (STGR.)
<i>Stenodes cultana</i> (LED.)	<i>Crociosema plebejana</i> (ZELL.)
<i>Phalonidia contractana</i> (ZELL.)	<i>Epinotia thapsiana</i> (ZELL.)
<i>Aethes languidana</i> (MN.)	<i>Acroclita subsequana</i> (H.-S.)
<i>Aethes bilbaensis</i> (ROESSL.)	<i>Gypsonoma minutana</i> (HB.)
<i>Cochylidia heydeniana</i> (H.-S.)	<i>Gypsonomoides trochilanus</i> (FROEL.)
<i>Cochylis posterana</i> (ZELL.)	<i>Eucosma expallidana</i> (HAW.)
<i>Xerocephasia rigana</i> (SODOFF.)	<i>Eucosma maritima</i> (WEST. & HUMPHR.)
<i>Cacoecimorpha pronubana</i> (HB.)	<i>Eucosma conterminana</i> (H.-S.)
<i>Lozotaenia cupidinana</i> (STGR.)	<i>Rhyacionia buoliana</i> (D. & S.)
<i>Clepsis pallidana</i> (F.)	<i>Rhyacionia maritima</i> (PROESE)
<i>Clepsis consimilana</i> (HB.)	<i>Clavigesta sylvestrana</i> (CURT.)

Bactra venosana (ZELL.)

Bactra bactrana (KENN.)

Bactra robustana (CHRIS.)

Cydia ulicetana (HAW.)

Cydia fagiglandana (ZELL.)

Cydia amplana (HB.)

Some of these species, e.g. *C. consimilana*, *B. venosana*, *C. plebejana* and *E. conterminana* probably originated from crops nearby. However, others are more interesting, being characters of salt marshes and littoral zones : *A. subsequana*, *E. expallidana* and *E. maritima*. *T. simoniana* and *A. sparulana* are both scarce Iberian endemics, the latter with a large population at La Albufera. *B. robustana* is new to the Iberian Peninsular, and the recently described *R. maritima* seems to be a rare Mediterranean species.

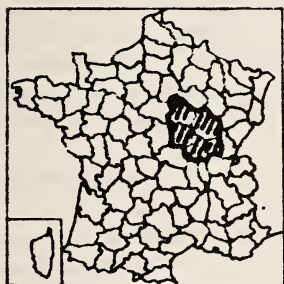
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Utilisation d'un inventaire cartographique et de ses délimitations en régions entomofaunistiques. Le cas des Hesperioidea et Papilionoidea de la Bourgogne (France)

Cl. DUTREIX

La partie méthodologique est développée en détail dans une thèse, soutenue en 1986 et éditée en 1988. Signalons succinctement que l'atlas cartographique des espèces est établi d'après un carré UTM — carroyage Universal Transverse Mercator — de 10 km de côté comme unité de situation opérationnelle. Sa mise à jour permanente jusqu'en mars 1988 prend ainsi en compte l'intégralité des observations de R. ESSAYAN et de l'auteur durant la période 1976-1987. D'autre part, la visualisation de l'affinité entomofaunistique a été possible par un travail considérable d'analyse statistique multidimensionnelle (analyse factorielle des correspondances et classification automatique). Pour ces cartes synthétiques, deux sorties graphiques sont ainsi proposées, grâce à l'utilisation des méthodes statistiques sans et avec la contrainte de contiguïté spatiale, pour définir des unités et des secteurs «entomogéographiques».

Cet objectif atteint, nous bénéficions désormais d'un acquis appréciable pour aborder certains aspects de la «biogéographie appliquée». Dans l'établissement de la liste des «espèces menacées», il s'est avéré rapidement que la création d'un indice spécial était superfétatoire. Nous avons donc commencé par effectuer l'inventaire des espèces qui ne semblent pas menacées à court terme, puis le classement de celles qui peuvent être directement menacées, sur la base des statuts de l'UICN. Ainsi, les «espèces menacées» sont évaluées pour les 128 taxons à environ 23%, réparties de la manière suivante :



- * en danger d'extinction : 2 (1,56%)
- ** vulnérables : 8 (6,25%)
- *** rares : 19 (14,84%)
- statut indéterminé : 8 (6,25%)
(espèces acclimatées, signalées avant 1950, en limite de leur aire de répartition)
- «hors danger» (6)
(législation nationale en vigueur pour la protection partielle ou totale des espèces)

Il convient donc de s'interroger sur les raisons de la rareté de ces espèces afin de distinguer des données objectives de leur déclin (raréfaction/disparition).

Nous envisageons différentes causes :

1. Hyperlocalisation des plantes nourricières (biotopes restreints) :
** *Satyrium w-album* KNOCH, ** *Cupido osiris* MEIG., ** *Maculinea (alcon) alcon* D. & S., *** *Maculinea (alcon) rebeli* HIRSCHKE, *** *Polyommatus thersites* CANT., * *Boloria aquilonaris* STICH., ** *Coenonympha tullia* MÜLL.
2. Facteurs — vraisemblablement — d'origine naturelle (modifications climatiques, ...) :
*** *Pontia daplidice* L., * *Coenonympha hero* L., ** *Hipparchia statilinus* HFN., ** *Chazara briseis* L.
3. Facteurs anthropiques (circulation routière, essences non indigènes, ...) :
** *Limenitis populi* L.
4. Espèces localisées qui ont toujours été probablement rares (sensibles aux modifications de biotopes et aux récoltes abusives) :
*** *Carcharodus flocciferus* Z., *** *Pyrgus alveus* HB., *** *Pyrgus (carlinae) cirsii* RBR., *** *Pyrgus carthami* HB., *** *Euchloe (ausonia) crameri* BUTLER, *** *Satyrium spini* D. & S., *** *Satyrium acaciae* F., *** *Heodes alciphron* ROTT., *** *Palaeochrysophanus hippothoe* L., *** *Lampides boeticus* L., *** *Pseudophilotes baton* Bergstr., *** *Plebejus argus* L., ** *Polyommatus dorylas* D. & S., *** *Fabriciana niobe* L., *** *Euphydryas maturna* L., *** *Mellicta parthenoides* KEF., *** *Lopinga achine* SCOP.

Référence

DUTREIX, Claude, 1988. Le peuplement des Lépidoptères de la Bourgogne (Hesperioidea, Papilionoidea). Société d'Histoire naturelle et des amis du Muséum d'Autun, éd., 277 pp.

Adresse de l'auteur : SHN Autun, 15 rue Saint-Antoine, F-71400 Autun, France.

Biogéographie de *Graellsia isabelae* GRAELLS (Saturniidae)

Albert MASÓ I PLANAS et Pierre WILLIEN

Adaptation au milieu

G. isabelae est une espèce adaptée à un milieu très concret. Les conditions optimales d'émergence de l'imago sont : de 20 à 25°C, de 70 à 80 p. 100 d'humidité. Celles-ci se produisent au printemps dans les écosystèmes où on la rencontre. L'imago vole de la fin mars au début du mois de juillet, avec une densité optimale de vol en mai, encore qu'au nord des Pyrénées elle puisse avoir lieu en juin. Les ♀ émettent des phéromones, mais les ♂ se montrent lorsque la température est supérieure à 13°C et l'humidité inférieure à 80 p. 100. Ce minimum thermique est inférieur à la normale chez les insectes, ce qui lui permet de s'adapter aux milieux froids (durant les nuits de printemps) où croissent les forêts d'arbres dont se nourrissent les chenilles : *Pinus sylvestris* et *P. nigra*. La chrysalide hiberne (la température optimale de mortalité minimale se situant entre 8 et 12°C).

