Proceedings of the Tenth International Symposium on Neuropterology

Piran, Slovenia, 22–25 June 2008

Edited by

Dušan Devetak, Saška Lipovšek & Amy E. Arnett

Maribor, 2010

Tenth International Symposium on Neuropterology, Piran, Slovenia, 22-25 June 2008

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Previous page:
The Pit of Antlion (colour pencil). Graphics Ilona Richter, Hungarian artist. Illustration from the book of I. Richter: 'Realm of Sand', Homokország, Budapest, 1961.

The Proceedings are respectfully dedicated
to the memory of Prof. Herbert Hölzel (1925-2008)

Contents

Preface

The Tenth International Symposium on Neuropterology was held on 22–25 June 2008 in Piran, in the Coastal Region of Slovenia. Fifty-five participants representing 20 countries and five continents took part in the meeting. Symposium topics devoted to neuropterid insects study (Neuropterida: Megaloptera, Raphidioptera, Neuroptera) reflect the state-of-the-art in Neuropterology in 2008. Thirty-seven lectures were presented and twenty-two posters were displayed in the symposium room. There were sessions on taxonomy, phylogeny and systematic, biogeography, morphology, ethology, biology, ecology, cell biology and applied entomology. The contributions in the Proceedings are presented in alphabetical order, according to the names of the (principle) authors.

The meeting was followed by three post-symposium excursions to interesting collecting places located in the Regional Karst Park, Škocjan Caves system, River Soča Valley, and Triglav National Park in the heart of the Julian Alps. The number of participants was higher than recorded for previous Symposia. Piran was an enchanting site and the convivial events (party at the Marine Biology Station, social dinner and excursions) received high praise from participants.

On the fourth day of the Symposium the General Assembly Meeting of the International Association of Neuropterology was organized and participants decided upon the venue for the next symposium from a list of three proposals. The group elected to accept the Portuguese offer to host the XI International Symposium on Neuropterology in 2011 in Azores. We wish Dr. Maria Ventura good luck in arranging all the necessary facilities for undertaking such a task.

Vorwort

Das Xth International Symposium on Neuropterology fand vom 22.-25. Juni 2008 in Piran, Slowenien statt. Fünfundfünfzig Teilnehmer aus zwanzig Ländern und fünf Erdteilen trafen sich zu dieser Tagung in der kleinen Stadt an der Küste Sloveniens. Die Themen des Symposiums bezogen sich auf Untersuchungen an Neuropteren im weiteren Sinne (Neuropterida: Megaloptera, Raphidioptera, Neuroptera) und spiegelten den Kenntnisstand der Neuropterologie zum Tagungstermin wieder. Siebenunddreißig Vorträge und zweiundzwanzig Poster wurden in den Symposiumsräumen vorgestellt. Sektionen zu folgenden Themen wurden abgehalten: Taxonomie, Phylogenie und Systematik, Biogeographie, Morphologie, Verhalten, Biologie, Ökologie, Zellbiologie und Angewandte Entomologie. Die Beiträge sind in diesem Tagungsband in alphabetischer Reihenfolge der jeweiligen Erstautoren angeordnet.

Nach Abschluss der Tagung fanden drei Post-Symposium Exkursionen statt, die in interessante Sammlungsgebiete führten: den Regional Karst Park, das Škocjan Höhlensystem, das Soča Tal und in den Triglav National Park im Zentrum der Julischen Alpen. Die Zahl der Teilnehmer war größer als bei den vorhergehenden Symposien. Piran präsentierte sich als bezaubernder Tagungsort und das Begleitprogramm (Empfang in der Meeresbiologischen Station, Gesellschaftsabend und Exkursionen) fanden höchstes Lob bei allen Teilnehmern.

Am vierten Tag des Symposiums fand die Mitgliederversammlung der 'International Association of Neuropterology' statt. Als Veranstaltungsort für das nächste Symposium lagen drei Vorschläge vor, von denen sich die Teilnehmer für die Azoren, Portugal als Tagungsort im Jahr 2011 entschieden. Wir wünschen Dr. Maria Ventura viel Erfolg bei der Organisation und Durchführung des XIth International Symposium on Neuropterology.

Avant-Propos

Le dixième Symposium International de Névroptérologie a eu lieu du 22 au 25 juin 2008 à Piran, sur la façade méditerranéenne de Slovénie. Cinquante-cinq participants prirent part à cette rencontre, représentants de 20 pays et des cinq continents. Les sujets abordés au symposium couvrent divers aspects de l'étude des névoptères (Neuropterida: Megaloptera, Raphidioptera, Neuroptera) et réfléchissent bien l'état de nos connaissances en Névroptérologie en 2008. Trente-sept communications orales furent présentées tandis que vingt-deux posters étaient affichés dans la salle de conférences. Il y eut diverses sessions, consacrées à la taxonomie, la phylogénie et la systématique, la biogéographie, la morphologie, l'éthologie, la biologie, l'écologie, la biologie cellulaire et l'entomologie appliquée. Les participations imprimées aux Comptes-Rendus sont présentées par ordre alphabétique en référence au nom du premier auteur.

La réunion scientifique a été prolongée par trois excursions vers d'intéressants sites de récolte situés dans le Parc Régional Karstique, le système souterrain Škocjan, la vallée de la rivière Soča et le Parc National Triglav, au cœur des Alpes Juliennes. Le nombre des participants fut plus élevé que lors de tous les précédents Symposiums. Piran a été un site enchanteur et les manifestations conviviales telles que la réception à la Station de Biologie Marine, le banquet et les excursions ont toutes été hautement appréciées par les participants.

Le quatrième jour du symposium a été organisée l'assemblée générale de l'Association Internationale de Névroptérologie au cours de laquelle les participants ont eu à choisir parmi trois propositions pour la tenue du prochain symposium. Il a été finalement décidé d'accepter l'offre de la délégation portugaise pour organiser le XI° Symposium International de Névroptérologie en 2011. Nous souhaitons au Dr Maria Ventura d'avoir toutes les facilités souhaitables pour entreprendre une telle tâche.

Predgovor

Deseti nevropterološki simpozij je potekal od 22. do 25. junija 2008 v Piranu, na obalni regiji Slovenije. Srečanja se je udeležilo petinpetdeset strokovnjakov iz 20 držav in petih celin. Teme, posvečene preučevanju nevropteridnih žuželk (Neuropterida: Megaloptera, Raphidioptera, Neuroptera), odražajo stanje nevropterologije v letu 2008. Udeleženci so na srečanju predstavili 37 predavanj in 22 posterjev, ki so se vključevali v naslednje sekcije: taksonomija, filogenija in sistematika, biogeografija, morfologija, etologija, biologija, ekologija, celična biologija in uporabna entomologija. Prispevki v zborniku so urejeni po abecednem vrstnem redu (prvega) avtorja prispevka.

Po srečanju so udeleženci na tridnevnih ekskurzijah obiskali za zbiralce zanimive lokalitete v Regionalnem kraškem parku, Škocjanskih jamah, dolini reke Soče in v Triglavskem narodnem parku v osrčju Julijskih Alp. Število udeležencev srečanja je bilo višje od števila na kateremkoli simpoziju doslej. Izbira Pirana kot mesta simpozija ter druženje na Morski biološki postaji, skupna večerja in ekskurzije so pri udeležencih poželi visoko priznanje.

Četrtega dne simpozija je potekal sestanek organizacijskega odbora Mednarodnega združenja nevropterologov in udeleženci so se odločili za mesto organiziranja naslednjega simpozija. Izbrali so ponudbo Portugalcev, ki bodo leta 2011 organizirali XI. mednarodni nevropterološki simpozij na Azorih. Dr. Marii Ventura želimo vso srečo pri prevzemu zaupane ji naloge.

Dušan Devetak, Saška Lipovšek & Amy E. Arnett
Maribor (Slovenia) and Unity (Maine, USA), October 2010

Acknowledgements

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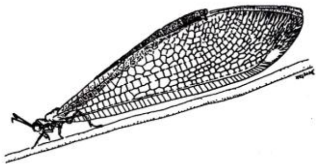


10th International Symposium on Neuropterology
Piran, Slovenia
22-25 June 2008

Programme

Sunday, 22 June 2008

12:00 – 18:00 **Registration** at the Hotel Barbara Fiesa, Fiesa 68, Piran
19:00 **Get together party** at the Marine Biology Station, National Institute of Biology, Fornače 41, Piran; Host: Director of the Station, Prof. Dr. Alenka Malej

Monday, 23 June 2008

9:00 Prof. Dr. Matija Gogala, Vice-president of the Slovene Academy of Sciences and Arts (SAZU):
Opening of the Symposium
Opening words of Prof. Dr. Nataša Vaupotič, Dean of the Faculty of Natural Sciences and Mathematics, University of Maribor. Opening words of Prof. Dr. Dušan Devetak, Symposium Organizer and Host. Opening words of Prof. Dr. John D. Oswald, President of the International Association of Neuropterology (IAN)

9:50 Horst ASPÖCK: In memoriam Herbert Hölzel (1925-2008).
10:10 Horst ASPÖCK: Neuropterida research at the threshold of the 21st century reflected through the International Symposia on Neuropterology, 1980-2008.

11:00 Coffee Break

Session 1: Digital Initiatives in the Neuropterida
Moderator: Atilano CONTRERAS-RAMOS

11:20 John OSWALD: The Lacewing Digital Library Project: progress and future.
11:40 Agostino LETARDI: With a little help from my friends: eight years of the Italian Neuropterological web site.
12:00 Mervyn MANSELL: Towards a catalogue of Afrotropical lacewings and alderflies (Neuroptera, Megaloptera).

12:20 Lunch Break

Session 2: Taxonomy and Systematics
Moderators: Mervyn MANSELL & Alexi POPOV

14:30 Atilano CONTRERAS-RAMOS & Elsa MELÉNDEZ-ORDÓÑEZ: Diversity of Hemerobiidae (Insecta: Neuroptera) of Rancho Santa Elena, Hidalgo, Mexico.
14:50 Daniel REYNOSO-VELASCO & Atilano CONTRERAS-RAMOS: Overview of the taxonomic and biological knowledge of Mexican Mantispidae (Insecta: Neuroptera).
15:10 György SZIRÁKI: Data on Coniopterygidae of Argentina, with discussion of the taxonomic rank of *Stangesemidalis* Gonzalez Olazo, 1985.

15:30 Break

15:40 Alinaghi MIRMOAYEDI: An updated checklist of the neuropterans of Iran.
16:00 Ulrike ASPÖCK, Susanne RANDOLF & Horst ASPÖCK: The Berothidae of Madagascar (Neuropterida: Neuroptera).

16:20 Coffee Break

16:40-18:30 **Session 3: Posters I**

Carlos Augusto Silva de AZEVÊDO, Atilano CONTRERAS-RAMOS, Neusa HAMADA & María Eugenia GRILLET: Synopsis of the Corydalinae of Venezuela, with the finding of an undescribed species of *Corydalus* (Megaloptera: Corydalidae).
Davide BADANO & Agostino LETARDI: A review of the Neuropterida of Liguria (North-West Italy).
Tomasz BLAIK & Roland DOBOSZ: Neuroptera of Polish Baltic Sea coast with remarks on *Wesmaelius balticus* (Tjeder, 1931).
Dušan DEVETAK, Sabina GOMBOC & Vesna KLOKOČOVNIK: Neuropterida of Kozjanski Regional Park.
Roland DOBOSZ & Tomasz BLAIK: Neuroptera of New Caledonia – present knowledge.
Roland DOBOSZ & Grzegorz GÓRSKI: New data on *Nyrma kervilea* (Neuroptera: Berothidae).
Agostino LETARDI, Rinaldo NICOLI ALDINI & Roberto A. PANTALEONI: Faunistical and zoogeographical considerations on Neuropterida of Triveneto (north-eastern Italy).
Rinaldo NICOLI ALDINI, Carlo CESARONI & Roberto A. PANTALEONI: On the larval morphology of the antlion *Gymnocnemia variegata* (Schneider, 1845) (Neuroptera: Myrmeleontidae).
André PROST: The African genus *Megistoleon* (Myrmeleontidae, Myrmeleontinae).
Ferenc SZENTKIRÁLYI, Viktor MARKÓ, László KAZINCZY & Éva KOVÁCS: When the antlions fall into pit: pitfall trappings in sandy grasslands.
Stefanie WEIGELMEIER & Axel GRUPPE: Occurrence of Raphidioptera-larvae in dead wood.

Tuesday, 24 June 2008

Session 4: Biology and Ecology
Moderators: Michel CANARD & Michael OHL

8:30 Axel GRUPPE & Stephanie SOBEK: Effect of tree species diversity on neuropterid communities in a deciduous forest.
8:50 Bruno MICHEL & Karl KRAL: Habitat, behaviour and vision in *Bubopsis agrionoides, Deleproctophylla dusmeti* and *Puer maculatus* (Neuroptera, Ascalaphidae, Ascalaphinae).
9:10 Gregor BELUŠIČ, Primož PIRIH, Gregor ZUPANČIČ, Peter STUŠEK & Kazimir DRAŠLAR: The visual ecology of the owlfly (*Libelloides macaronius*).

9:30 Break

9:45 Ferenc SZENTKIRÁLYI, László KAZINCZY, Ferenc KÁDÁR, Tamás RÉDEI & Sándor BARABÁS: Long-term monitoring of ant-lions in Hungary.

10:25-11:00 Coffee Break

Session 5: History of Neuropterology
Moderator: György SZIRÁKI

11:00 Horst ASPÖCK & Ulrike ASPÖCK: Milestones of Neuropterology in the German-speaking countries before 1950.
11:50 Roberto PANTALEONI: The nomenclatural roots of the Neuropterida: the species of Linnaeus and his coeval authors.

12:10 Symposium Group Photo

12:30 Lunch Break

Session 6: Biology: Chrysopidae
Moderators: Peter DUELLI & Maria Anunciação VENTURA

14:30 Michel CANARD, Dominique THIERRY, Andrew WHITTINGTON & András BOZSIK: The actual annual occurrence of the green lacewings of northwestern Europe (Neuroptera: Chrysopidae).
14:50 Raquel MENDES & Maria Anunciação VENTURA: Fitness of *Chrysoperla agilis* (Neuroptera: Chrysopidae) fed on different natural prey.