Écologie

Contrairement à ce qui a été affirmé, l'altitude minimale où puisse vivre l'espèce n'augmente pas à mesure que diminue la latitude. Cette confusion provient sans doute de la rareté des citations la concernant. Maintenant que nous connaissons mieux sa biogéographie, nous sommes en mesure d'affirmer qu'elle manifeste tout simplement une nette préférence pour le climat continental et, surtout, qu'elle suit les forêts des deux conifères mentionnés plus haut.

Il n'est pas plus exact, tel que cela a été publié, qu'elle ne puisse vivre en dessous de 1000 m. S'il est des zones où elle n'apparaît pas, c'est uniquement dû au fait que ces dernières n'abritent aucun des deux pins en question, ou que l'espèce n'y est pas encore arrivée. L'altitude et autres facteurs n'y sont donc pour rien, puisqu'en Catalogne elle a été capturée à 215 m (Garrotxa), 200 m (Empordà), 170 m (Banyoles) et même 95 m (Cornellà del Terri, Gironès). Ce qui est certain, en revanche, c'est qu'elle évite le littoral.

Répartition

Limitée à la péninsule ibérique et au sud-est de la France, elle constitue 8 populations au total :

2 en France :

- au nord du Massif central, il y a quelques références, mais on ne peut pas considérer qu'il y existe une population.

- dans le Jura (Ain), presque touchant l'ouest de la Suisse.
 - Hautes-Alpes, longeant la frontière franco-italienne. Il s'agit de la population la mieux établie et la plus étendue de la France, parvenant jusque dans les Alpes-Maritimes.
- 2 dans les Pyrénées :
- occidentales : nord-est du Pays basque (Navarre) et moitié septentrionale de la province de Huesca.
 - orientales : centre et nord de la Catalogne, jusqu'au versant français (Vallespir et haute Cerdagne). C'est la zone la plus vaste et où l'espèce s'est le mieux adaptée : elle a été rencontrée dans 86 localités.
- 4 dans la péninsule ibérique :
- cols de Caro, à proximité du delta de l'Ebre. C'est la population la moins abondante de la péninsule.
 - sierras de Albarracín, Javalambre, Gudar, Penyalgosa, montes Universales et serranía de Cuenca (provinces de Teruel, Cuenca et Castellón).
 - sierra de Guadarrama, à l'ouest de la province de Madrid et régions limitrophes. C'est la seule population qui ne puisse se nourrir que de *P. sylvestris*.
 - sierras de Cazorla et Segura, dans la province de Jaén, la seule où il n'existe que des forêts de *P. nigra*.

Isolément géographique

Les populations françaises sont nettement séparées les unes des autres, ce qui ne semble pas être le cas de toutes celles de la péninsule ibérique. Cependant, le fait qu'elles aient toujours été considérées comme telles a entraîné la description de diverses sous-espèces, dont pas une seule, à nos yeux, n'est suffisamment prouvée. En ce qui concerne les zones de Jaén et Guadarrama, la séparation est nette, même s'il existe dans la province de Ségovie des forêts de *P. nigra* s'étendant jusqu'à Teruel-Cuenca. À son tour, cette dernière population pourrait être rattachée à la minuscule population des cols de Caro et ce, par les montagnes du Maestrat, concrètement par les cols de Morella, où l'on rencontre des forêts de *P. sylvestris* et même de *P. nigra*. Cette zone de Caro est incontestablement limitée au nord par le Bassin de l'Ebre, étant donné qu'il existe de part et d'autre du fleuve une vaste étendue totalement dépourvue de pins.

La connexion la plus évidente à nos yeux est celle des Pyrénées. Traditionnellement, on supposait que la frange de séparation entre la population occidentale et la population orientale occupait tout le nord de la province de Lérida, de Huesca à l'est d'Andorre. Cependant, à l'heure qu'il est, grâce aux spécimens que nous avons récoltés, nous pouvons prouver que la population orientale s'étend plus à l'ouest (elle vit dans la région ouest de l'Andorre) ; nous l'avons rencontrée, en particulier, à Jou, au centre de la prétendue frange de séparation, ce qui nous entraîne à affirmer que cette dernière est circonscrite à l'espace transversal que détermine le val d'Aran. De futures prospections confirmeront ou non cette hypothèse selon laquelle les deux

populations des Pyrénées se confondent et ne forment qu'une seule aire très étendue. Il faut tenir compte du fait que les deux conifères précités se rencontrent d'un bout à l'autre du territoire.

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Past and present studies on the Mongolian Lepidoptera fauna

L. PEREGOVITS

From the mid 19th century to the first three decades of the 20th century, collecting in Mongolia was restricted mostly to expeditions which had as their main interest China, Tibet or southern Siberia. These expeditions usually crossed the present territory of Mongolia via the Great Lakes Basin or Ulaan-Baator (Urga).

Although the territory was poorly explored, some well-known collectors of this period (e.g. LEDERER, AVINOV, GROUM-GRSHIMAILO) collected here. The material collected was studied by STAUDINGER, ALPHÉRAKY and GROUM-GRSHIMAILO, and several papers were published at the end of the 19th century. For a long period, these papers had been the only source for scientists interested in the Lepidoptera of this part of the Palaearctic region.

Entomological collecting activity increased again at the beginning of the 1960's. Most of these expeditions were organised and led by entomologists, although only a few lepidopterists were involved. This meant that the collecting of Lepidoptera was only of secondary interest, and was usually restricted to the butterflies. It should be mentioned that the late Z. KASZAB, former General Director of the Hungarian Natural History Museum, collected an enormous amount of insect material, including some 41,000 Lepidoptera. Though some papers were published in the series "Insects of Mongolia" (Science Press, Leningrad), the Lepidoptera material collected by the Mongol-Soviet joint biological expeditions has not yet been fully investigated. As far as I know, the majority of the material is deposited between layers of cotton-wool at the Zoological Institute in Leningrad awaiting pinning and labelling. Of course there were several other less extensive collecting trips, most of which received little attention, or the results of which were not published.

In 1986, 1987 and 1988, there were four Hungarian lepidopterological expeditions to Mongolia. The participants, apart from the author and M. HREBLAY, were G. FÁBIÁN and G. RONKAY in 1986, A. OROSZ and T. STÉGER in 1987, and Z. VARGA in 1988. The fourth expedition was undertaken by P. GYULAI and Z. VARGA in 1986. Their trip took place at about the same time as that mentioned above, but the route was different (Fig. 1). The aim of these expeditions was to sample the Lepidoptera fauna, with emphasis on the macrolepidoptera, using various methods. More than 50,000 "macros" were collected, the majority of which have already been identified. Further expeditions should concentrate on the rather poorly known desert and high mountain (alpine) habitats, which cover nearly 20% of the country.

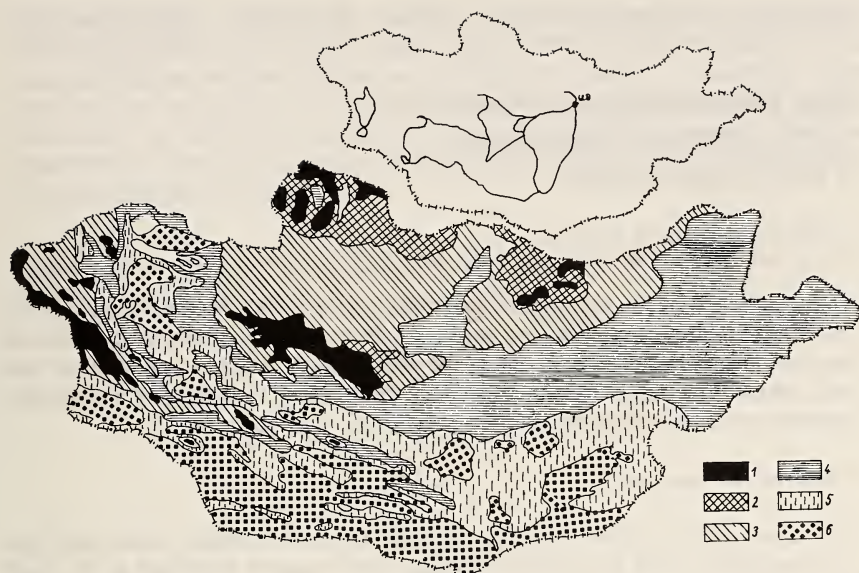


Fig. 1. Vegetation map of Mongolia. 1. Alpine belt, 2. Montane taiga, 3. Montane forest steppe, 4. Tall grass steppe, 5. Short grass steppe, 6. Desert. Above : the routes taken by the various expeditions.

Although results on some groups (Diurna, Arctiidae and a few Noctuidae groups) have been published or are in print, our final aim is to summarize the findings in a book on the Mongolian Lepidoptera.

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The Macrolepidoptera fauna of the Eastern Carpathians : a multivariate study

L. PEREGOVITS and J. PODANI

Our knowledge of the macrolepidoptera fauna of the Eastern Carpathians is still insufficient. Only sparse data have been published and the localities investigated are unevenly distributed. The objective of the present study is to evaluate available data and materials by multivariate methods in order to show the influence of collecting intensity on biogeographical classification.

Material and methods

The present study utilizes checklists compiled by the first author during field trips to Transylvania from 1978-1984, published data, material deposited at the Zool. Dept. of the Hung. Nat. Hist. Mus., and private collections. The faunistic records were entered in a computer data base. A presence/absence matrix composed of 878 species and 137 localities was extracted from the data base. The number of species per locality ranged from 1 to 449, reflecting an extreme imbalance of sampling. Therefore, we decided to examine the effect of reducing the number of localities upon the result. In the first step, localities with less than 23 species were omitted, so that 54 localities and 869 species remained. In the subsequent steps the threshold was set to 60 and then to 90 species, yielding 30 localities with 850 species, and 18 localities with 833 species (Fig. 1), respectively. The three data matrices were subjected to clustering and principal co-ordinate analysis (PCoA), using programs NCLAS2 and PRINCOOR of the SYN-TAX III package written by the second author. The dissimilarity coefficient was the complement of Jaccard's index ; single and complete linkage methods were selected for clustering. PCoA was based on the same dissimilarity measure.

Results and discussion

Results of single linkage clustering exhibit chaining (therefore not presented here), an effect characterizing situations when no sharp clusters can be delimited. Only a few pairs or small clusters could be recognized. Complete linkage forced a group structure on the data (Fig. 2), and these groups are not always recognizable in single linkage and PCoA results (Fig. 3). The eigen-values associated with PCoA axes are very small and slowly increase, further suggesting that no clear-cut data structure exists. However, it is worthwhile to examine how the positions of the 18 localities are influenced when additional localities are added to the analysis. Comparison of the three ordinates show that increase in sample size does not change the relationships

among the objects of the basic set. Numbers of species are important in determining these relationships, but closely related objects are often found together in the diagrams despite the great differences in their species number. A conclusion is that one must be very careful when interpreting biogeographical classifications, because differences in collecting intensity may obscure similarities between localities. Nevertheless, obvious biogeographical relationships remain visible even if differences in species number are great.

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Fig. 1. The distribution of the 137 collecting localities. The localities with less than 23 collected species are marked with dots, those with > 90 species with numbers 1-18, those with 60-89 species with numbers 19-30 and those with 23-59 species with numbers 31-54.

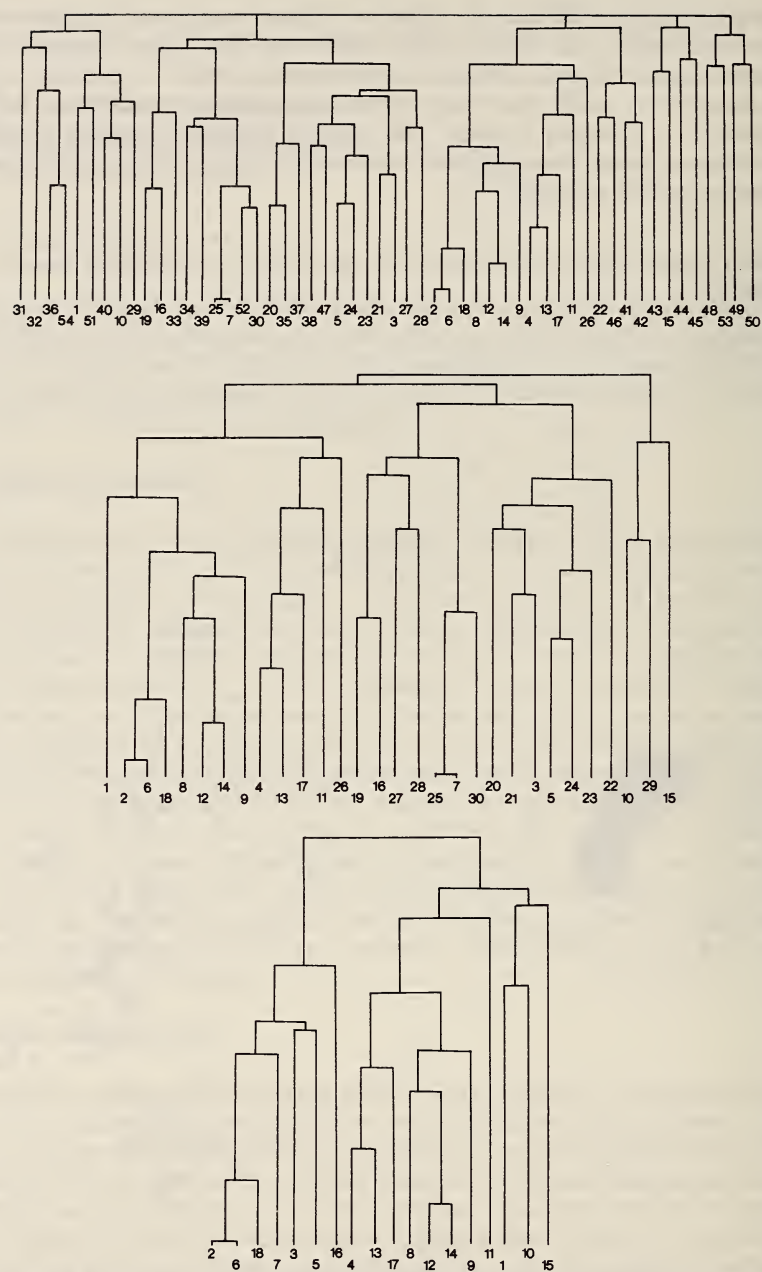


Fig. 2. The results of the complete linkage cluster analysis of 18, 30, and 54 localities, respectively (for explanation see Fig. 1).