15:10 Break

15:20 Erika OREŠEK & Lea MILEVOJ: Diet needs of the species *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae).
15:40 Roberto PANTALEONI: Why not suppress the name *Chrysopa carnea* Stephens, 1836?

16:00 Coffee Break

Session 7: Cell Biology
Moderator: Saška LIPOVŠEK DELAKORDA

16:20 Romano DALLAI, Roberto PANTALEONI, Agostino LETARDI & Zaira Valentina ZIZZARI: The sperm structure of Neuropterida.
16:40 Zaira Valentina ZIZZARI & Romano DALLAI: The sperm ultrastructure of Coniopterygidae (Neuroptera).

17:00 Break

17:10-18:30 **Session 8: Posters II**

Geraldo ANDRADE CARVALHO, Luiz Carlos DIAS ROCHA & César Freire CARVALHO: Evaluation of selectivity of five pesticides used in Brazil to *Chrysoperla externa* (Hagen, 1861) (Neuroptera: Chrysopidae).
András BOZSIK: Occurrence and species composition of the *Chrysoperla carnea* complex in Hungary.
András BOZSIK: Pesticide tolerance of lacewing species.
András BOZSIK: Pesticide testing and the sibling species problem in the *Chrysoperla carnea*-complex.
András BOZSIK, R. GONZÁLEZ RUÍZ & B. HURTADO LARA: New data on the sibling species of the common green lacewings in southern Spain.
César Freire CARVALHO, Cleidson Soares FERREIRA & Brígida SOUZA: Biology and functional response of *Ceraeochrysa cubana* (Hagen) (Neuroptera: Chrysopidae) fed *Aphis gossypii* Glover (Hemiptera: Aphididae) on cucumber in greenhouse.
Francisco A. DÍAZ, Francisco J. SOSA & Astrid K. YÁNEZ: Parasitoids associated with chrysopids (Neuroptera: Chrysopidae) in Venezuela.
Sérgio de FREITAS: Morphological characterization of *Chrysoperla externa* (Hagen, 1861) (Neuroptera: Chrysopidae) adults in which larvae were reared under different food regimens.
Atsushi MOCHIZUKI, Naoto HARUYMA, Hideshi NAKA & Masashi NOMURA: Larval head capsule markings change with the temperature in *Chrysoperla nipponensis*.
Suegene NOH: Are hybrid lacewings attractive?
Maria PAPPAS, Georgios BROUFAS & Dimitrios KOVEOS: Life-history traits of the lacewing *Dichochrysa prasina* (Burmeister) under variable prey availability in the laboratory.
Mihaela PAULIAN, Dominique THIERRY & Michel CANARD: Green lacewing assemblages in two European fluvial lower valleys in Rumania and in western France (Neuroptera: Chrysopidae).
Brígida SOUZA, Jairo Boaventura OLIVEIRA Jr., César Freire CARVALHO & Lucas Castro TORRES: Effect of the bean cultivars (*Phaseolus vulgaris* L.) on the biology of *Bemisa tabaci* (Gennadius) Biotype B and of the predator *Chrysoperla externa* (Hagen).
Maria A. VENTURA, R. MENDES, R. RESENDES & J. SEQUEIRA: Up-to-date on the presence of Chrysopidae on Flores and Corvo islands (Western Azorean Group).

19:00 **Social Dinner**

Wednesday, 25 June 2008

Session 9: Biology of the Antlion Larvae
Moderators: Karen L. HOLLIS & Lionel STANGE

8:30 Johannes GEPP: Biology of *Dendroleon pantherinus* in Styria (Austria).
8:50 Tina JERIČ & Dušan DEVETAK: Variability in the predatory behaviour of antlions (Myrmeleontidae) in the presence of different prey.
9:05 Karen L. HOLLIS: Learning in a sedentary insect predator: Antlions (Neuroptera: Myrmeleontidae) anticipate a long wait.

9:25 Break

9:30 Saška LIPOVŠEK DELAKORDA, Ilse LETOFSKY-PAPST, Dušan DEVETAK, & Maria Anna PABST: The structure and the chemical composition of the spherites in the midgut of the antlion larvae *Euroleon nostras* (Geoffroy in Fourcroy, 1785).
9:40 Dušan DEVETAK, Maria Anna PABST, Barbara JELEN & Saška LIPOVŠEK DELAKORDA: Pit-building and non-pit-building predatory strategies of larval antlions (Neuroptera: Myrmeleontidae) in relation to their morphology and behaviour.
10:05 Petra DEVETAK: Effect of substrate density on pit building decision making and pit size in the antlion *Euroleon nostras*.

10:15 Coffee Break

Session 10: Phylogeny and Systematics
Moderator: John OSWALD

10:40 Ulrike ASPÖCK & Horst ASPÖCK: Landmarks towards a phylogeny-based classification of the Neuropterida.
11:00 Niels Peder KRISTENSEN & Rolf BEUTEL: Larval head anatomy and endopterygote high-rank phylogeny: neuropterid perspectives of some recent findings.
11:20 Tatyana S. VSHIVKOVA: Some morphological characters interesting for the phylogenetic study of the Megaloptera and other orders of Holometabola.
11:40 Joshua JONES: Review of the Haplogleniinae (Ascalaphidae).

12:00 Lunch Break

Session 11: Biogeography
Moderators: Agostino LETARDI & Ulrike ASPÖCK

14:00 Jonathan BALL, Catherine SOLE, Mervyn MANSELL & Clarke SCHOLTZ: South African Nemopteridae (Neuroptera) – a unique heritage.
14:20 Alexi POPOV: Comparative zoogeographical analysis of Neuropterida of the Apennine and Balkan peninsulas.

14:40 Break

15:00 Peter DUELLI & Herbert HÖLZEL: Habitat and larval instars of the enigmatic genus *Kimochrysa* in South Africa.
15:20 Andre PROST: Patterns of distribution of the Palparinae (Neuroptera, Myrmeleontidae) in the northern half of Africa. Faunal transitions and regional overlaps.

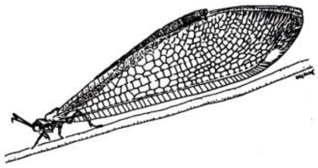
15:40 Break

16:00 **International Association of Neuropterology, General Assembly Meeting**
Chairperson: John OSWALD

17:30 C**losing of the Symposium**
Closing words of Prof. Dr. Dušan Devetak, Symposium Organizer and Host
Closing words of Prof. Dr. John D. Oswald, President of the International Association of Neuropterology (IAN)

Thursday, 26 June 2008

8:00 Departure for the Post-Symposium Excursion (26-29 June)



Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp 17–23.

In memoriam Herbert Hölzel (1925–2008)

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With the death of Herbert Hölzel on 27 April 2008 not only the Austrian, not only the German-speaking, not only the European, but the whole scientific community of neuropterologists has lost one of its best. Herbert Hölzel was an outstanding expert on the Neuropterida of Europe, in particular, an authority for the Chrysopidae of the Western Palaearctic and of Africa and the islands west and east of this continent and one of the leading taxonomists of the Palaearctic Myrmeleontidae and Nemopteridae.

Herbert Hölzel was born in Wels (Upper Austria) on 11 November 1925. His father, Emil Hölzel, a life-long and passionate entomologist, served in the Austrian army as a major and retired early to become a curator at the Museum of Klagenfurt. As a child, the young Herbert Hölzel was influenced by his father's passion for entomology and developed an intensive fascination to insects. With the greatest of ease he rapidly acquired a comprehensive knowledge of the insects of Carinthia.

By the age of 14, he began systematically to build up a Lepidoptera collection (which is at the museum of Klagenfurt today). The events of the Second World War, however, abruptly interrupted his leisurely exploration of nature. Herbert Hölzel became a soldier. At the end of the war he was captured by the Americans, and in 1946 he was released from a French prisoner-of-war camp. His parents had lost all their means during the war, and thus it was not possible for Herbert Hölzel to realize his original wish to study biology; he was forced to look for a bread and butter job. After his second school-leaving exam (in addition to his school-leaving certificate during the war), he entered upon a long career in the Austrian National Bank, where he moved ahead quickly. After posts in Klagenfurt and Salzburg, finally in 1963, he became deputy director of the Styrian branch of the Austrian National Bank in Graz. He held this position until his retirement in 1980. Afterward he moved together with his wife, Gerlinde (to whom he had been married happily since 1958), to Annenheim at the Ossiach Lake in Carinthia. In 1988 they moved to a beautiful and old castle-like edifice ("Schloss Eppersdorf"; Fig. 1), an old property of the family of his wife, near Brückl (not far from Klagenfurt). Here in spacious rooms magnificent with valuable antique furniture, precious paintings and oriental carpets Herbert Hölzel could work undisturbed. The impressive, isolated edifice with its associated neighbouring buildings, surrounded by meadows, fields and forests offered a tranquil and homely atmosphere.

Due to the high position which he had reached in his profession as a banker, Herbert Hölzel was able to fulfil all the dreams of a practicing entomologist: microscopes and the necessary bits and pieces, the perfect equipment for field work, computers, literature, travels to institutions (particularly museums in various countries) and field trips to many regions of the world. It is astonishing that Herbert Hölzel – although he had published two small articles in which, among other insects, he treated the Neuropterida by the late 1940s – he immersed himself fully into neuropterology only in the beginning of the 1960s when he had already exceeded the age of 35. His first publication which merits the term scientific paper (it dealt with species of a Hemerobiid genus) appeared at the beginning of 1963 (Hölzel, 1963). At that time, I was convinced that I was the only entomologist in Austria working on Neuropterida, thus it was a big surprise when I saw Herbert Hölzel's article in a Bavarian journal. I immediately contacted him, and on 23 March 1963 we met in Linz (Upper Austria) for the first time. From then

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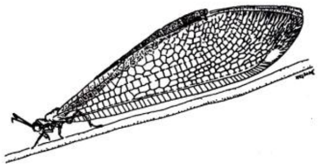

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Neuropterida research at the threshold of the 21st century reflected through the International Symposia on Neuropterology 1980–2008

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Abstract. In the wake of a renaissance in neuropterological research in several countries, particularly in Europe during the 1960s and 1970s, the First International Symposium on Neuropterology took place, September 1980, in Graz, Austria. Nine more symposia followed during the period leading up to 2008: 1984 Hamburg, Germany; 1988 Berg en Dal, Kruger National Park, South Africa; 1991 Bagnères-de-Luchon, France; 1994 Cairo, Egypt; 1997 Helsinki, Finland; 2000 Budapest, Hungary; 2003 College Station Texas, USA; 2005 Ferrara, Italy; 2008 Piran, Slovenia. This period is characterized by an unimaginable progress in science, particularly in the biological disciplines, and thus also in neuropterology. Several developments and inventions, as well as political events, were of tremendous influence: development of new techniques in microscopy and in photography, electronic databases, invention of DNA sequencing techniques and of PCR, storing and distributing information (e-mails, internet), economic improvement in many countries, breakdown of the Iron Curtain, and new opportunities to conduct field trips into large regions previously inaccessible to scientists. A further development was the establishment of English as the *lingua franca* among scientists of all parts of the world, which led considerably to improve communication.
Progress in neuropterology due to these fundamental changes and achievements is also impressively reflected by the 10 international symposia and, in particular, the eight volumes of the Proceedings (Table 1). Moreover, several hundred original papers and numerous large reviews, monographs, revisions and contributions in books were published throughout the past 30 years by a growing number of neuropterologists the world over.
Since 1980, however, an appallingly high number of neuropterologists have passed away (Table 2). The future of neuropterology will increasingly be characterized by the application of methods of molecular biology in all fields yet further great achievements are still to be expected from the classical disciplines.

Key words: Raphidioptera, Megaloptera, Neuroptera, Neuropterida, history of neuropterology, international symposia of neuropterology

Introduction

About 30 years ago the first Symposium on Neuropterology took place in Graz in Austria. I was one of the organizers, and at that time I had been working on Neuropterida for about 20 years. Nine more Symposia would follow. I am the sole person to have attended all 10 Symposia, and meanwhile almost half a century has passed since I commenced my studies on Neuropterida, which I have continued without interruption or decline of interest – moreover, since 1963 together with my wife, Ulrike – till today. These facts may serve as a reliable precondition for this overview.

Condition of neuropterology in the 1970s

After the Second World War, only few neuropterologists were studying Neuropterida and publishing their results regularly. In particular, the Swedish entomologist Bo Tjeder (1901–1992) and the Italian Maria Matilde Principi (born 1915) were the most outstanding in our field. Moreover, the British entomologist Douglas Eric Kimmins (1905–1985) and the Japanese Waro Nakahara (1896–1976) contributed to link the past with the future

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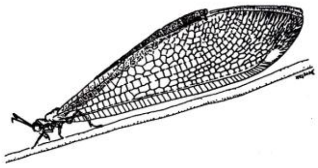

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Milestones of neuropterology in the German-speaking countries before 1950

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Abstract. During the period from 1700 to 1950, about 100 authors from German-speaking countries (Germany, Austria, Switzerland, including German-speaking minorities in other countries of Central and Eastern Europe) have published about 400 original papers, reviews, monographs or other articles dealing with Neuropterida, as well as book chapters on Neuropterida. Among many important publications the following represent the truly major milestones of neuropterology which exercised a substantial and long-lasting influence on the further development of this discipline:

- first monograph of Raphidioptera (Schneider, 1843);
- first monograph of the Chrysopidae (Schneider, 1851);
- basic studies on the biology and early stages of Neuropterida, among them the discovery of the larva of *Osmylus* and clarification of the development and hypermetamorphosis of *Mantispa* (Brauer, 1851a, 1851b, 1852a, 1852b, 1854, 1869; Rogenhofer, 1862);
- recognition of the sucking tubes of Neuroptera as the autapomorphy of this order (Brauer & Löw, 1857);
- first annotated catalogue of all known species of Neuropterida (Hagen, 1866);
- introduction of criteria concerning characters of the genital segments into the taxonomy of Neuropterida (Hagen, 1867);
- differentiation of the genera *Coniopteryx* and *Aleuropteryx*, which paved the way for the establishment of the two subfamilies Coniopteryginae and Aleuropteryginae, and a critical review of the taxonomy, systematics and biology of the Coniopterygidae (Löw, 1885);
- comprehensive account of fossil Neuropterida and foundation of paleoentomology (Handlirsch, 1906–1908);
- introduction of characters of genitalia into the taxonomy of Coniopterygidae and first monograph of this family (Enderlein, 1906).