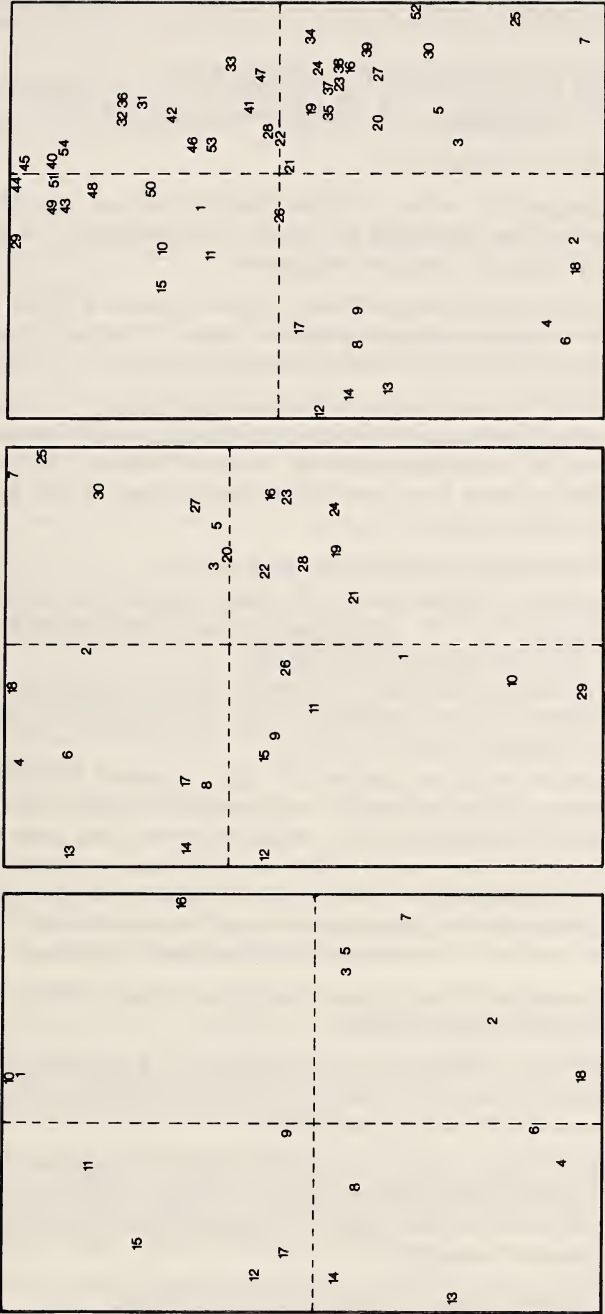


Fig. 3. The results of the PCoA of 18, 30 and 54 localities, respectively (for explanation see Fig. 1).

Geographical distribution of Lepidoptera in the Italian peninsula : A numerical analysis (*)

Tommaso RACHELI & Alberto ZILLI

An overall biogeographical survey of Italian Macrolepidoptera has never been undertaken. None the less, our actual knowledge of taxonomy and distribution of many Lepidopterous taxa is more than satisfactory.

The similarity index for binary data proposed by BARONI-URBANI & BUSER has been used to ascertain the faunal relationships between areas on the basis of studies on Papilionoidea, Hesperioidea and Noctuidae, comprising a total of 951 species.

A data matrix of the 951 taxa according to their presence/absence in 13 regions was set down. The regions were arranged not as strictly political units, but lumped into more "natural" regions. As faunistic data were poor for Campania, the presence of many species likely to occur there were added. Corsica, Sardinia and Sicily have been excluded from the analysis.

A single-link cluster analysis gave the following results :

- (1) The cluster relative to Noctuidae + Papilionoidea + Hesperioidea exhibits a high degree of similarity at 0.75, differentiating however three subclusters which identify the Alps, the Apennines and Liguria ;
- (2) The cluster relevant to Noctuidae (714 species) shows a difference for Toscana due to a probable underestimation of the data, while Piemonte + Val d'Aosta is significantly removed from the Alps ;
- (3) The Hesperioidea, being few species (30), give no general information, displaying however a high homogeneity in the distribution due to the relatively high incidence of eurieious species which are spread over large territorial zones ;
- (4) The cluster for Papilionoidea, comprising 207 species, exhibits four main subclusters, one centred in Piemonte and the others representing the central-eastern Alps, northern Apennines and central-southern Apennines.

The main result emerging from the present analysis is the high degree of faunistic similarity between all the regions studied.

The data obtained with quantitative methods reflect the actual scenario without considering the species qualitatively ; each have different population dynamics, and are distributed according to their unique history.

The high number of species used in the present analysis is suggestive of a "true" homogeneity of the Macrolepidoptera in the Italian peninsula, with small geographical differences from North to South where the Apennines have played and still play a major role in faunistic balancing.

(*) The research has been supported by grants M.P.I. 40% and 60%.

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Les Lépidoptères et la végétation dans la zone sommitale du massif du Crêt de la Neige (Ain, France)

P. RÉAL

Notre collègue J. F. Prost a inventorié environ 470 plantes supérieures dans la zone sommitale du Crêt de la Neige. Nous pouvons faire état d'environ 560 Lépidoptères (dont 406 «Macro»).

Plantes et Lépidoptères ont subi les mêmes vicissitudes dès avant l'ère tertiaire jusqu'à aujourd'hui. Cependant le spectre biogéographique des deux ensembles est très différent. Notre communication ne portera que sur les «Macrolépidoptères».

Chez les plantes, 30% sont endémiques européennes, contre 2,2% chez les Lépidoptères. On pourrait admettre que la qualité «européenne» est une variante de l'ensemble du fonds commun eurasiatique dont le total chez les plantes atteindrait alors 57%. Chez les Lépidoptères, 63% des espèces sont de ce type.

Les grandes différences s'observent dans les proportions des sphères froides (alpine, boréoalpine, hygroholarctique) et chaudes (diverses méditerranéennes, sarmatiques) qui constituent respectivement chez les plantes 31 et 7% des espèces, et chez les Lépidoptères 17 et 18%. Cette situation provient de ce que les Lépidoptères qui sont mobiles ont abandonné le Crêt de la Neige lors du réchauffement postwürmien tandis que les plantes tendaient à rester sur place, avec un faible apport méridional. D'où une modification partielle de l'allure de la faune, et une adaptation progressive aux plantes locales.

Il aurait été intéressant de s'attarder aux différences d'ordre systématique. On se bornera à ce qui suit. Les Lépidoptères ont de grandes familles cosmopolites, Noctuides (ici 22%), Géométrides (ici 26%) ; la plus grande famille botanique, les Composées, est limitée à 12%, les Graminées à 9%, les Papilionacées à 5%, les Rosacées à 4,5% etc. Là encore il est évident que le rôle des diverses familles comme supports ne sera pas en rapport avec le % d'espèces.

Nous avons tenté, à partir d'un fichier plantes-hôtes/Lépidoptères, d'évaluer la liaison. Il en est sorti que la mobilité des chenilles dans l'intérieur d'une famille botanique est l'apanage de 27% des espèces, et d'une famille à l'autre, de 30,5%, à l'échelle française. Cependant sur le total de nos captures en zone altitudinale, plus de 300 espèces dépendent d'une seule famille.

En considérant les espèces qui habiteraient les plantes rencontrées et les espèces voisines sur lesquelles une adaptation est très probable, nous avons chiffré une faune virtuelle d'environ 1000 espèces. Le massif supporterait donc 1550 espèces et un gros travail reste à faire surtout chez les ex-«Micros».

Nous aboutissons enfin à classer les espèces en allant de la plus grande polyphagie à la stricte monophagie. La zone sommitale restreint un peu les données et certaines

espèces y sont probablement contraintes à la monophagie, sauf migration. Ce phénomène n'a pas une grande ampleur. 9% des espèces vivent sur au moins 4 familles botaniques : souvent on observe une pseudo-oligophagie de base, élargie ensuite. 10% d'espèces, surtout des Géométrides, vivent sur 3 familles.

16% vivent sur seulement 2 familles : 1/5 est pseudo-oligophage ; 1/4 choisit deux familles voisines du point de vue systématique, surtout Dialypétales ; 1/5 est centré sur les Ericacées ; d'autres autour de *Thymus serpyllum*, de Composées et de Dipsacacées.

315 «Macros» vivent sur une seule famille, sur un genre ou même une espèce (56 monophages). Nous ne pouvons, dans ce cadre, donner que quelques exemples : *Colias palaeno* L. vit sur *Vaccinium uliginosum*, *Eupithecia veratraria* H.-S. sur *Veratrum album*, *Minoa murinata* SCOP. sur *Euphorbia cyparissias*, *Zygaena fausta* L. sur *Coronilla vaginalis*, *Apamea platinea* TR. sur *Hippocrepis comosa*, *Adela fibulella* D. & S. sur *Veronica chamaedrys*, *Euphya frustata* TR. sur *Galium verum*, *Pterophorus nephelodactylus* EVERS. sur *Cirsium eriophorum* etc. Nombreux sont les exemples d'espèces ou de genres vivant sur un genre botanique.

Il paraît plus important de souligner un fait qui ne semble pas avoir été remarqué, tant à l'échelle générale (par ex. la France), que locale : il existe beaucoup plus d'espèces (25%) vivant sur des Composées, que l'importance numérique de cette famille ne permet de le supposer (12%). À l'échelle française, on remarque de même que des familles très évoluées se comportent ainsi : plus de 45% des *Cochylidae*, plus de 42% des *Pterophoridae*. Le phénomène s'accroît avec le degré d'évolution du groupe de Lépidoptères. On recherchera ce phénomène, ses modalités et ses causes chez d'autres familles botaniques très évoluées.

Les relations des Lépidoptères avec leurs plantes-hôtes sont très complexes. Encore n'a-t-on pas évoqué ce qui se passe chez les ex «Micros» et apparentés, ni les modes de nutrition, dont celui des imagines.

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Les Lépidoptères alpins et méditerranéens du massif du Crêt de la Neige (Ain, France)

P. RÉAL

Le Crêt de la Neige (1723 m) est le plus haut sommet du Jura, situé très au sud, mais il n'a l'horizon barré que sur 135° d'angle, principalement au sud par le Vercors et la Chartreuse (à env. 160 km) et dans le quadrant SE par les Alpes, Revard, Bauges, monts d'Annecy (à env. 50 km) puis par les Alpes cristallines (Reposoir et Dent du Misi, à 60 km). Il en résulte qu'il constitue un promontoire avec vue libre sur 225%.

La flore et la faune qui l'habitent illustrent cette particularité. Nous avons fait une série d'expéditions sur ce terrain difficile d'accès et avons par nos récoltes et quelques compléments de la littérature recensé plus de 550 espèces, dont 405 Macrolépidoptères dont la biogéographie est assez connue pour permettre des conclusions assez sûres. Il semble qu'antérieurement moins de 180 espèces aient été signalées au dessus de la forêt, en général, de 1350 à 1450 m, jusqu'aux sommets.

Dans la littérature, surtout helvétique, les sphères biogéographiques sont peu ou pas définies ; nous avons dû écarter, en principe, du sujet qui nous intéresse, de nombreuses espèces qui ne sont que des eurasiatiques orophiles, et faire le départ entre les méditerranéomontagnardes et les alpines ; en outre il faut distinguer entre alpines, boréoalpines, hygropholarctiques d'une part, méditerranéoasiatiques, atlantoméditerranéennes et parfois tyrrhéniennes, ou pontosarmatiques d'autre part. Les résultats sont les suivants.

1. Macrolépidoptères alpins, 20 dont 18 connus dans la littérature ; celle-ci contient de plus 9 espèces dont 3 sont les célèbres douteuses, *Oeneis glacialis* MOLL., *Parnassius phoebus* F., *Colias phicomone* ESP. ; 11 autres ont été rayées à juste titre par J. F. AUBERT.
2. Boréoalpins : 18 dont 8 connues dans la littérature qui mentionne 2 espèces à rayer de la liste jurassienne.
3. Hygropholarctiques : 4 espèces dont 3 déjà citées.
4. Méditerranéoasiatiques : 54 espèces dont 10 citées dans la littérature plus 11 autres citées qui n'atteignent peut-être pas les sommets.
5. Atlantoméditerranéens : 4 espèces plus 2 citées dans la littérature.
6. Méditerranéomontagnards : 14 dont 6 connus dans la littérature qui en cite encore deux autres.
7. Pontoméditerranéens : difficiles à définir, au moins 1 espèce.
8. Subtropicaux et plus ou moins cosmopolites : 3 (2 cités dans la littérature qui en cite 3 autres).

Autres Lépidoptères («Micros» etc.) : nous avons (les n° renvoient aux sphères ci-dessus) :

- 1 – 18 espèces dont 7 citées dans la littérature qui en indique 4 autres.
- 2 – 27 dont 10 dans la littérature où figurent 4 autres plus une à supprimer.
- 3 – 2 espèces, les autres holarctiques étant de zone tempérée (6 espèces).
- 4 – 28 espèces dont 2 dans la littérature où en figurent 8 autres.
- 6 – 6 espèces dont 3 dans la littérature.
- 7 – 1 espèce possible mais non déterminée avec certitude.
- 8 – 1 seule espèce (*Plutella xylostella* L.).

Un certain nombre d'espèces sont nouvelles pour le Jura :

- Autographa aemula* D. & S., alpin d'Eurasie, sur flancs E et W.
- Entephria contestata* VORBRDT., alpin, trouvé au Colomby de Gex.
- Aricia artaxerxes* F., très rare, au sommet du Crêt de la Neige.
- Catoptria luctiferella* HB., alpin, pris sous le Reculet.
- Kessleria saxifragae* STT., alpin, pris sous le Reculet.
- Epinotia granitana* H.-S., boréoalpin, dans les Conifères subsommitaux.
- Rhyacia helvetina* BSDV., méditerranéomontagnard pris sur le flanc E.
- Scotopteryx vicinaria* DUP., méditerranéomontagnard, pris sous le Reculet.
- Diceratura roseofasciana* MN., subsp. *leucanthana* CST. (S. du Reculet).

Nous devons signaler que quelques espèces mal connues, non encore retrouvées par nous, ont été découvertes pour la première fois en France dans le massif du Crêt de la Neige. Nous ne l'avons publié que pour *Blastotere laevigatella* H.-S. (trouvée depuis dans les Hautes-Alpes) ; ce sont aussi *Cataplectica silerinellet* Z., *Caloptilia loriolella* FREY et *Stenoptilia lutescens* H.-S. (bona sp. ?).

Au total nous attirons l'attention sur 140 espèces, 46 appartenant aux sphères biogéographiques froides, 94 aux chaudes, la littérature essentielle citant seulement 33 espèces de la première série, 36 de la seconde. À noter que 11 espèces appartenant aux sphères froides, prétendument présentes dans le Jura, ont été rayées de la liste. Mais notre travail ne nous a permis de récolter à ce jour, selon nos évaluations, qu'environ 1/3 de ce qui peut exister dans ce massif, les Lépidoptères autres que les «Macros» requérant une nouvelle prospection importante.

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Zoographical survey of the Mongolian Noctuidae fauna

Z. VARGA, L. RONKAY and L. PEREGOVITS

The importance of investigating the Mongolian lepidopterous fauna is emphasized by the following points: 1. The boundaries of some major faunal types with antagonistic dynamics, some of which overlap, run through the country; 2. It appears to be an important centre of diversification for some characteristic xeromontane and eremic genera. Our investigations were based on material consisting of more than 100,000 specimens collected mainly by Hungarian expeditions (see PEREGOVITS, this Supplement, p. 00).