Key words: Neuropterida, Raphidioptera, Megaloptera, Neuroptera, history of neuropterology, German-speaking countries

1. Introduction and overview

All who examine any particular aspect of the Neuropterida will eventually come into contact with publications of authors of German-speaking countries, i.e. Germany, Austria and Switzerland. And if one works on the history of neuropterology, one will soon arrive at the conclusion that a considerable part of what we know about Neuropterida today, was found out and published by German native speaking authors.

This review is dedicated to the period before 1950 so that the work of living authors and, in particular, our own publications are not a subject of this article.

The first substantial information on Neuropterida obtained by German-speaking scientists was published in 1736 by the German Leonhard Frisch (1666–1743). From that time onwards for approximately the next 200 years (till 1950), altogether about 400 publications written by almost 100 German-speaking authors treated numerous

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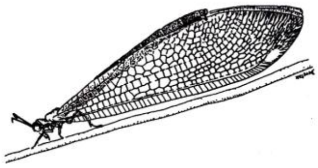

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Landmarks towards a phylogeny-based classification of the Neuropterida (Insecta: Endopterygota)

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Abstract. Like Ariadne's thread, the larvae of Neuropterida wriggle their way through the milestones of the systematic history of the group starting with recognition of the monophyly of Neuroptera, in a pre-Darwinian stroke of genius by the young Friedrich Brauer (1857), and the pre-Hennigian phylogenetic tree arranged by Withycombe (1925). The thorough study of larval heads by McLeod (1964) separated the myrmeleontoid from the hemerobioid types and provided the basis for subsequent analyses; however, the larvae of Nevrorthidae were unknown to him. The hypothesis of Nevrorthidae + Myrmeleontiformia (Aspöck, 1992) was replaced by Nevrorthiformia + (Myrmeleontiformia + Hemerobiiformia) (Aspöck *et al*., 2001). A molecular analysis (Haring & Aspöck, 2004) rejected the monophyly of the Hemerobiiformia; an analysis of genital sclerites (Aspöck & Aspöck, 2008) provided a fresh approach. The hypothesis of Megaloptera + Neuroptera, which assumes a common ancestor with aquatic larvae having cardines integrated into the head capsule (Aspöck, 2002), has been corroborated by molecular and morphological analyses. The evolution of the sucking tubes of the Neuroptera remains a challenge.

Key words: phylogeny, systematics, larvae, Neuropterida, Raphidioptera, Megaloptera, Neuroptera, Nevrorthiformia, Hemerobiiformia, Myrmeleontiformia

Preludium

Like Ariadne's thread, larvae wriggle their way through the systematics of the Neuropterida. This statement is in a way our preludium, will accompany us through the analysis and finally will be our postscriptum! The title and Fig. 1 signalise distinct steps – in reality we manoeuvre through the turbulences of detaching hypotheses.

Historical background

Already in the 1850's the young Friedrich Brauer – he was about 20 – recognised the evolutionary relevance of the larvae of the Neuropterida! In his legendary publication (Brauer, 1852), he transferred the Nemopteridae from the Panorpidae to a group comprising our present-day Myrmeleontiformia, and he removed the Mantispidae from the Raphidioptera to the present-day Hemerobiiformia. It is noteworthy that the Neuroptera were called Megaloptera at that time. A few years later he established the Neuroptera as a single taxonomic group, i.e. a monophylum, based on larval sucking tubes – a pre-Darwinian stroke of genius (Brauer, 1857). The precise description of the sucking tubes permitted the recognition of two groups – A: our present-day Hemerobiiformia, and B: our present day Myrmeleontiformia!

Half a century later Anton Handlirsch created the first phylogenetic tree of insects. His fantastic *opus magnum* "Die fossilen Insekten und die Phylogenie der rezenten Formen" (Handlirsch, 1906–1908) remains a milestone

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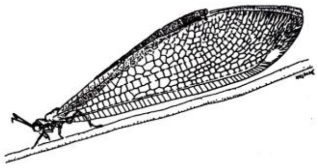

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The Berothidae of Madagascar (Neuropterida: Neuroptera) and Madagascar's biological exploration by the Viennese adventuress Ida Pfeiffer (1797–1858)

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Abstract. The genus *Podallea* is the only representative of Berothidae in Madagascar. Presently, five *Podallea* species, belonging to the *vasseana*-group, have been recorded from the island: *P. vasseana*, widespread in tropical and subtropical regions of Africa and the Comoro Islands, and four species endemic to Madagascar: *P. seyrigina, P. duellii, P. pauliani*, and *P. madegassica*. Investigation of additional material brought four new species to light. All Malagasy species belong to the *vasseana*-group. They are closely related to each other and to African species of this group. The results are presented in distribution maps of known, new and unidentified species. The hypothesis that *Podallea* is a neoinvader is corroborated. Madagascar`s biological exploration is outlined with special emphasis on the Viennese adventuress Ida Pfeiffer (1797-1858).

Key words: Berothidae, *Podallea*, neoendemics, termitophily, Ida Pfeiffer, Madagascar

Introduction

For more than three centuries the diverse fauna and flora of Madagascar have fascinated natural historians. In 1661, Étienne de Flacourt (1607–1660), then the French governor of Madagascar, listed in his "Histoire de la Grande Isle Madagascar" a huge number of animals and plants. He recalled that "Des mouches, il y en a une si grande quantité & de diverses sortes, que cela seroit inutile de les écrire" (de Flacourt, 1661, p. 158).

Two centuries later, the Malagasy Neuroptera entered entomological literature: continuing French tradition the celebrated M. P. Rambur described the first antlion from Madagascar, *Creoleon aegyptiacus* (Rambur, 1842), with a type series from Senegal and Madagascar.

Most of the naturalists visiting Madagascar were French and men, but there was also an Austrian woman who made contributions to the scientific discoveries of the island: Ida Pfeiffer. Although she did not collect Neuroptera in Madagascar, her story shall be sketched representatively for the enormous exertions that so many collectors accepted and as tribute to the 150th anniversary of her death.

The Austrian adventuress Ida Pfeiffer (1797–1858)

Ida Pfeiffer (Fig. 1) was one of the first female explorers of the 19th century and an example for subsequent women entering this male domain (Habinger, 2006, p. 210). Her published travel diaries were of great success, quickly translated in several languages and appeared in several editions. For a woman, early memberships in diverse geographical societies show that she was held in high esteem during her lifetime. She even received the Prussian gold medal for science and art from King Friedrich Wilhelm IV. (Habinger, 1997, p. 133).

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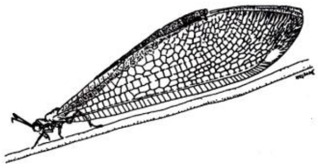

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A review of the Neuropterida of Liguria (North-West Italy)

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Abstract. Liguria is a small region of Northern Italy; despite its great environmental diversity, this area was never subjected to a thorough research on Neuropterida, so there were only few isolated records, included in papers concerning the whole Italian fauna of these insects. In the last three years specific samplings allowed to double the number of known species, from 42 to 85 belonging to 10 families. The aim of this contribution is to provide a provisional checklist of the Ligurian Neuropterida.

Key words: Neuropterida, checklist, faunistics, Liguria, Italy

Introduction

The state of knowledge of the distribution of the Italian Neuropterida is characterized by heterogeneity: some areas are relatively well known (the Alps, Romagna, Sardinia and some national parks of peninsular Italy) while others have never been examined thoroughly (Letardi, 1998, 2006); Liguria, a small region of North–West Italy (Fig. 1), stands up from the last ones (Badano, 2008). This district is located between the Ligurian Sea, the Alps and the Apennines and despite the small territorial extent is of remarkable naturalistic value because it comprises a great variety of environments from dry Mediterranean habitats to Alpine ones. Moreover the western portion of region, where the thermo–xeric influence is more widespread, is interesting from a biogeographical point of view due to presence of Ibero–French taxa absent from the rest of Italy. This implies the possibility that Liguria comprises an interesting and rich Neuropterofauna but, unfortunately, it has never been investigated in detail. In fact, most of data for the area are isolated reports in papers concerning the whole Italian Neuropterida or even papers about other insects. The whole bibliographical references allow to list only 42 species for this area (Letardi, 2006).

To resolve the situation, in the last three years specific samplings, performed mainly in the western part of the region, allowed to obtain new information about their distribution; preliminary results of these studies are reported in Badano (2008).

Material and methods

The aim of this work is to provide a checklist of Ligurian Neuroptera, which integrated bibliographical data with results of recent surveys. Investigations have been conducted in the two years 2007 and 2008, in different environmental typologies in several localities, collecting specimens especially with sweeping net but also with the aid of a light trap and by rearing immature stages. The systematic order used derives from the checklist of Italian Neuropterida (Bernardi Iori *et al*., 1995) with few modifications; symbol "*" indicates new species for Liguria found in the two years 2007–2008; "**" indicates species collected for the first time in 2006 and quoted in Badano (2008); "?" indicates doubtful species. Numeric codes for genera and species have been derived from the project of the checklist of the Italian Fauna (http://www.faunaitalia.it/checklist/introduction.html, see also Bernardi Iori *et al.*, 1995).

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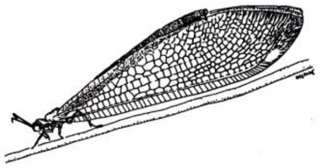

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The visual ecology of the owlfly (*Libelloides macaronius*)

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Abstract. The owlfly *Libelloides macaronius* is a classical model animal of sensory physiology, famous due to its bipartite compound eyes with superposition optics. The dorso-frontal part of the eyes is sensitive in the UV only, while the ventro-lateral part is predominantly UV sensitive with a small additional sensitivity peak in the blue-green wavelength range. We address the following questions: (1) why see only in the UV; (2) how robust is UV vision; (3) what is the purpose of a bipartite eye? The data presented here suggest that: (1) seeing the sky in the UV helps to simplify the visual environment, and thus facilitates the detection of prey; (2) the amount of UV is sufficient throughout the whole day and even during the dawn and dusk; (3) the ventral eye part has a wide field of vision, while the dorsal part functions as an acute zone or fovea, a region with a narrow field of vision and high spatial acuity. We argue that these characteristics are visual specialisations that greatly improve the performance of a diurnal airborne predator.

Key words: Neuroptera, *Libelloides macaronius,* owlfly, photoreceptor, UV, temperature dependence

Introduction

The owlfly *Libelloides macaronius* (Scopoli, 1763) (formerly: *Ascalaphus macaronius*) (Insecta: Neuroptera: Ascalaphidae) is a remarkable inhabitant of warm meadows of the Pontomediterranean (Aspöck *et al*., 2001). It is a predatory animal in its larval and adult form. As an imago it exploits its excellent flying abilities for hunting other flying insects and, in males, for chasing opposite-sex conspecifics. Its success as a hunter depends on its visual sense, which is mediated by a pair of large, bipartite compound eyes with refractive superposition optics. The dorso-frontal (DF) part of the eyes is virtually exclusively UV sensitive, and the ventro-lateral (VL) part has a small additional sensitivity peak in the blue-green wavelength range (Gogala & Michieli, 1965; Gribakin *et al*., 1995).

Eye regionalisation and shift of sensitivity towards the short wavelength range in the dorsal part of the eye seem to be rather common specialisations of insect visual systems. They are especially prominent features of insects which hunt or find their mates against the sky. For instance, in male blowflies and honeybee drones, the dorsal eye part has increased acuity and has the sensitivity peak in the blue or in the UV, respectively (Stavenga, 1992). Also in damselflies and dragonflies, the dorsal and ventral eye parts have different ommatidial compositions (Labhart & Nilsson, 1995). An extreme case of regionalisation is encountered in the eyes of male mayflies, which possess an additional, UV-sensitive turban eye with refractive superposition optics, while the normal eye is of the apposition type (Horridge *et al*., 1978).

Superposition optics can increase the receptor aperture and the receptor photon catch by up to three orders of magnitude (Warrant, 2006). The superposition eye is mostly found in nocturnal and crepuscular insects, but sometimes, despite the transition to an exclusively diurnal lifestyle, the ancestral optical superposition design is retained, such as in the case in some moths, and in the exclusively diurnal skipper butterflies (Horridge *et al*.,

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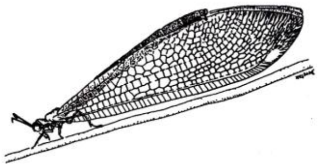

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Lacewings (Neuroptera) of the Polish Baltic coast with remarks on *Wesmaelius* (*Kimminsia*) *balticus* (Tjeder, 1931) – a new species of Hemerobiidae to the fauna of Poland

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Abstract. The paper summarizes the state-of-the-art on Neuroptera recorded on the Polish Baltic coast. The results of investigations conducted since the eighties of the 20th century against the background of revised original data on the area are presented. The complete list of local neuropteran fauna comprises 6 families and 51 species (ca. 59% of the total Neuroptera known from Poland). Siberian faunal elements are dominating here, but a considerable number of Mediterranean, Holarctic and, to a lesser extent, Extramediterranean-European faunal elements is also present. A group of several species reaches a limit of distribution on the area. The occurrence of supposedly relic within northern part of Central Europe, Holomediterranean: *Acanthaclisis occitanica* (Vill.), *Myrmeleon inconspicuus* Ramb. and *Distoleon tetragrammicus* (Fabr.) must be highlighted, as well probably not transitional in Poland, rare: *Nothochrysa fulviceps* (Steph.) and *N. capitata* (Fabr.), and noted far from the known Central European centres of distribution - *Peyerimhoffina gracilis* (Schn.). First record of *Wesmaelius balticus* (Tjed.) in Poland is given. The general habitus of the sole male specimen is presented, and its genital structures are figured. The occurrence of this rarely reported in Europe species is discussed and all published locality records are plotted on a map. *W. balticus* represents Atlantolittoral faunal element with characteristic coastal distribution pattern. It is a stenotopic species inhabiting a strict zone of white and semi-fixed grey dunes. The new locality in Rowy is the most southeastern record of this species on the shores of continental Europe and the first not insular within the Baltic Sea area.