The present fauna has been determined by the extreme continental climate, the varied orographical and edaphic conditions of the region, and historically by the effect of the great climatic fluctuations during the Pleistocene. The S. Siberian taiga, montane taiga, altoherbosa and the "arboreal derived tall grass" steppe faunas have been displaced by the non-arboreal faunas of xeromontane and eremial types. The contact zones of some W. and E. Palaearctic subspecies of some species (e.g. *Polia bombycina* HUFNAGEL) are to be found here.



Fig. 1. The distribution of a selection of species typical of their faunal types: **Manchurian arboreal**: *Hydraecia mongoliensis* URBACH (large open triangle); **Siberian arboreal**: *Xestia sincera* H.-S. (filled diamond), *Polia vespertilio* DRAUDT (tall open triangle); **tundra-alpine and alpine**: *Xestia laetabilis pergratiosa* KOVÁCS and VARGA (filled circle), *Lasionycta leucocycla altaica* STGR (crossed circle), *Estimata herichschaefferi* ALPHÉRAKY (inverted filled triangle).



Fig. 2. As Fig. 1. **Xeromontane** : *Dichagyris ignara* STGR (filled triangle), *Dichagyris kaszabi* VARGA (filled circle), *Rhyacia junonia schistochroa* KOVÁCS and VARGA (crossed circle), *Haderonia sukharevae* (inverted triangle) ; **eremial** : *Aleucanitis mongoliensis* WILTSHIRE (filled square), *Cardiestra gobideserti* VARGA (barred filled circle), *Hadula halodeserti* (VARGA (open square).

The two major groups of the orol faunal types, the alpine s.l. (in this connection as "S. Siberian alpine"), and the xeromontane intergrade here. The distribution of the former has a clearly peripheric, scattered character, following the main ranges of the Mongolian Altai, Changaj, Chentei and Sajan mountains. During the pluvial phases of the Pleistocene, these mountains served as "stepping stone" corridors and/or filters for the tundral and S. Siberian alpine and arboreal faunal types. The xeromontane faunal elements of the Mongolian Noctuidae fauna have, on one hand, a more or less autochthonous character manifested by the presence of endemic taxa of some species-rich genera, e.g. *Dichagyris*, *Euxoa*, *Haderonia*, and on the other they show connections with some central Asiatic regions, especially Kurdistan, by the presence of numerous common, but stenochorous species, e.g. *Pseudohadena*, *Paleoagrotis*, *Dichagyris*, *Euxoa*, *Parexarnis*.

The desert/semi-desert areas, which served in the interpluvial stages as the main barriers for faunal movements of the region, presently provide habitats for many, mostly endemic or stenochorous, eremic species and subspecies (see Figs.).

Though physiognomically similar landscapes can be found not so far away (e.g. Turkestan, Tibet), it is striking that in cases of some genera and species groups, the number of vicariant taxa is high, especially compared with Turkestan.

Future studies will have to focus on the poorly known eremial and montane steppe faunas, e.g. the island-like exclaves of the Gobi Altai chain and the Hangay mountains.

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History of Lepidopterology – Geschichte der Lepidopterologie – Histoire de la lépidoptérologie

Soixante ans de lépidoptérologie italienne

Prof. Sergio BEER

Le rapporteur évoque les traits saillants du caractère et de l'activité des lépidoptérogues italiens disparus qu'il a connus personnellement : Emilio TURATI, Ruggiero VERITY, Ubaldo ROCCI, Attilio FIORI, Orazio QUERCI, Federico HARTIG, etc.

Cet exposé est précédé d'une introduction historique concernant l'apport des auteurs italiens au développement de la lépidoptérologie après la réforme linnéenne (œuvres de Leonardo DE PRUNNER, Giuseppe GENÉ, Vittore GHILIANI, Pietro ROSSI, Orazio COSTA, Luigi FAILLA TEALDI, Antonio CURO, Fortunato ROSTAGNO, Renato PERLINI, Mario MARIANI et autres) ; il est suivi d'un aperçu de l'activité des lépidoptérogues actuels et des perspectives ouvertes par les méthodes nouvelles d'étude et de vulgarisation (méthodes génétiques et biomoléculaires ; éco-éthologie comparée, cinéma et télévision, etc.). Il se termine par le tableau encourageant des liens étroits entre les membres de la «famille SEL», qui préfigure l'unité de l'Europe au-delà des frontières, des langues et des systèmes politiques, unité soutenue par une même passion pour les êtres les plus splendides et les moins bruyants de toute la nature vivante.

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The history of butterfly research in the Caucasus

Yuri P. NEKRUTENKO

The following entomologists have provided the greatest contribution to our knowledge of the butterfly fauna of the Caucasus. Full details will appear in my book "The butterflies of the Caucasus" (Vol. 1) under the title "The history of research : people, collections, publications".

E. MÉNÉTRIES (1802-1861), A. VON NORDMANN (1803-1866), F. A. KOLENATI (1812-1864), A. KINDERMANN (1810-1860), J. HABERHAUER (1828-1902), J. LEDERER (1821-1870), O. STAUDINGER (1830-1900), S. ALPHERAKY (1850-1918), H. CHRISTOPH (1831-1894), N. N. SHAVROV (1858-?), G. RADDE (1831-1903), L. BRAMSON (1842-1909), E. BALLION (1816-1901), A. BECKER (1818-1901), N. M. ROMANOFF (1859-1919), A. A. JACHONTOV (1879-1973), L. A. SHELJUZHKO (1890-1969), V. V. SOVINSKY (1881-1957), M. A. RJABOV (1890-1962), E. S. MILJANOWSKI (1908-1976).

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Life Histories and Biology – Entwicklung und Biologie – Biologie

**An attempt at the classification
of six species of *Satyrus* (s.l.)
based on morphological characters of the early stages
(Nymphalidae : Satyrinae)**

Enrique GARCÍA-BARROS and José-Luis VIEJO

The early stages of many European Satyrini have long been known, but no attempt has been made to evaluate their importance in classification.

In a preliminary approach based on a small number of species, we attempt to assess the results of including egg, larval and pupal characters together with adult features (mainly those previously used in taxonomic arrangements of this group) when calculating overall similarities among species.

The possible relevance of some morphological features of the immature stages of *Satyrus* s.l. is briefly discussed.

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Phenological synchronization and adaptation in five satyrine butterflies from central Spain

Enrique GARCÍA-BARROS

This communication summarizes the results of breeding experiments and field observations of five satyrines from central Spain : *Hipparchia alcyone* D. & S., *H. semele* L., *H. statilinus* HUFN., *H. fidia* L. and *Maniola jurtina* L. The phenology and behaviour of these five species in the study area is stated and briefly compared with the literature data.

The patterns of adult seasonal abundance differ among the five species, but the dates of oviposition and the beginning of larval feeding periods are, as a general rule, remarkably similar. This can be regarded as the result of a synchronization of the larval feeding periods with the period when rains are expected and consequent growth of the larval foodplants. As stated by previous workers on the subject, it appears that the seasonal pattern of larval feeding of temperate monovoltine satyrines has been strongly influenced by the seasonal distribution of rains in temperate areas. Thus, it is suggested that some phenological adaptations known from temperate satyrines (delayed ovarian maturation, first instar larval quiescence) might have evolved as responses to the occupation of dry areas (or climatic changes) in certain species.

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Some biological and behavioural notes on the Scythrididae (Gelechioidea)

P. PASSERIN D'ENTRÈVES & C. FESSILE

Five larvae of *Scythris flaviventrella* (HERRICH-SCHAEFFER) were collected on Mount Rocciamelone, at an elevation of about 1000 m (Valley of Susa : Prov. of Torino : NW Italy). Two of them were found on *Helianthemum apenninum* (MILL.) [Cistaceae], and three on *Astragalus onobrychis* (L.) [Papilionaceae]. This is the first report of the occurrence of this species in Italy.

The caterpillars were raised using the same plant species as foodplant. In this connection it is relevant to observe that *Scythris flaviventrella* is a member of the strictly pea-family eating 'aerariella group' (PASSERIN D'ENTRÈVES 1982). The species had previously only been known to feed on *Vicia* sp.

The mature larvae are marbled orange-grey in colour and measure 13 mm in length. They weave a loose fabric of silk joining leaves of the foodplant together, shielding a more closely knit silken tube. The latter is used as a shelter and is attached to the plant's stem. The imagines emerged 10-12 days after pupation.

Courtship took place in the upper part of the breeding cage where the two partners flew separately (Fig. 1). The males probably discover females from their pheromone emissions and start following them, walking about 10 cm behind. After a while, the female continues to walk straight ahead, while the male follows a wide circular path, leading him to face the female from a distance of 5-6 cm. At this moment the male starts a series of three consecutive wing vibrations, each performed at a smaller distance from the female. When the two partners reach to touch each other by the tips of their antennae, they start vibrating their wings simultaneously, more quickly than during the previous part of courtship. The following step consists of opening their fore and middle legs until they reach a vertical position, and contact with the substrate is kept by their wing-tips and metathoracic legs only.

Then the male reaches forward with its abdomen, making contact with the female's genital opening. Once copulation has begun the two partners make a quick lateral rotation movement and assume a tail-to-tail position. The whole courtship lasts several minutes. Copulation normally takes place in the late afternoon and lasts 6-7 hours. During this time the two partners remain immobile. An attempt to disturb the pair made by an intruding male had no effect.

Each of our 2 females mated again, always with the same partner, about 48 h after the first copulation.

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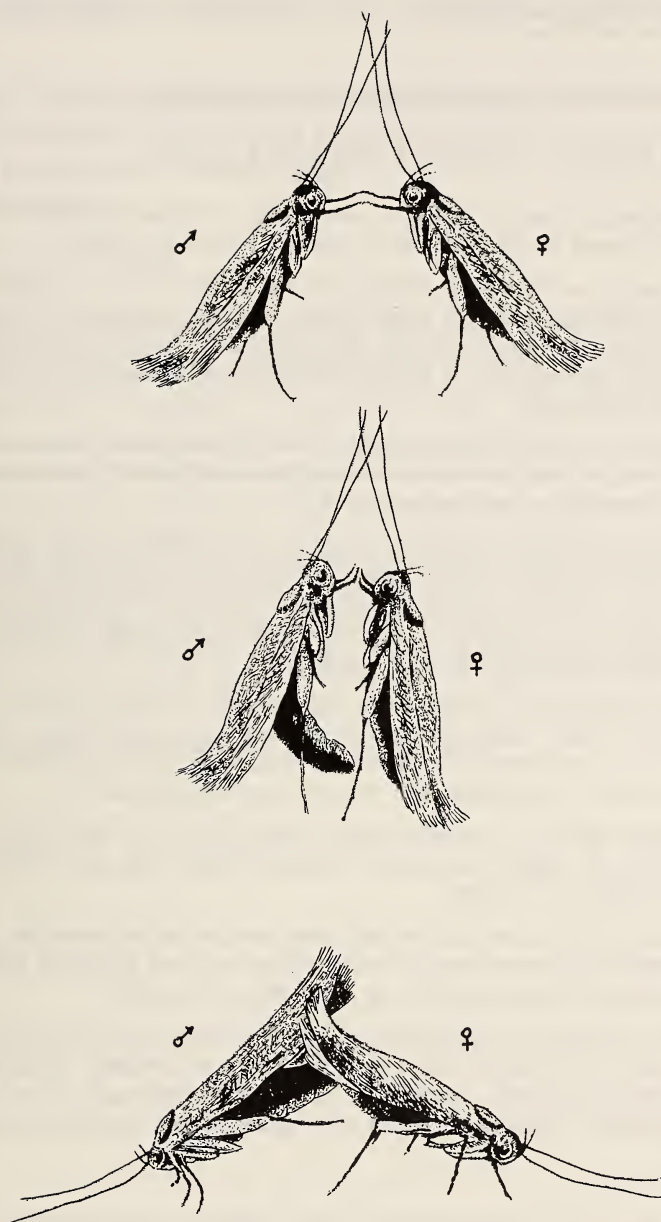


Fig. 1. The courtship of *Scythris flaviventrella* (H.-S.).

Factors affecting flower choice in butterflies

V. SARTO I MONTEYS, V. E. JONES, K. HARRISON & J. YLLA

Flower selection, for nectar feeding, by two species of tropical butterflies, *Eurema hecabe* and *Eurema brigitta* (Pieridae : Coliadinae), has been studied.

The trials, using one butterfly at a time, were run inside $3 \times 3 \times 2$ m tents which contained flowering plants, on James Cook University Campus in Townsville, Queensland, between December 1986 and January 1987. A total of 16 species of flowering plants, belonging to 11 families, were offered to the butterflies ; 4 pots per plant species were used.

The butterflies were obtained from eggs laid on their foodplants ; they were sexed, tagged and released into the tents immediately after emergence. In this way the sex and age of butterflies in each trial was known.

The most important data recorded per trial were the number of open flowers per individual plant, number of initial flower visits and total settlings on each plant performed by a particular individual butterfly and time spent nectaring on those flowers. Other data were relative to the butterfly age, some weather parameters and average height of the flowers from the ground.

To enable interpretation of results three partial indices of flower preference by the butterflies have been defined as well as a total index. Such indices take into consideration the probability a particular type of flower has of being used as a nectar source according to its abundance in the tent when the trial was run.

The results are based on a recorded feeding time of 18565 sec and 20983 sec for *E. hecabe* and *E. brigitta* respectively. Recorded flower visits were 1869 for *E. hecabe* and 1108 for *E. brigitta*.

Results clearly support a non-randomized flower selection by the butterflies, the very likely existence of a search image at an individual level and significant differences in flower selection between species and sexes within the species.

The factors that might be responsible for such a selection, such as nectar components, colour of the flowers within the insect's visual spectrum, morphological features affecting the flower, such as shape, corolla width and length, nectar location, butterfly proboscis lengths, and others, are presently being measured and will be discussed.

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Some faunistic and ecological aspects
of the autumn and winter noctuid moths
of a locality in Central Spain
(Noctuidae)

José Luis YELA GARCÍA

Noctuid moths (Lepidoptera : Noctuidae) were caught between early April 1983 and late May 1985 in Trillo, Guadalajara (Central Spain). This locality is 732 m above sea level in the Tagus Valley. Its climate is continental-mediterranean. The dominant type of vegetation is evergreen oak forest (*Quercetum rotundifoliae*), although other plant communities of some importance exist. Among these are the gall oak forest (*Cephalanthero-Quercetum fagineae*) and riparian forests (*Populion albae*). During the sampling period 250 watt mercury-vapour light traps were placed every 15 days in three locations : one in an evergreen oak forest, another in a gall oak forest and a third one in a small valley with riparian forest and orchards, so that we have generally taken two samples per month in each location (in some cases three samples per month). In this study we consider and discuss only the results obtained in the months between November and March, giving special attention to the supposed ecological preferences of the species for each plant community considered.