Key words: Neuroptera, *Wesmaelius balticus*, new record, South Baltic coast, North Poland, faunistics, zoogeography

Introduction

The beginning of investigation on Neuroptera of the southern shore of the Baltic Sea, at present borders of Poland, reaches half of the 19th century. To the end of thirties of 20th century, the research activity was concentrated on the eastern part of the area, in the region of the Gulf of Gdańsk (Fig. 1). The first observations of *Acanthaclisis occitanica* (Vill.) on the Vistula Spit and in the vicinity of Elbląg were given by Hagen (1859, 1873). Since the end of seventies to middle nineties of the 19th century, several short notes and reports were given by Brischke, presenting observational data obtained during short excursions in the region of Gdańsk and Sopot (1879, 1887, 1894), to the Hel Peninsula (1888) and in the vicinity of Stegny (1889, 1891). During the next years, research on Coniopterygidae in the Puck and Karwia environs, and the Hel Peninsula were conducted by Enderlein (1905, 1906, 1908). The last data from the Hel Peninsula and the surroundings of Gdynia were given by Zaćwilichowski (1938a, b, 1939). These latter materials belong to the group of very meagre historical evidences from the area discussed, preserved in the Polish collections (Dobosz 1991). Western part of the coast, not taking into account unclear data from the environs of Szczecin, is known only from a short note by Krüger (1921) about presence of *Euroleon nostras* (Geoff. in Fourc.) on the Uznam Island. The middle part of the coast was investigated by Karl (1937), with better knowledge on the vicinity of Słupsk. During the next 50 years, no methodic studies on Neuroptera were carried out in this part of Poland. On the turn of eighties of the 20th century, during the research on noctuid moths (Lepidoptera, Noctuidae) in the dune belt of the Polish Baltic

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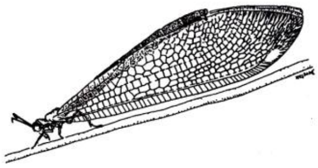

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp. 113–120.

Pesticide testing on adults of the *Chrysoperla carnea*-complex (Neuroptera: Chrysopidae) and the sibling species problem in the toxicology of common green lacewings

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Abstract. The chrysopids, referred to as *Chrysoperla carnea* (Stephens, 1836) sensu lato (Chrysopidae), the so-called "common green lacewings" belong to the best tested beneficial insects regarding their pesticide susceptibility. Side-effects of several hundred pesticides have already been tested on their different developmental stages. However, the systematic position of this species has been changing, and it is not possible to learn at present which taxon/taxa of the *Ch. carnea* complex was/were used for the individual testing during a long period, and so it is difficult to apply the old data to the characterisation of a given natural or reared population. Results of new tests performed on adults of *Ch. carnea* s. l. and the stated *Chrysoperla affinis* (Stephens, 1836) (Chrysopidae) will be presented according to the common principles of toxicology. The toxicity of the preparations was determined by measuring the surface contact effects (dried spray on leaves of *Philadelphus coronarius* Linnaeus). Three to nine concentrations were tested, with 20 adults exposed per concentration. Data were analyzed by probit analysis and one-way ANOVA. On the basis of known categories of evaluation Nissorun 10 WP and Match 50 EC seem to be environmentally safe from point of view of chrysopid adults but in case of Karate 5 EC, Mospilan 20 SP, Danitol 10 EC, Ambush C, Decisquick EC and Talstar 10 EC further semi-field or field test is needed to measure their real effects under field conditions. In addition, after collecting in the original sampling area and identifying the caught common green lacewing individuals, an attempt has been made to identify the composition of the original population.

Key words: side-effects, pesticides, *Chrysoperla affinis*, *Chrysoperla carnea* s.l., *Chrysoperla lucasina*, *Chrysoperla carnea* s. str., Neuroptera, Chrysopidae

Introduction

The function and importance of biological control methods in agriculture grow steadily. However, maintaining natural enemies, whether as introduced biocontrol agents or as natural populations of native species, may be difficult where pesticides are used, due to their remarkable pesticide susceptibility. Consequently, successful introduction, colonization, use, augmentation, conservation, or the summary of these parts, can be dubious. Potential response to this issue can be the use of harmless or less harmful pesticides to natural enemies. For achieving this goal, thorough studies of pesticide side-effects on beneficial species are indispensable.

The aim of the present study was to assess the detrimental effects of some pesticides on adult common green lacewings, prime candidates of biological control and IPM (Integrated Pest Management) programs (Canard *et al.*, 1984; Pree *et al.*, 1989; Bay *et al.*, 1993; Tauber *et al.*, 2000). *Chrysoperla carnea* (Stephens, 1836) sensu lato or "the common green lacewings" are among the best tested beneficial organisms regarding their pesticide tolerance. Side-effects of more than 150 formulated pesticide products have been assessed only on their larvae and pupae (Bigler & Waldburger, 1994; Rumpf *et al.*, 1997b), and also the number of preparations tested on the adults is approximately 100 (Bartlett, 1964; Wilkinson *et al.*, 1975; Suter, 1978; Grafton-Cardwell & Hoy, 1985; Bozsik, 1991). This study also discusses new testing results which characterize *Chrysoperla affinis* (Stephens,

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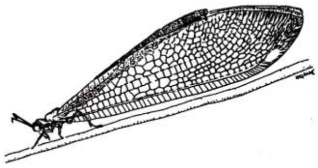

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Toxicity of pyrethroids to the adults of three green lacewing species (Neuroptera: Chrysopidae)

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Abstract. Generally, merely one lacewing species, *Chrysoperla carnea* sensu lato has been used for assessing pesticide side-effects on chrysopids. Considering the other lacewing species, toxicological information is scarce and the applicability of data gained on *Ch carnea* to other chrysopids has not been examined. Present study assessed the impact of some synthetic pyrethroids on *Chrysoperla carnea* s.l., *Chrysopa perla* and *Chrysopa formosa* adults. On the basis of LC_{50} values, *Chrysoperla carnea* s.l. adults were significantly more tolerant to cypermethrin and lambda-cyhalothrin residues than those of *Chrysopa perla*. As to *Chrysopa formosa* adults, they were more susceptible to lambda-cyhalothrin than the adults of *Ch. carnea* s.l. Regarding other toxicological parameters like LT_{50} values and the mortality of the registered concentration both, *Ch. perla* and *Ch. formosa* proved to be more susceptible than *Ch. carnea* s.l. Results showed that the insecticide tolerance of these species can differ significantly from each other, that is *Ch. carnea*'s role as a model species for the family Chrysopidae from point of view of pesticide tolerance is questionable.

Key words: Neuroptera, Chrysopidae, green lacewings, *Chrysoperla carnea* sensu lato, *Chrysopa perla*, *Chrysopa formosa,* pesticide, side-effects

Introduction

The number of organisms beneficial to crops is significant. When characterising their pesticide tolerance, it would be too demanding to measure the response of each species to different pesticide preparations. Regarding IOBC WPRS (International Organisation for Biological Control of Noxious Animals and Plants, West Palaearctic Regional Section) Working Group "Pesticides and Beneficial Organisms" there was an agreement that the natural enemy chosen for the pesticide testing should be relevant to the crop on which the pesticide in question is to be used. From the family Chrysopidae, *Chrysoperla carnea* (Stephens, 1836) sensu lato has been selected as a general predator (Franz, 1975; Hassan, 1989) because this species is a good candidate for use in IPM (Integrated Pest Management) programs. It is distributed worldwide, has a wide host plant and prey range (Principi & Canard, 1984), can be easily mass cultured (Ridgway *et al.* 1970), manipulated using food sprays (Hagen & Tassan, 1970) and overwintering boxes (McEwen *et al.*, 1999), and pesticide tolerant populations have been identified (Pree *et al.*, 1989). However, the researchers of Working Group "Pesticides and Beneficial Organisms" did not examine other lacewing species or deal with whether the toxicological values measured on *Ch. carnea* can be applied or not to other lacewing species. This question has not been investigated nor asked.

Ch. carnea s.l. is among the best tested beneficial organisms regarding pesticide tolerance. Side-effects of more than 150 formulated pesticide products have been assessed on their larvae and pupae (Bigler & Waldburger, 1994; Rumpf *et al.*, 1997), and also the number of preparations tested on the adults is approximately 100 (Bartlett, 1964; Wilkinson *et al.*, 1975; Suter, 1978; Grafton-Cardwell & Hoy, 1985; Bozsik, 1991). Regarding the assessment of side-effects of genetically-modified crops to natural enemies, *Ch. carnea* s.l. is also the most thoroughly investigated test organism (Lővei & Arpaia, 2005).

In Europe besides *Ch. carnea* s.l. there are many lacewing species having a considerable role in controlling pest populations. *Chrysopa perla* (Linnaeus, 1758) and *Chrysopa formosa* Brauer, 1850, are both common, wide-

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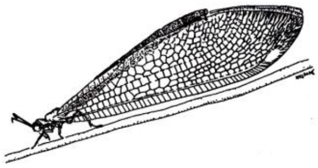

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The actual annual occurrence of the green lacewings of northwestern Europe (Neuroptera: Chrysopidae)

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Abstract. Quantitative surveys of chrysopids from northwestern Europe were analysed. A total of thirty-five species are known within the zone although only twenty-six were recorded. Only the common green lacewings (i.e. the sibling species of the *Chrysoperla carnea* complex, here not differentiated) were elsewhere abundant comprising more than 3/4 of the specimens in all countries and reaching 97 % in Belgium. For the scarcer species, comments are given on their enhanced geographic range. The French fauna shows 19 species, six are exceptional (< 0.1 %) such as the Atlanto-Mediterranean *Dichochrysa picteti*. Five species are considered rare ($1<Q \leq 5$ %): *Chrysopa perla*, *Ch. phyllochroma*, *Dichochrysa flavifrons*, *D. inornata* and *D. prasina.* The fauna of both Great Britain and Ireland has the same faunistical richness but manifests a more balanced equitability. *Chrysopa perla*, *Dichochrysa flavifrons* and *Cunctochrysa albolineata* are uncommon ($5 < Q \leq 15$ %), the others are at least rare. Belgium and Luxemburg gave 16 species and a very low diversity. *Hypochrysa elegans, Nineta vittata, N. principiae* and *Chrysopa pallens* are exceptional. Comments are given on some underestimated species, such as *Dichochrysa mariana* and *Cunctochrysa bellifontensis* not unanimously agreed, and *D. abdominalis* too recently re-instated to be identified in many collections.

Key words: Neuroptera, Chrysopidae, green lacewing, faunistics, northwestern Europe, biodiversity

Introduction

The European Neuropteran fauna is well known, and relative data have been published in major general works (e.g. Aspöck *et al*., 1980, 2001) and a variety of recent accounts. Most surveys are qualitative, and the occasional encounters of rare species in the samples are often highlighted by collectors. Such disproportionate attention may give readers a biased perspective of actual occurrence of species. Accurate studies quantifying the relative abundance and overall incidence of Neuroptera are scarce, probably because such work is deemed less rewarding.

In a previous paper (Canard *et al*., 2007a), the chysopid fauna of southwestern Europe was examined to assess the actual species abundance and determine whether the listed species are indeed as frequent in the field as the literature purports. The differences between the different investigated zones and the origin of rare species was also assessed. The goal of this second study is to continue in this way, in order to help typify the assemblages of Chrysopidae in northwestern Europe.

Material and methods

The geographical zone of the survey is limited southward by 45° N in France; it encompasses west to east from 10° W to the French boundaries with Switzerland and Germany; it includes Luxemburg and Belgium on the

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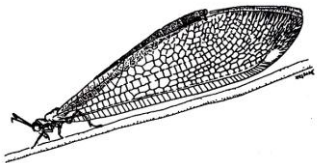

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The larvae of *Gymnocnemia variegata* (Schneider, 1845) and *Megistopus flavicornis* (Rossi, 1790) (Neuroptera: Myrmeleontidae): a comparative description

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Abstract. *Gymnocnemia variegata* (Schneider, 1845) (Myrmeleontidae Myrmeleontinae), the only species belonging to the genus *Gymnocnemia*, is a Turanian-Mediterranean antlion. As this species is found rarely, available information on its biology is very occasional and insufficient. The larva does not construct pitfall traps, and acts as a sit-and-wait predator beneath the surface of sandy soils. Only an incomplete description of the larval morphology of *G. variegata* is available in the literature. In the present work, morphological studies of third instar larva were made using both optical and scanning electron microscopy. Larvae were obtained and reared from eggs laid in the laboratory by a female caught in Sardinia. A comparative description of third instar larva of the related antlion *Megistopus flavicornis* (Rossi, 1790), a Turanian-European-Mediterranean species, is also provided. The larva of *M. flavicornis* and its lifestyle are rather similar to those of the former, sympatric species.

Key words: antlions, Myrmeleontidae, Nemoleontini, Glenurini, larval taxonomy, larval morphology, SEM

Introduction

Myrmeleontidae is the largest family of the Neuroptera (*sensu stricto*). The larvae are cryptic and in most cases very difficult to find, so collecting is often fortuitous, but also rearing from eggs is difficult because the reproductive biology of this family is very poorly known. As a result, there are few species whose larvae are well known; a short list of published descriptive accounts of ant-lion larvae is given in Stange & Miller (1990). The same authors make an attempt at splitting up the family Myrmeleontidae into tribes based on larval morphology.

The examination of larval morphological features, together with imaginal, ecological and more recently biochemical characteristics, is necessary in order to determine the phylogenesis of the Neuropterida correctly. From the time of the classic, basic work by Withycombe (1925) up to the most recent studies on this subject matter (U. Aspöck, 1992; U. Aspöck & H. Aspöck, 2007), larval morphology has been one of the crucial points for defining the phylogenesis of this superorder.

A detailed description of the larvae of this family should be accompanied by a comparison of closely related species, in an attempt to clarify discriminating features among genera or congeneric species and to provide useful information for future phylogenetic analyses.

Aspöck *et al*. (2001) ascribe three Euro-Mediterranean genera to the tribe Glenurini of the subfamily Myrmeleontinae: *Nedroledon* Navás, 1914, *Megistopus* Rambur, 1842, and *Gymnocnemia* Schneider, 1845.