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Spatial partitioning of *Heterogynis penella* Hb. cocoons : Evidence for sexual selection on larval behaviour (*)

Alberto ZILLI & Tommaso RACHELI

Heterogynis penella (HÜBNER, 1819) is a species with a west Mediterranean range. It is strongly sexually dimorphic. The males are normally winged and with plumed antennae. The females lack all cephalic and thoracic appendages and spend their life inside their cocoons, except when they protrude outside to attract the males for mating. After copula, the females return inside the pupal exuvia, eggs are laid and subsequently the young larvae devour their mothers. After this period of cannibalism the larvae change diet and move on to their foodplants.

In the central Apennines it has been observed that the female cocoons and hence the adult females are found on stems at higher levels than those of the males. This phenomenon can be explained as the result of intra-sexual selection in the females, in that female larvae need to climb up higher to be better exposed at mating time. The male larvae do not need to spin cocoons in prominent sites because the adults can fly.

The proposal of parental specialisation as the underlying factor which affects and regulates the intensity of sexual selection was examined. With a 1 : 1 sex ratio, members of the less specialised sex would need to compete more, because the reproductive success of one sex strongly depends on the meeting occasions with the other.

Because of the remarkable behaviour of the females, all their life being devoted to increasing their offsprings' chances of survival, intrasexual competition for mates should be expected to occur in the male sex. The unique life cycle affects the relevant population densities of both sexes : the females are more aggregated than males, which are scattered all over their habitat. For such reasons, males can be viewed also as a limiting resource to females, which attain their reproductive success only if they succeed in attracting the flying males. It is a selective advantage for the female to find a conspicuous position for releasing her sex pheromone and to succeed in attracting a male to her, rather than to one of the nearby females. The successful arrival of a male is likely to be influenced by visual cues, as the females retain the black and yellow-striped larval pattern.

(*) The research has been supported by grants M.P.I. 40% and 60%.

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Nomenclature and taxonomy – Nomenklatur und Taxonomie – Nomenclature et taxonomie

**Confusion around *Kessleria zimmermanni* (NOWICKI)
(Yponomeutidae)**

P. HUEMER and G. TARMANN

The genus *Kessleria* is distributed in the Holarctic Region, Papua, New Guinea, Madagascar and New Zealand. Numerous species live in mountainous or even high alpine areas. The larvae feed mainly on various species of Saxifragaceae ; only a few taxa are able to exploit other host-plants.

NOWICKI described *Kessleria zimmermanni* from a large number of specimens collected in the Tatra mountains. In the original description almost no differences were noted between the sexes. In the early years of this century HAUDER collected a number of *Kessleria* in Styria and Upper Austria including two flightless females. Nevertheless, he identified this material as *zimmermanni*, as also did FRIESE with the population from Tyrol, believing that *zimmermanni* occurs in the Tatra and the Eastern Alps.

In 1960 FRIESE revised the Palearctic Yponomeutidae including *Kessleria*. Although he did not examine any material of *zimmermanni* from the type-locality (Tatra), he described a new species, *tatrica*, from a single male collected in the Tatra. FRIESE's '*zimmermanni*' included males from Eastern Austria and specimens of both sexes from Tyrol. However, he obviously never dissected males from Tyrol nor females from Styria. Therefore, when the authors started a revisional work on *Kessleria* it was really surprising that *zimmermanni* sensu FRIESE is a mixture of two different species, one restricted to Eastern Austria, the other to Tyrol and both with flightless females. The species are easily distinguishable by their forewing markings and the genitalia of both sexes.

As a preliminary result of the previous revisional work on *Kessleria* the following proposals are stated :

- (1) *Kessleria zimmermanni* is a species either restricted to the Tatra mountains or distributed in the Tatra and Eastern Austria.
- (2) *Kessleria tatrica* is possibly a junior synonym of *zimmermanni*.
- (3) The population from eastern Austria is either *zimmermanni* or, more likely, a distinct species.
- (4) The population from Tyrol does not belong to *zimmermanni* and is possibly an undescribed species.

The confusion around *Kessleria zimmermanni* demonstrates the problems of modern taxonomy. The authors will try to examine all the original material and undertake additional field studies.

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Les espèces ibériques du genre *Conistra*
(Lepidoptères : Noctuidae).
Critères pour l'identification des femelles
par les genitalia.

Ibon DE OLANO

L'auteur a fait l'étude du genre *Conistra* HUEBNER (1821) dans la Péninsule ibérique, genre dont les espèces ont une phénologie hivernale, un cycle biologique univoltin, et dont les imagos ont une période de repos pendant la période la plus froide.

Il se base sur la «Lista Sistemática de los Noctuidae de la Península» publiée au volume V de l'ouvrage «Mariposas de la Península ibérica» (GOMEZ BUSTILLO, ARROYO VARELA et YELA GARCIA, 1986), et sur la liste mise à jour des Noctuidae d'Alava (OLANO, MARCOS et SALAZAR, 1987). Le genre *Conistra* compte 11 espèces dans la Péninsule, groupées en deux sous-genres.

L'auteur fournit les données nécessaires pour l'identification génitale des femelles et des dessins schématiques des genitalia femelles.

C. (Conistra) vaccinii (LINNAEUS, 1761)

Deux signums larges et petits (Fig. 1).

C. (C.) ligula (ESPER, 1791)

Un signum large (Fig. 2).

C. (C.) alicia (LAJONQUIERE, 1939)

Un signum arrondi (Fig. 3).

C. (C.) veronicae (HUEBNER, 1813)

Deux rangées de signums arrondis qui se rejoignent en formant un V à l'envers (Fig. 4).

C. (C.) rubiginosa (SCOPOLI, 1763)

Bursa non arrondie, plaque chitineuse occupant le milieu du cervix (ostium bursae ?) ; deux rangées longitudinales de signums doubles de quatre faces et deux signums doubles à la base. (Fig. 5).

C. (C.) gallica (LEDERER, 1857)

Bursa arrondie, plaque chitineuse occupant un tiers du cervix ; trois rangées longitudinales de signums doubles (Fig. 6).

C. (C.) daubei (DUPONCHEL, 1838)

Plaque chitineuse caractéristique en forme de bec dans le cervix bursae (Fig. 7).

C. (C.) torrida (LEDERER, 1857)

Trois signums arrondis : deux grands à la base et un autre petit en haut et dans la face (Fig. 8).



Fig. 1
C. (C.)
vaccinii



Fig. 5
C. (C.)
rubiginosa

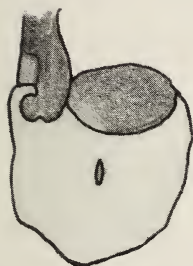


Fig. 2
C. (C.)
ligula



Fig. 6
C. (C.)
gallica



Fig. 3
C. (C.)
alicia

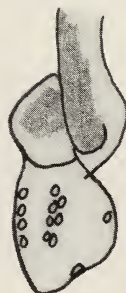


Fig. 7
C. (C.)
daubei



Fig. 4
C. (C.)
veronicae



Fig. 8
C. (C.)
torrida



Fig. 9
C. (D.)
rubiginea



Fig. 10
C. (D.)
staudingeri



Fig. 11
C. (D.)
erythrocephala

C. (Dasycampa) rubiginea (DENIS & SCHIFFERMUELLER, 1775)

Trois signums longitudinaux larges, avec plaque chitineuse du ductus plus courte que dans l'espèce suivante (Fig. 9).

C. (D.) staudingeri (GRASLIN, 1863)

Quatre signums longitudinaux larges (Fig. 10).

C. (D.) erythrocephala (DENIS & SCHIFFERMUELLER, 1775)

Quatre signums longitudinaux larges, l'un plus séparé et plus épais ; grand cervix bursae (Fig. 11).

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