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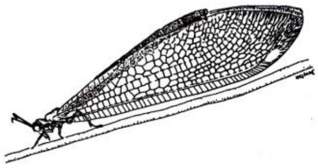

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Effect of substrate density on pit building decision making and pit size in the antlion *Euroleon nostras* (Geoffroy in Fourcroy) (Neuroptera: Myrmeleontidae)

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Abstract. Antlion larvae dig pitfall traps in loose soil or dry sand and wait for prey at the bottom of the trap. In natural habitats antlions choose the most convenient substrate. The aim of the study was to answer the question what kind of substrate regarding its density is the most appropriate for the antlion larvae *(Euroleon nostras)* to build pits. The hypothesis was that the substrate with the smallest density will be the most frequently chosen. In substrate choice experiment substrates and their densities were brown forest soil 530 g/l, sugar 881 g/l, natural habitat 1074 g/l and the quartzitic sand 1492 g/l. The most frequently chosen substrate was brown forest soil – the substrate with the lowest density. Pit diameter was negatively correlated with substrate density. On the basis of results it could be concluded that the higher the density of the substrate smaller is the pit size and lower is the frequency of pits constructed in the substrate.

Key words: Density, choice-experiment, antlion, *Euroleon*, Neuroptera, pit building decision

Introduction

Antlions (Myrmeleontide) with 2000 species is the largest family of Neuroptera. Most of their larvae live in sand or loose soil but only few of them are pit-builders. The larvae construct conical pitfall traps in sand and then wait for prey at the bottom (Gepp & Hölzel, 1989; Mansell, 1996, 1999). The predators feed on small arthropods that slide into the pit. The pits are usually found in dry situations such as under overhanging cliffs or under buildings (Triplehorn & Johnson, 2005).

Pit building activity is influenced by food, population density, larval age, temperature and sand particle size (Griffiths, 1980; Lucas, 1982; Kitching, 1984; Arnett & Gotelli, 2001; Botz *et al*., 2003; Devetak *et al*., 2005). Antlions readily build pits in dry and loose substrates of granulation smaller than 0.5 mm (Youthed and Moran, 1969; Botz *et al*., 2003; Devetak *et al*., 2005) and this is also the size that was used in this study. In natural habitats antlion larvae are found in different types of substrates, such as forest soil, sandy material nearby forest routes, in detritus between roots etc. (Gepp & Hölzel, 1989). It was presumed that different substrates have different physical properties. Two different types of soil and two artificial substrates were used in the experiment because it was supposed that they will be of a different density. In the present study the number of pits and pit diameter were used to estimate substrate preference in antlion larvae. The aim of the study was to answer the question what kind of substrate regarding its density is the most appropriate for antlion larvae.

Material and methods

Thirty third-instar larvae of *Eurolen nostras* (Geoffroy in Fourcroy, 1758) were collected in the surroundings of Maribor. Experiments were made with the following substrates: quartzitic sand (Kema Puconci d.o.o), natural habitat soil, brown forest soil and sugar. The substrates were sieved so that diameter of the particles of the substrates was ≤ 0.5 mm. The substrates were dried and than their masses and therefore densities were determi-

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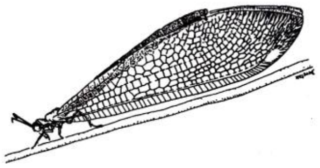

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Neuroptera of New Caledonia – present knowledge

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Abstract. This paper is a synthesis of scanty information available on the Neuroptera of New Caledonia.

Key words: Insecta, Neuroptera, New Caledonia, faunistic

The island of New Caledonia is widely known from its rich and ‘primitive’ insect fauna, showing many links to the ancient fauna of Australia, to which New Caledonia was connected in the time of Gondwanaland, 80–70 Myr ago. Further distinct links are with the fauna of New Zealand, another ancient part of Gondwana, dated from the times when island arc related to the Norfolk Ridge likely existed (Upper Cretaceous−Eocene). This paper is a synthesis of scanty information available on the Neuroptera of this biogeographically important region, relevant for assessing the evolution and distributional relationships of this group.

Present knowledge of Neuroptera of New Caledonia is largely inadequate, based almost entirely on sporadic collecting, mostly covering very short phenological periods. Because of remoteness and difficult access to the island the former visiting collectors (commonly non- neuropterologists) used to attempt to work over as much area of the island as possible in a short time, and, while seeking for other groups of insects, they collected lacewings rather incidentally.

Only four families with 18 species are known to occur on the island: Hemerobiidae (6 spp.), Chrysopidae (9 spp.), Ascalaphidae (1 sp.) and Myrmeleontidae (2 spp.). Six endemic species in New Caledonia are: *Micromus neocaledonicus* Nakahara, 1960 (Hemerobiidae); *Noius noumeanus* Kimmins, 1958 (Hemerobiidae); *Apochrysa montrouzieri* (Girard, 1862), *Mallada noumeanus* (Navás, 1910) (Chrysopidae); *Suhpalacsa caledon* McLachlan, 1873 (Ascalaphidae); *Myrmeleon neocaledonicus* Navás, 1922 (Myrmeleontidae). All the original data on New Caledonian lacewings were published in a few old papers by Girard (1862), Kimmins (1953, 1958), Lacroix (1923), McLachlan (1873), Nakahara (1960) and Navás (1910, 1922).

Annotated Checklist of the Neuroptera of New Caledonia (based on literature data)

The scientific name of the New Caledonian lacewings follows Oswald (2007).

HEMEROBIIDAE

***Notiobiella multifurcata* Tilliard, 1916**
Notiobiella multifurcata: Kimmins (1953); Nakahara (1960); New (1988).
1 ♀, 21 IX – 3 X Mt.Tinchialit [=Mandjélia], 2,020 ft.; 1 ♀ or (♂ by New, 1988), 12 VII 1914 Bâ Bay (Kimmins, 1953); 1 ♂, 9.10.1958, Koghi (Nakahara, 1960).

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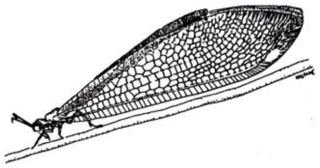

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Habitat and larvae of the enigmatic genus *Kimochrysa* Tjeder (Neuroptera: Chrysopidae) in South Africa

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Abstract. Very few specimens of the three known *Kimochrysa* species endemic to the Western Cape Province of South Africa have been collected. Larvae and their habitats were unknown. We present photographs of the second and third instars of *Kimochrysa africana* (Kimmins), the host plants of their prey and the pollen-feeding adult. Relationships with the closest relatives among the subfamily Nothochrysinae are discussed. We postulate that the first chrysopid lacewings were small pollen feeders, followed by the much larger honeydew feeding genera of the Nothochrysinae.

Key words: Neuroptera, Chrysopidae, Nothochrysinae, pollen-feeders, relict distribution, rarity, isolation, South Africa

✞ Our dear colleague, Prof. Herbert Hölzel, passed away shortly before the Neuropterological Symposium in Piran.

Introduction

The genus *Kimochrysa* Tjeder comprises three species and is restricted to the Western Cape Province of South Africa (Tjeder, 1966; Mansell, 2005). It belongs to the subfamily Nothochrysinae, the oldest extant subfamily of the family Chrysopidae (Neuroptera). Bo Tjeder, who revised the genus *Kimochrysa* in 1966, wrote that all known fossil chrysopids were Nothochrysinae, or Dictyochrysinae as he called them at that time. Later, however, fossil species of the subfamily Chrysopinae were described from early Miocene Dominican amber (Engel & Grimaldi, 2007).

Todays world distribution of the subfamily Nothochrysinae is indeed relictual: Every continent has a few, mostly rare and very restricted species (Adams, 1967). In Africa, two genera have been found so far, completely isolated from the rest of the subfamily: *Pamochrysa* Tjeder and *Kimochrysa*, both restricted to small areas in South Africa. Only a few specimens of both sexes of *Pamochrysa stellata* Tjeder, from the type locality in the eastern Drakensberg area of KwaZulu-Natal are known. The larval stages of this monotypic genus are unknown.

Three species of *Kimochrysa* have been described, all from the Western Cape Province. Here also, the larval stages were unknown. *Kimochrysa raphidioides* Tjeder is known only from the female type specimen, collected around 1830 in the Cape area. *Kimochrysa africana* was described by Kimmins in 1937, based on two females collected in August north of Cape Town. Further specimens of this species were collected on flowers in the Cedarberg area in recent years (Mansell, unpubl.). The third species, *K. impar* Tjeder, is very special among chrysopids by having several subcostal crossveinlets in the proximal part of the wings, instead of one, as in all other extant chrysopid species (Tjeder, 1966). This species is known from two localities, one north and one southeast of Cape Town and only very few adult specimens have been collected, in March and April. So, finding the habitat of *Kimochrysa* was indeed a challenge.

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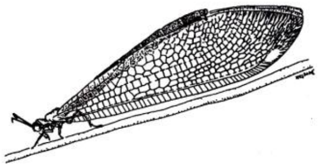

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Learning in insects, with special emphasis on pit-digging larval antlions (Neuroptera: Myrmeleontidae)

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Abstract. Learning in insects is widespread, having been demonstrated in species from multiple families in all major insect orders. Here we provide a brief overview of the literature on insect learning, a literature that suggests the capacity to learn is likely an adaptation that helps to guide animals as they actively search for – or move away from – ecologically relevant events like food, mates, hosts and predators. In this context, we review recent studies from our laboratory demonstrating that pit-digging larval antlions, extremely sedentary insect predators that do not need to search their environment for prey, nonetheless are capable of learning about the imminent appearance of prey. In three separate experiments, individual antlions (*Myrmeleon crudelis* Walker) received, once per day, either a vibrational cue presented immediately before the arrival of prey in the pit (the learning group) or that same cue presented independently of prey arrival (the control group). Signaling of prey arrival not only produced an anticipatory learned response, behavior that was not observed in control group antlions, but also conferred a fitness advantage: Associative learning enabled antlions to extract food more efficiently, dig better pits and, in turn, decrease the amount of time spent in the larval stage, than antlions not receiving the learning treatment. Our finding that larval antlions can learn is important because antlions do not fit the "learning profile" of active approach and avoidance behaviour, and, thus, insofar as the insect learning literature is concerned, they are unlike all other insect species studied to date.

Key words: invertebrate learning, learning in insects, associative learning, conditioning, predation, sit-and-wait predation, antlions, Neuroptera, Myrmeleontidae, pit-building insects

Introduction

In this paper, we provide a brief overview of the rapidly expanding literature demonstrating learning in insects, and review our own recent studies of learning in larval antlions. As we explain below, antlion learning represents a very large departure from learning in other insect species. Thus, our work not only increases researchers' understanding of learning processes per se, but also contributes to the vast literature on the behaviour of larval antlions (see Gotelli, 1997; Devetak *et al*., 2007; Griffiths, 1980; Mansell, 1999; Scharf & Ovadia, 2006; Topoff, 1977 for reviews).

Learning in insects

Learning is well documented in social, eusocial, and solitary-living insects and, currently, the research literature spans multiple families in all major insect orders (Papaj, 2003; North & Greenspan, 2007). Indeed, the capacity for learning, as well as its fitness benefits, have been demonstrated repeatedly over the last half-century, beginning with some of the very first studies of honeybees, *Apis mellifera* (e.g., Menzel, 1968; Menzel *et al*., 1974), fruit flies, *Drosophila melanogaster* (e.g., Murphy, 1967, 1969; Quinn *et al*., 1974; Spatz *et al*., 1974), and ants, *Formica* sp. (Schneirla, 1941, 1943), to more recent research with grasshoppers, *Schistocerca americana* (Dukas & Bernays, 2000), cockroaches, *Periplaneta americana* (Sakura & Mizunami, 2001; Watanabe & Mizunami, 2005), locusts, *Locusta migratoria* (Simpson & White, 1990), mosquitoes, *Ades aegypti*

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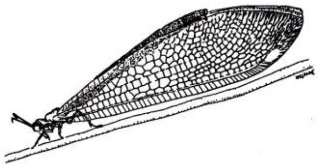

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp. 171–174.

Neuropterida (Megaloptera, Raphidioptera, Neuroptera) of Kozjanski Regional Park, Slovenia

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Abstract. Kozjanski Regional Park, consisting of about 20,600 hectares, is a protected area situated in SE Slovenia and characterized by Subpannonian and Prealpine influences. In 1980 and from 2003 to 2007, 47 neuropterid species were collected in the area. Among them, the following species are recorded for the first time in Slovenia: *Dichochrysa abdominalis* (Brauer, 1856), *Chrysoperla mediterranea* (Hölzel, 1972) and *Chrysoperla pallida* Henry, Brooks, Duelli & Johnson, 2002. The Park is important as a refuge for rare as well as interesting species of Neuropterida and the results could be helpful for environmental survey or management plans.

Key words: Neuropterida, Kozjanski Regional Park, nature conservation, Slovenia

Introduction

Kozjanski park, consisting of about 20,600 hectares, is situated in SE Slovenia (Fig. 1). It is the largest Regional Park in the country and it represents a wide range of regional ecosystems and landscape-types with large parts of the primordial nature, where human impact is balanced with nature. The Bistrica river runs through the centre of the Park, and the territory is covered by the forested Rudnica on eastern border, mountain range of Bohor and Vetrnik on the west, Orlica in the south and the eastern part of the Park is fringed by the river Sotla (Zidar, 2001).

The major part of Kozjanski Regional Park meets the criteria for special protection area SPA in Natura 2000 in order to protect endangered species of birds (Mencinger, 2004). Local fauna, flora and vegetation have Subpannonian and Prealpine biogeographical character (Zupančič & Žagar, 1995). Throughout the Park there are four forest reserves, at least six forest communities (probably the most interesting thereof are *Vicio oroboidi-Fagetum* and *Hacquetio-Fagetum*), and 25 to 30 grassland communities. Characteristic grassland assemblages are from *Brometalia erecti* (Škornik, 2001), *Molinietalia, Arrhenatheretalia* and *Nardetalia* orders (Zidar, 2001; Škornik, 2001).

Neuropterida, especially the families green lacewings (Chrysopidae), brown lacewings (Hemerobiidae) and dusty-wings (Coniopterygidae), are of great interest to a large group of applied entomologists because of their role as predators of other small arthropods – pests on plants important in agriculture and natural ecosystems (Canard *et al*. 1984; Stelzl & Devetak, 1999; McEwen *et al*., 2001). Despite of the fact that Slovenian neuropterid fauna is relatively well known (Devetak, 1992b, 1995, 2007), new findings, even spectacular, are not excluded (e.g. Jones & Devetak, 2009).

Material and methods

During occasional visits of the Park the specimens were collected between May and October in the years 1980 and 2003–2007 using sweeping net. Antlion larvae were excavated from their pit-fall traps in sand using a spoon.

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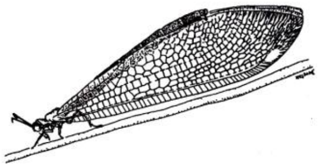

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp. 175–179.

Sharing entomological knowledge: eight years after the release of the Italian Neuropterological web site*

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Abstract. Ten years after the discussion of the "state of the art" of Italian Neuropterida (Letardi, 1998) during the Sixth International Symposium on Neuropterology, held in Helsinki, the frame is substantially changed: several centres of study in different topics are spread through Italy; some new taxa have been described in these years, specific faunistic databases have been implemented, peculiar faunistic surveys have been organized. When a web page on Italian Neuropterida appeared in 2000, very few information in Italian language could be get back from internet. Several web sites are now available, mostly with pictures of selected species, but recently (starting from 2005) also a web forum with a wide range of news about Neuropterida is highly visited and attended. A review of these developing facts, due to the cooperation of a high number of Italian naturalists, is presented.

Key words: Italy, faunistics, web resources, shared information

*This contribution is dedicated to Ornella Casnati, a keen Tuscanian naturalist and photographer who sadly died just few days after the X International Symposium on Neuropterology, as a sign of deep gratitude for her several discussions on Italian Neuropterida in the last two years.

Introduction

Ten years after the discussion of the "state of the art" of Italian Neuropterida (Letardi, 1998a) during the Sixth International Symposium on Neuropterology, held in Helsinki, the frame is substantially changed. Several centres of study in different topics are now spread through Italy (University of Genova – Faunistics; University of Piacenza –Morphology, Taxonomy, Faunistics; University of Bologna – Lacewings in Applied Entomology; University of Siena – Ultrastructural Morphology; Agricultural Research Centres in Roma – Faunistics, Lacewings in Applied Entomology; University of Sassari – Morphology, Taxonomy, Faunistics, Lacewings in Applied Entomology; in recent past almost all the activities regarding Neuropterida gravitated on University of Bologna round the authoritative personality of Prof. Maria Matilde Principi.

Several field research was organized in different parts of Italian Peninsula and in main as well in some minor islands: among the results, some new species were described (*Calabroraphidia renate* Rausch, Aspöck H. & Aspöck U., 2004 (Rausch *et al*., 2004), *Subilla principiae* Pantaleoni, Aspöck U., Cao & Aspöck H., 2004 (Pantaleoni *et al*., 2004)) and several species were reported for the first time in Italy (Nicoli Aldini & Baviera, 2001; Letardi, 2004; Nicoli Aldini, 2005; Letardi *et al*., 2006; Pantaleoni, 2008), increasing the known biodiversity of Italian Neuroptera fauna.
Specific faunistic databases have been recently implemented, which have considered Neuropterida (Checklist of Italian Fauna (Bernardi Iori *et al*., 1995), CKMap project (Letardi, 2005; Letardi & Pantaleoni, 2007)); precise faunistic surveys have been organized in different wide Italian areas (Western Liguria (Badano, 2008), Val Camonica (Nicoli Aldini, 2005), several National Parks (Letardi, 1998b, 2007; Letardi & Biscaccianti, 2007;

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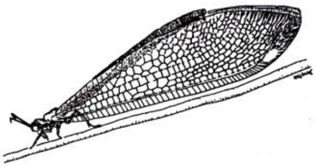

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp. 181–189.

The Neuropterida of Triveneto (Northern Italy): an updated faunal checklist with some zoogeographical remarks

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Abstract. As far as we know, about two-thirds of the whole Italian Neuropterida fauna (Raphidioptera, Megaloptera, Neuroptera) are present in north-eastern Italy (i.e. in the so-called 'Triveneto', corresponding to the administrative regions of Trentino-Alto Adige, Veneto, and Friuli-Venezia Giulia) and almost all the families reported in Italy (with the exception of Dilaridae and Berothidae) are also quoted for this area. In the present work, an updated checklist of the species is provided and faunal notes on certain noteworthy species as well as zoogeographical considerations concerning connections among Triveneto, Central Europe, the Apennine Peninsula and the Balkan Peninsula are presented. As far as Neuropterida are concerned, Triveneto can be considered a well-studied area.

Key words: Raphidioptera, Megaloptera, Neuroptera, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, fauna

Introduction

The "Triveneto" (also know as "Tre Venezie") macro-region covers the three Italian administrative regions of Trentino-Alto Adige, Veneto and Friuli-Venezia Giulia, i.e. the north-eastern sector of continental Italy. A large sector of the Alps, the Pianura Padana and the Adriatic coast fall within this area which is therefore subject to different types of climate (Fig. 1).

On the southern edge of Central Europe, between the eastern sector of the Italian peninsula and the western sector of the Balkan peninsula, from a biogeographical point of view Triveneto is part of both the Central-European and Mediterranean subregions within the West Paleartic region (Vigna Taglianti *et al*., 1992; AA.VV., 2005). It borders on Engadine, North-Tyrol and Carinthia to the north, the Istrian peninsula and Slovenia to the east, the Adriatic Sea and the Po river to the south. The western part of Triveneto also borders on the Insubric area, where the great lakes of glacial origin are located. Starting from Lake Garda, thermophilic Mediteranean faunal elements penetrate Triveneto, including along the Adige Valley, rising to the subalpine and alpine environments. On the other hand, the characteristic springs of the Friuli plain have an opposite effect on local climatic conditions, favouring the presence of Alpine elements in a plain environment. On the whole, because of its geographic location and orographic and hydrographic conditions, Triveneto exhibits a high biodiversity as a result of different affinities: Mediterranean, Balkan, Alpine and also the Danubian basin to the north. This complexity also interests the entomological fauna too and it is not surprising that much of the Italian neuropterofauna is cited for Triveneto.

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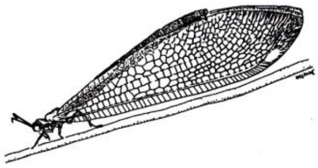

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (eds). Maribor, Slovenia, 2010. Pp. 191–200.

Towards a catalogue of Afrotropical Lacewings and Alderflies (Neuroptera, Megaloptera)

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Abstract. A catalogue has been compiled to provide a modern inventory of the taxa comprising the Neuroptera and Megaloptera of the Afrotropical Region. The directory includes all names and combinations listed under the currently valid epithet. Details are provided of synonymy, type depository, type locality, country distribution and taxonomic status. Introductions to families, taxonomic history and a selection of colour photographs are also included. The two orders comprise 15 families in the Afrotropics, and there are currently 3800 names and combinations in the relational database that underpins the catalogue. The work focuses exclusively upon Afrotropical Africa and associated Indian and Atlantic Ocean islands, including Cape Verde, Madagascar and Socotra. The Afrotropical catalogue is designed to complement the inventory of Neuropterida of the Western Palaearctic by Aspöck *et al*. (2001), as well as specific families dealt with by recent authors. The catalogue will be available in electronic format as well as hardcopy, which will be published by the South African National Biodiversity Institute.

Key words: Neuropterida, Neuroptera, Megaloptera, Afrotropical, catalogue, lacewings, alderflies

Introduction

The order Neuroptera (lacewings) comprises 19 families, 13 of which occur in the Afrotropical Region. In addition, the two families of the archaic order Megaloptera are also represented in the Afrotropics. These two orders, together with the extra-Afrotropical Raphidioptera constitute the super-order Neuropterida. Neuroptera are distributed worldwide, with especially rich concentrations in Africa, and southern Africa in particular.

Long-term ongoing research by the author on the lacewings of southern Africa commenced in the 1970's, with specimen collections and a taxonomic card catalogue that evolved into electronic format as a Relational Database that is maintained in MS Access© (Mansell & Kenyon, 2002). The database enables data to be collated across various platforms and facilitates conversion into document and HTML formats to generate printed catalogues and web-based products. This comprehensive database has been expanded to include all taxa from the entire Afrotropical Region. There are currently about 3800 taxonomic names and combinations spanning the 15 Afrotropical families of Neuroptera and Megaloptera, and a catalogue became essential to provide a modern inventory and synopsis of current knowledge of all taxa comprising these two orders in the Afrotropics.

Development of the database was supported by a grant from the Electronic Catalogue of names of known organisms (ECAT) programme of the Global Biodiversity Information Facility (GBIF), and will be available to the portals of both GBIF and South African Biodiversity Information Facility (SABIF). The inventory will also be published in book format under the auspices of the South African National Biodiversity Institute (SANBI).

The Afrotropical catalogue is designed to complement the comprehensive directory of the Neuropterida of the Western Palaearctic Region by Aspöck *et al*. (2001), as well as individual families documented by recent authors listed below. The inventory specifically excludes those African countries covered by the Western Palaearctic

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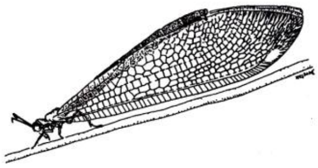

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Fitness of *Chrysoperla agilis* (Neuroptera: Chrysopidae) fed on different natural preys

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Abstract. Due to the current distribution of *Chrysoperla agilis* in the island of Flores (Azores) as recorded in the summer of 2007, we aimed to investigate the reasons for its greater abundance on ornamental plants, infested mainly with mealybugs. Specimens of these populations were collected and brought to laboratory for study. Descents from the above mentioned populations were subjected to 4 different diet schemes under controlled environments: *Aphis fabae*; *Myzus persicae*; *Pseudococcus* sp.; mixed diet with all three preys. Predator's fitness was evaluated through the following parameters: developmental rate; weight increase along development; survival; reproductive ability of issued generation. The predator's feeding preference towards these preys was also evaluated, through a dietary self-selection test. *M. persicae* and *Pseudococcus* sp. were able to provide a complete life-cycle of the predator with a higher survival rate than the one obtained with the other preys. With *Pseudococcus* sp., *Ch. agilis* experienced a greater developmental time, but on the other hand, females from first generation had the greatest reproductive rate of all treatments. *A. fabae* was by far the less suitable prey for the predators' survival, experiencing a mortality rate of 90%, whilst the dietary self-selection test showed an absence of a nutritional selectivity of the predator, which actually preferred the most unsuitable prey, the aphid *A. fabae*.

Key words: Neuroptera, *Chrysoperla agilis, Myzus persicae, Aphis fabae, Pseudococcus* sp., fitness, dietary self-selection

Introduction

Green lacewings are essentially polyphagous predators whose larvae feed on small soft-bodied arthropods, and are highly voracious (Principi & Canard, 1984). The genus *Chrysoperla* is widespread in cultivated areas almost all over the world (Duelli, 2001) and many species of the genus play an important role in the biological control of field crop pests (Canard *et al*., 1984), with the species from the *carnea*-group being dominant within the genus (Duelli., 2001). Larval prey quality has considerable influence on the developmental parameters of these predators, such as survival, reproductive ability, fecundity and fertility (Canard & Pincipi, 1984; Rousset, 1984; Canard, 2001). Some authors refer that a mixed diet can bring benefits to a generalist predator (*e.g*. Uetz *et al*., 1992; Evans *et al*., 1999; Toft & Wise 1999; Oelbermann & Scheu, 2002), likely due to the nutritional optimization achieved by the combination of prey with different qualities (Toft, 1995 *fide* Oelbermann & Scheu, 2002).

The lacewing *Chrysoperla agilis* (Neuroptera: Chrysopidae) was described by Henry *et al.* in 2003 as being part of the *carnea*-group of European sibling species, and so far few studies have been done on the influence of biotic factors such as the type of prey, on the biological parameters that characterize its fitness.

Chrysopidae populations in the Azores are subjected to monitoring since 1996, mainly in the island of S. Miguel. In the island of Flores sampling started in the nineties and in 1998 a great number of *Ch. agilis* specimens were found, mainly in corn fields and citrus orchards infested with aphids. In 2007 sampling started to be conducted on the same habitats, but with much less success than in previous years. We were finally successful while searching on ornamental flowery plants infested with *Pseudococcus longispinus* (Targioni Tozzeti, 1867).

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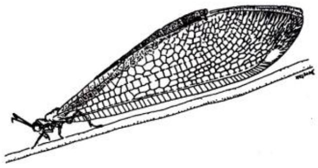

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Larval head capsule markings of *Chrysoperla nipponensis* (Neuroptera: Chrysopidae) vary according to rearing temperature

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Abstract. There are two larval types, differentiated by head markings, within the Japanese green lacewing, *C. nipponensis*, which are called type A and type B according to their different adult courtship songs. The two types are thought to be cryptic species that are reproductively isolated. The head of the type A larva has one pair of longitudinal dark brown or blackish-brown stripes on the dorsal side of the cranium, whereas that of type B has heavy blackish-brown markings, distinctly separated by a pale Y-shaped line. The larval head markings of *C. nipponensis* type A become black and broad when reared at low temperatures and those of type B show narrower markings when reared at high temperature. Since the larval head markings of *C. carnea* s. str. change little with temperature, this temperature-mediated phenotypic plasticity may be a characteristic unique to *C. nipponensis*.

Key words: Japanese green lacewing, *Chrysoperla nipponensis*, larval head markings, larval types, cryptic species, *Chrysoperla carnea* sensu stricto

Introduction

The Japanese green lacewing has until recently been regarded as conspecific to the Eurasian *Chrysoperla carnea* (Stephens). However, Brooks (1994) revised it to *C. nipponensis* (Okamoto) based on adult external morphological differences such as the color of the gradate crossveins of the wings, which are black in *C. nipponensis* and green in *C. carnea*. Tsukaguchi (1995) found that there are two larval types, differentiated by head markings, within the Japanese green lacewing, *C. nipponensis*, which in his paper he calls *C. carnea* type A and type B. He described the head of the type A larva as having one pair of longitudinal dark brown or blackish-brown stripes on the dorsal side of the cranium, and that of type B having heavy blackish-brown markings, distinctly separated by a pale Y-shaped line. Taki *et al*. (2005) reported that the larval types correspond to different song phenotypes. Little cross-hybridization was observed in the laboratory, suggesting them to be reproductively isolated cryptic species. Differences of the larval head markings have been thought to be thus an easy way of differentiating type A from type B.

In early spring, we often find larvae with wide black stripes and darkly pigmented markings on the center of the frons, which resemble the head markings of type B larva, in areas where type B has not yet been collected. The courtship song of the emerged adult is identical to that of type A. Their larval offspring, reared at 25˚C, revealed the same head markings as type A. We hypothesized that the larval head markings of *C. nipponensis* type A turn black and broad at low temperatures and examined changes in larval head markings of *C. nipponensis* type A at different rearing temperatures, comparing them with those of *C. nipponensis* type B and *C. carnea* sensu stricto.

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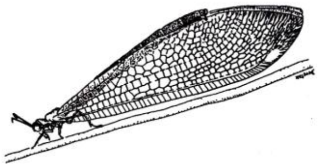

Proceedings of the Tenth International Symposium on Neuropterology. Piran, Slovenia, 2008. Devetak, D., Lipovšek, S. & Arnett, A.E. (Eds). Maribor, Slovenia, 2010. Pp. 215-229.

Nomenclatural roots of Neuropterida: Linnaeus' era

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Abstract. Linnaeus' Systema Naturae [LSN], 10^{th} Edition is deemed to have been published on 1^{st} January 1758, the starting point of zoological nomenclature. This date was arbitrarily set and clearly the publication of the 10^{th} edition of the LSN does not represent a real break away from the past. Even if it is not part of the zoological nomenclature, information, such as descriptions or illustrations, published before that date may be used.
Literature from the pre-Linnean and Linnean period (i.e. the first ten years from the birth of zoological nomenclature closing with the publication of the 12^{th} edition of LSN) was analysed in order to define the state of knowledge about Neuropterida in Linnaeus' time through the exploration of his works, the works of preceding authors to whom he refers, and his most important coeval authors (Poda, Scopoli, Schäffer, Müller).

Key words: History of entomology, 18^{th} century, bibliography, Linnaeus' species, insect classification

Introduction

According to the International Code, Zoological Nomenclature originated about 250 years ago on the 1^{st} January 1758, a date which was arbitrarily set by art. 3 as the starting point: « No name or nomenclatural act published before 1 January 1758 enters zoological nomenclature ». The first work to be recognised by the Code (with the well known exception of *Clerck's Aranei Svecici*) is *Linnaeus' Systema Naturae*, 10^{th} Edition (International Commission on Zoological Nomenclature, 1999).

This date, dutifully defined with great precision by the Code, represents a caesura in time which is so effective that many zoologists see it almost as an impasse beyond which they should not push their studies. Actually, there is obvious continuity between the works which precede and follow 1758 – sanctioned by the same Code: « information (such as descriptions or illustrations) published before that date may be used » (art. 3.2). Every line of the works which appeared in the years immediately following the "starting point" inevitably took their roots from the works of the preceding years. The pre-Linnean volumes are not only interesting for the history of science or the history of philosophy, but also for the same taxonomists.

It is well-known that the order of Neuroptera (now the super-order Neuropterida), at the time of the "starting point" was extremely heterogeneous. The species of Neuroptera listed in *Linnaeus' Systema Naturae*, 10^{th} Edition are now distributed among at least ten different orders. Even within the same genus, such as *Phryganea*, *Hemerobius* and *Panorpa*, species are found which are now attributed to several different orders. A confused situation which made any future detailed analysis of the species described by Linnaeus, and his coeval authors, problematic.

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Green lacewing assemblages in two fluvial lower valleys in eastern and western Europe (Neuroptera: Chrysopidae)

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Abstract. Green lacewings were surveyed by various collecting methods in several sites of two European fluvial lower valleys, in Rumania (Danube Plain) and in France (Val-de-Loire). Faunistic richness was higher in Val-de-Loire whilst diversity indices showed that the Plain of the Danube exhibits a better degree of biodiversity. Seventeen common species appeared jointly in samples of the two valleys. The Plain of the Danube harboured two characteristic Eurosiberian elements: *Chrysopa dasyptera* and *Chrysopa hungarica*, Val-de-Loire showed three particular species: *Dichochrysa picteti*, *D. inornata* and *Chrysoperla mediterranea*. Concerning actual numbers of individuals, the Danubian populations were constituted equally with predaceous and aphidophagous adult green lacewings (50/50 %) contrarily to Val-de-Loire which was essentially dwelt by glyco-palynophagous chrysopids (98 %), overwintering as adults (89 %) or larvae (9 %).

Key words: Neuroptera, Chrysopidae, Plain of the Danube, Val-de-Loire, biodiversity, adult diet, overwintering

Introduction

The European fauna of Neuroptera is well known and large amounts were published over recent years (e.g. Aspöck *et al*., 2001). Most of these works are relative to faunistics, pointing out to elaborating diversity, but they do no provide information on the actual frequency of and balance between species. Qualitative surveys most often feature occasional encounters of rare specimens in the samples, highlighting their occasional occurrence and so giving readers a biased perspective of actual species assemblages.

The fauna of Chrysopidae of Rumania is composed of 33 species (Kis *et al.*, 1970; Paulian, 2002), including the sibling species of the complex *Chrysoperla carnea* (Stephens, 1836) *sensu lato*, so-called "the common green lacewings". Due to the uncertainty of the actual identity of several specimens of the complex, we grouped here the three constitutive European species *Chrysoperla carnea*, *Ch. affinis* (Stephens, 1836) and *Ch. lucasina* (Lacroix, 1912), keeping in mind that *Ch. affinis* is dominant in the surveyed biotopes (Paulian *et al.*, 1996; Deutsch *et al.* 2005). The lower valley of the Loire (Val-de-Loire) harbours 27 amongst 35 green lacewing species occurring in the northern part of France (Canard *et al.*, 2007b).

The goal of the present study is to give an accurate assessment of green lacewing populations and so to help typify the chrysopid assemblages of similar biotopes situated in two opposite parts of Europe, southern Rumania and northwestern France.

Material and methods

Biotopes in which the surveys are performed are both fluvial valleys in their terminal part (Fig. 1). That of Danube is located between 23 and 28° E on a distance of about 500 km, from Dabuleni to the Delta (Uzlina), between 43° 30' and 45° 30' N. All sites consisted mainly of crops (maize, orchards, vineyards and meadows) submitted to standard chemical plant protection programmes, in which grow some weeds. The neighbouring

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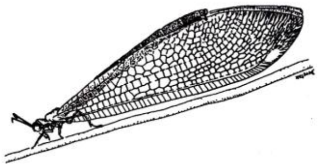

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Comparative zoogeographical analysis of Neuropterida of the Apennine and Balkan peninsulas

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Abstract. The Apennine Peninsula (AP) proper with Sicily and the Balkan Peninsula (BP) proper harbour 255 taxa of Neuropterida (155 taxa in AP and Sicily; 223 taxa in BP). The fauna of BP is richer than that of AP by one family, 6 genera and 68 species and subspecies. The Balkan taxa not occurring in AP are 3 times more in genera and 3.1 times more in species than the Apennine taxa not occurring in BP. The share of the southern species is higher in AP than in BP in all groups except Chrysopidae. The number of expansive northern species entered in BP is 1.5 times higher than their number in AP. The Holomediterranean species are better represented in AP (33 %) than in BP (23 %). Pontomediterranean taxa in BP are 3.5 times more than the Adriatomediterranean taxa in AP. The species of all secondary Mediterranean centres of dispersion are more in the Balkan fauna (38 %) than those in the Apennine fauna (30 %). Routes of dispersal (13 types) in main categories of origin are outlined. Areas of higher rate of endemism are listed. BP is characterized by richer fauna of Neuropterida than AP because of its larger territory, its long land border with Central Europe, the absence of high mountain transverse barriers on its border with Central Europe, its long-term history in Neogene as land, the presence of many centres of fourth and fifth level of speciation for Raphidioptera.

Key words: Neuropterida, Apennine Peninsula, Balkan Peninsula, species diversity, zoogeography, endemism, origin, dispersal

Introduction

The Balkan and Apennine peninsulas shelter two of the three richest faunas in Europe. Higher is the species diversity only of the Iberian Peninsula. This is valid for most taxonomic group of animals, including the order Neuroptera (Popov, 2007) and related orders (superorder Neuropterida). Between the two discussed faunas, Balkan and Apennine, exists close relationship. Both peninsulas are located on places of mixing of various zoogeographical elements. Quite evident is the difference in comparison with North and wide parts of Central Europe with their much more homogeneous in zoogeographical respect (and much poorer) faunas. Because of that the recent composition of both faunas is a result of paleogeographical, paleoclimatic, paleoecological, phytogeographical and anthropogenic changes.

The species diversity of the Apennine and Balkan peninsulas is in general sufficiently studied (Aspöck *et al*., 1980, 1991, 2001; [Bernardi] Iori *et al*., 1995). Although the intensive investigations during the last 20 years in Italy and 40 years in some Balkan countries revised considerably our knowledge about the number of species and their distribution, remarkable new records were published up to now. Examples of this in the Apennine Peninsula are *Calabroraphidia*, a new endemic and relict genus of snakefly (Rausch *et al*., 2004) and the first record of the genus *Turcoraphidia* (Letardi, 2004), known by that time from the Pontomediterranean area and the Caucasus. In other parts of Italy, new findings are the establishing of the family Nevrorthidae for the first time in the Alps (Letardi *et al*., 2006), of *Cunctochrysa bellifontensis* Leraut in the same region (Nicoli Aldini,

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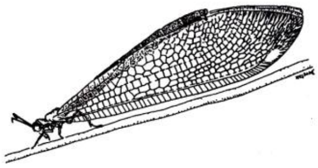

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Patterns of distribution of the Palparini (Neuroptera: Myrmeleontidae: Palparinae) in the northern half of Africa. Faunal transitions and regional overlaps

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Abstract. The Afrotropical Region encompasses the African continent south of latitude 16°N. This definition leaves most of the Sahara within the Palaearctic Region, together with the Mediterranean basin. This paper describes the geographical distribution of Palparini in the northern part of the Afrotropical Region, *i.e.* between the equator and 16°N. Distribution maps are presented.
The presence of 25 species in the region is confirmed. A new synonymy *Nosa tigris* (Dalman, 1823) = *Nosa adspersa* Navás, 1914 is proposed. The striking feature is the apparent absence of species that extend over the entire Afrotropical domain. The equatorial forest is a biological barrier. In contrast to this situation, four species that belong to the Eastern Mediterranean arid ecosystems penetrate deeply into this region of Africa.
As a consequence of the ecological barriers of the region, with a desert to the north and an equatorial forest belt in the south, a high degree of endemicity in Neuroptera has developed. Three species are recorded uniquely from Ethiopia/Somalia, while *P. zebroides* is known exclusively from desert locations in Chad and Niger; and all except one specimen of *S. arenosus* originate from the Bamako district, Mali. Other species seem to depend on the degree of aridity/humidity of the African savannah, where the majority are distributed along elongated narrow bands from the Atlantic Ocean to the Nile River, with very limited northern or southern expansion.
The fragmentation of the African rain forest into a western bloc (Sierra Leone to Ivory Coast) and an equatorial bloc (Cameroon to Congo) has isolated Neuroptera populations but was not conducive to the differentiation of endemic characteristics, as was the case for other insect groups.

Key words: Myrmeleontidae, Palparinae, Palparini, antlions, Africa

Background

In 1995, a preliminary revision of the Palparini of West Africa set the total number of species at 18, based upon examination of about 450 specimens deposited in European museums and private collections (Prost, 1995). Later, further information was added by Michel (1999) and Whittington (2002), the genus *Palparellus* was revised by Mansell (1996), a catalogue of the west Palaearctic fauna was published by Aspöck *et al.* (2001), a synopsis of Neuropterida species of the World was published on the internet (Oswald, 2008), and nomenclatural changes were introduced by the "Catalog of World's Antlions" (Stange, 2004). I have further examined collections in the National Museums of Scotland in Edinburgh (courtesy of Andrew Whittington), in the Russian Academy of Sciences in St Petersburg (courtesy of Viktor Krivokhatsky), and in Cornell University, Ithaca, New York (courtesy of Richard Hoebeke).

The scope of the 1995 revision was limited to West Africa, which is not a meaningful concept in zoogeography. As pointed out by Aspöck *et al*. (2001), the equatorial forest is a barrier that divides the continent into two unconnected savannah areas. The only communication is through the East African corridor along the Rift Valley, a narrow path with so many geological and climatological features that it is hardly a route for dispersal. Therefore, the present paper considers the distribution of Palparini in Africa north of the equatorial divide, from 0° to 16°N, which is the conventional limit between the Afrotropical and the Palaearctic zoological regions.

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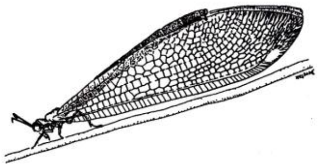

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The African genus *Megistoleon* Navás (Neuroptera: Myrmeleontidae: Myrmeleontinae)

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Abstract. The African genus *Megistoleon* Navás is well characterized, being the only one among *Myrmeleontini* with a double row of costal cells in the forewings. It is poorly represented in museum collections: only three specimens have been documented, each in a different genus with a different species name. At least one has been destroyed. A review of the genus was prompted by the examination of a new specimen from Guinea, and concludes that all specimens belong to a single species and that the name *Megistoleon ritsemae* (Van der Weele, 1907) has priority. Its description was overlooked by Navás when he described *Megistoleon fumosus* Navás, 1931 and *Mizoleon leroyanus* Navás, 1936, which are consequently junior subjective synonyms.

Key words: Myrmeleontidae, Myrmeleontinae, *Megistoleon*, Africa

Megistoleon Navás, 1931: 63; Markl 1954: 234; Oswald & Penny 1991: 35; Stange 2004:305.
= *Megistroleon* (!): Navás 1931: 64. (Incorrect subsequent spelling of *Megistoleon*).
= *Mizoleon* Navás, 1936:335, Markl 1954: 234.

The genus *Megistoleon* was established by Navás (1931) for a specimen in the Hamburg University Museum bearing a label "Ameisenlöwe, 19.V.12", a locality he suspected to be in Africa. Anyone with some exposure to the German language would not be surprised to find an "antlion" with such a label and it is not surprising that Navás did not find the locality on a map! He named the species *Megistroleon* (sic) *fumosus*. The genus is represented in the literature by three specimens only, each allocated to a different species.

The genus is well characterized, being the only one among the *Myrmeleontini* with a double row of costal cells in the forewings, starting with the twelfth vein, and further divided into three rows before the pterostigma. Specimens are large (body length 40 mm; wingspan 90-100 mm) with long antennae (10-11 mm). The wings are broad with large white pterostigmas and brown apical markings, especially on the hind wings. Navás' description is accurate.

Later, Navás (1936) described the genus *Mizoleon* for an insect collected in Bambesa (Belgian Congo) by M. Leroy on 30.X.1933. The characters of the new genus and species, *Mizoleon leroyanus*, are similar to those attributed in 1931 to *Megistoleon fumosus*. The figures also match perfectly.

Markl (1954) synonymized *Mizoleon* with *Megistoleon* and placed it in the tribe *Myrmeleonini*. He also included *Myrmeleon ritsemae* described from Johan-Albrechtshöhe in Cameroon by Van der Weele (1907) in the genus, on the basis of a specimen purchased in Berlin by H. Rolle.

The Hamburg specimen of *M. fumosus* was destroyed during World War 2. The type specimen of *M. ritsemae*, which Van der Weele deposited in the Leyden Museum, Netherlands, cannot be traced, although Stange (2004) gives the reference of the Humboldt University in Berlin; the only available specimen is *M. leroyanus* in the Royal Museum of Central Africa, Tervuren (MRAC) which I have examined. All three descriptions are fortunately very detailed. It is clear that Navás overlooked his previous description when he introduced *Mizoleon* in 1936, and that Van der Weele's description in German also escaped his attention.

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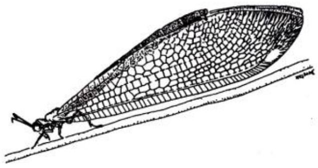

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Overview of the taxonomic and biological knowledge of Mexican Mantispidae (Insecta: Neuroptera)

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Abstract. Taxonomic and biological knowledge of Mexican Mantispidae is summarized. Knowledge on this insect group in Mexico is only fragmentary, particularly in regard to life history. Currently, 23 valid species and three morphospecies have been recorded. Morphospecies of *Plega* (2) and *Trichoscelia* (1) probably represent undescribed species. Known species diversity is distributed in the genera *Plega* (10), *Trichoscelia* (4), *Zeugomantispa* (3), *Climaciella* (2), *Dicromantispa* (2), *Nolima* (2), *Entanoneura* (1), *Leptomantispa* (1), and *Xeromantispa* (1). Few studies treat the taxonomy of Mexican mantispids. Studies are required for the partially revised *Plega* and *Trichoscelia*, while a taxonomic revision of *Nolima* is close to completion. In regard to biology, it is known that members of *Plega* and *Trichoscelia* are predators of some hymenopterans. Mating behavior of one species of *Trichoscelia* has also been documented.

Key words: Mantispidae, Mexico, taxonomy, biology

Mantidflies are quite particular insects, because they resemble praying mantises (Mantodea), because of the convergent raptorial forelegs and an elongate, cylindrical prothorax (Reynoso-Velasco & Contreras-Ramos, 2008). The Mantispidae consist of the subfamilies Calomantispinae Navás, Drepanicinae Enderlein, Mantispinae Leach, and Symphrasinae Navás (Lambkin, 1986).

Symphrasinae is distributed from the southwestern United States to Argentina, Drepanicinae occurs in continental Australia and South America, and Calomantispinae in eastern Australia (including Tasmania) and North and Central America, while Mantispinae is considered cosmopolitan occurring between 50° N and 45° S (Lambkin, 1986; Ohl, 2004).

There are few works dealing with Mexican Mantispidae, and those are focused mostly on taxonomy. Only a few publications contain biological notes but there is no comprehensive synthesis of all available data. According to several authors (Penny, 1977; Hoffman, 1992, 2002; Oswald *et al*., 2002; Ohl, 2004), the Mexican Mantispidae fauna is composed of 23 described species from nine genera and three subfamilies (Table 1). The best known group in Mexico is Mantispinae. *Nolima* Navás, in Calomantispinae, is undergoing a taxonomic revision, which is close to completion. Other Neotropical genera in Symphrasinae, such as *Plega* Navás and *Trichoscelia* Westwood, require taxonomic revision, and when this is achieved, taxonomic knowledge on the Mexican mantispid fauna will be in an acceptable state.

Overall, the biology of Mantispidae is poorly understood. Larvae of Mantispinae are obligate predators on spiders egg sacs; Calomantispinae larvae feed on a wide variety of sedentary prey under laboratory conditions; and larvae of Symphrasinae have been found in association with insect immature stages. There is no information on the biology of Drepanicinae (Redborg, 1998). In this paper, we present a summary of available information about the taxonomy and biology of Mexican Mantispidae based on literature, in order to foster knowledge on this insect group. The term biology is used broadly, to mean studies related to natural history, life history, and

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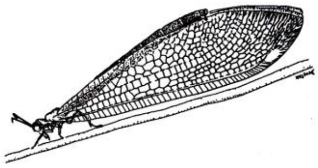

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When the antlions fall into a pit: pitfall trappings in sandy grasslands

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Abstract. In this paper eight antlion species collected by pitfall trappings in the period of 1980–2007 on Hungarian sand dunes are analysed. The collections were carried out by 10 pitfall traps per site emptied biweekly from April to October. The study presents the temporal and spatial distribution of larvae, the possible effects of grassland structural characteristics, weather and climatic variables on larval assemblages and evaluates the pitfall trapping as a collecting method of antlions.
As shown by the data from both pit-building and not-building antlions all the three larval instars were collected. The younger larvae showed bimodal seasonality according to the overwintering and new generation. The abundance of larvae responded by optimal curves to the increasing percent rate of bare soil surface and plant cover. The increasing amount and frequency of rainfall increased the catches via the forced movement of larvae during relocation and reconstruction of pits and giving up of hiding places. The drought seasons are favourable for population dynamics of antlions. The pitfall trapping method can produce useful data, such as abundance and activity level of antlions, only when (a) the number of operating traps reaches the level of hundreds, (b) the catching intervals do not exceed a month, a more suitable biweekly or ten-day period is recommended, and (c) the traps are settled in typical habitats of antlions characterised by higher larval densities.

Key words: Myrmeleontidae, antlion, larvae, pitfall trapping, monitoring, seasonality, plant cover, drought, precipitation

Introduction

The history of human interest in antlions originated a long time ago (Wheeler, 1930; Gepp & Hölzel, 1989), which can be attributed to their peculiar way of hunting. The larvae of pit-builder antlion species sit-and-wait, while non-pit-builders ambush predators. Pit-builders dig conical pits serving as traps for their preys walking on soil surfaces, non-pit-builder larvae hide under the surface covering themselves with a thin layer of soil grains and wait in rest for their preys. Structural variables of habitat, like plant cover of soil surface or the physical characteristics of soil as substrate greatly influence the predatory efficiency of antlions. Foraging mode of both larval groups requires dry soil types with loose structure and fine grains, like sand or loess. Therefore the frequency of pit relocations and reconstructions following physical disturbances, like heavy rainfalls or stronger wind-storms with transported sand particles will increase in field conditions. Scharf & Ovadia (2006) reviewing the literature summarized the biotic and abiotic factors that may influence the habitat selection and pit relocation of antlions. According to this review, studies so far have been conducted only on pit-building species, and physical environmental factors, like precipitation have been considered only in one or two cases. Meanwhile structural features of habitats (e.g. soil surface cover, characteristics of vegetation), and effects of disturbances influencing these factors were completely neglected in these antlion studies.

Therefore any field study aiming to eliminate the above shortcomings can significantly contribute to the knowledge of ecological constraints of antlion larvae. The long-term monitoring of epigeic arthropod assemblages on the protected sandy area of a Hungarian national park offered a good opportunity for such an investigation.

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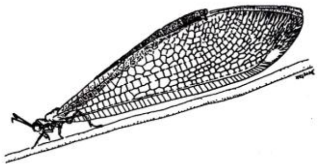

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Ultrastructural morphology of leg cuticle derivatives useful for phylogenetic study of Neuropterida (Insecta: Megaloptera, Neuroptera): preliminary report

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Abstract. Ultrasculpture of leg surface and cuticle derivatives such as spinules, sensilla, and spurs were investigated with SEM in the Neuropterida families Corydalidae and Sialidae (Megaloptera); Ascalaphidae, Chrysopidae, Dilaridae, Hemerobiidae, Ithonidae, Mantispidae, Myrmeleontidae, Nemopteridae, Nevrorthidae, Osmylidae, Polystoechotidae, Psychopsidae, and Sisyridae (Neuroptera). These characters may provide useful phylogenetic information for Neuropterida. The polarity of twenty-five character states of the tibio-tarsal area of the hind leg is preliminary determined. True spurs were not detected in Sisyridae examined.

Key words: Neuropterida, Megaloptera, Neuroptera, SEM, cuticle derivatives, microsculpture (texture) of leg surface, external morphology, spinules, sensilla, spines, spurs

Introduction

Characters of leg cuticle derivatives have recently been found to be useful in phylogenetic analyses of some Holometabolian orders (Basibuyuk & Quicke, 1995; Basibuyuk *et al*., 2000; Baszio & Richter, 2002; Vshivkova *et al*. 2007, 2009). The possible value of the ultrastructure morphology of sensilla, spines, and spurs is also obvious for palaeontology, palaeoecology, and taxonomy, which often use insect body fragments. However, neuropterologists' attention has been almost exclusively concentrated to the presence, number, shape and size of spurs. These characters have been discussed at least passing mention in many publications on Neuroptera (e.g., Tillyard, 1919; Tjeder, 1959, 1960, 1986; Hölzel, 1975, 1999; New, 1981, 1983, 1984a, 1985a,b; Penny, 1983, 1996; Mansell, 1985, 1990, 1992; Stange, 1989, 2008; Brooks & Barnard, 1990; Willmann, 1990; Oswald, 1993, 1998; Aspöck & Aspöck, 1997; Engel, 2002; Archibald & Makarkin, 2004; Penny & Winterton, 2007; Miller, 2008).

However, apart from these brief instances, leg cuticle vestiture and the external morphology of spurs, spines, and sensilla have received very little attention in Neuropterida. We know only few references where they have been treated in any detail. For example, Killington (1936) mentioned that tibial spurs of Osmylidae "are peculiar in being densely clothed with stiff hairs." Poivre (1978, 1981) described and schematically illustrated the tibial spur vestiture in some species of Mantispidae. Further, the ultrastructure of leg sensilla with regards to vibration communication in Neuropterida (particularly Chrysopidae) has received some attention (e.g., Devetak, 1998; Devetak *et al*., 1996, 2004).

Here, we report preliminary results of a study of the external morphology of leg cuticle derivatives in the majority of the neuropterid families, mainly to determine any phylogenetic significance of variation. We have paid particular attention to the tibio-tarsal area of the hind legs.

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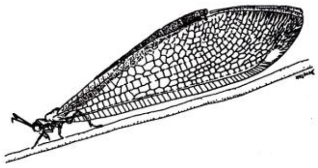

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Occurence of Raphidioptera larvae in dead wood of *Quercus petraea* (Matt.) Liebl.

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Abstract. The occurrence of Raphidioptera larvae was analysed in decomposed dead wood from oak trees (*Quercus petraea*) in Spessart, Germany. Samples from crowns of recently felled trees were compared to samples from tree crowns felled a year before, i.e. dead wood was exposed for one year close to the forest ground. All 12 larvae (11 specimens of *Phaeostigma notata*, 1 specimen of *Subilla confinis*) were extracted from samples of the recently felled trees indicating that oviposition had happened in the tree crown stratum. Larvae were found mostly in highly decomposed wood, which was also inhabited by other arthropods. The number of Raphidioptera was positively correlated with the number of other arthropods. Results were discussed under the aspect of habitat quality and the suitability of dead wood as a larval substrate of Raphidioptera.

Key words: Neuropterida, Raphidioptera, *Quercus petraea*, larval habitat, dead wood, decomposed wood, tree crown fauna, canopy

Introduction

Larvae of snake-flies (Raphidioptera) develop either corticolous on trees and shrubs or terricolous in the detritus of arboreal sites. Nine out of ten species known from Germany live corticolous but in some species migration between tree trunks and detritus on the forest floor was observed (Aspöck *et al*., 1980, 1991, 2002). Larvae of corticolous species have also been found in pitfall traps, on the surface of emergence traps, and even in decomposed branches and trunks on the ground in forest stands (Gruppe, personal observation). Aspöck *et al*. (1991) do not regard dead wood as a possible substrate for larval development, but mention decomposed and cavernous wood as a suitable substrate for oviposition.

In recent studies on the occurrence of arthropods in tree crowns Raphidioptera were found to occur frequently in that stratum; on one hand in different trapping systems, on the other hand through breeding of dead wood branches from tree crowns in the lab (Gruppe, 2006; Schubert & Gruppe, 1999). Those findings led to the conclusion that the relevance of dead wood as a larval habitat has not been proofed well enough yet.

The aim of this study is to analyze the occurrence of Raphidioptera larvae in dead wood from a mature oak stand in Spessart mountains. We try to contribute to the questions (i) if Raphidioptera larvae use dead wood as a larval habitat, (ii) if they prefer dead wood within a certain stratum, (iii) if they prefer a certain degree of decomposition and, (iv) if the presence of Raphidioptera larvae is connected with the presence of potential prey.

Material and methods

Dead wood from oak (*Quercus petraea* (Matt.) Liebl) crowns was collected in Spessart in December 2007. Spessart mountains lie in the northwestern part of Bavaria (south Germany) and are covered by one of the largest

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